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DELTA CONVEYANCE PROJECT

Draft Environmental Impact Statement

PREPARED FOR:

US Army Corps of Engineers®
Sacramento District

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ICF

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Sacramento District

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Acronyms and Abbreviations

2D	two-dimensional
AAQA	ambient air quality analysis
ACM	asbestos-containing material
AP-42	EPA's AP-42 Compilation of Air Pollutant Emission Factors
AVE	area of visual effect
BAAQMD	Bay Area Air Quality Management District
Banks Pumping Plant and Jones Pumping Plant	Harvey O. Banks and C. W. Bill Jones Pumping Plants
Bay-Delta WQCP	Bay-Delta Water Quality Control Plan
BiOp	Biological Opinion
BMPs	best management practices
BNSF	Burlington North-Santa Fe
CAAQS	California ambient air quality standards
CalEEMod	California Emissions Estimator Model
Caltrans	California Department of Transportation
CAP	Climate Action Plan
CARB	California Air Resources Board
CBC	California Building Code
CDFW	California Department of Fish and Wildlife
CEQ	Council of Environmental Quality
cf	cubic feet
CFR	Code of Federal Regulations
CHABs	cyanobacterial harmful algal blooms
cKOPs	candidate key observation points
CMP	Compensatory Mitigation Plan
CNDDB	California Natural Diversity Database
CO	carbon monoxide
CO2	carbon dioxide
CO2e	carbon dioxide equivalent
CVP	Central Valley Project
CWA	Clean Water Act
dB	decibels
Delta	Sacramento–San Joaquin River Delta
DEM	Digital Elevation Model
DO	dissolved oxygen
DOC	dissolved organic carbon
DPM	diesel particulate matter
Draft EIR	Delta Conveyance Project Draft Environmental Impact Report
DWR	California Department of Water Resources
EIS	environmental impact statement
EM	USACE's Engineer Manual

EMFAC 2017 AND CT-EMFAC 2017	Emissions FACtors model
EPR	Engineering Project Report
FEMA	Federal Emergency Management Agency
FHWA Guidelines	Federal Highway Administration (FHWA) Guidelines for the Visual Impact Assessment of Highway Projects
FHWA	Federal Highway Administration
FMMP	Farmland Mapping and Monitoring Program
FR	Federal Register
ft/s	feet per second
FY	fiscal year
GHGs	greenhouse gases
GIS	geographic information system
Guidance	State of California Sea-Level Rise Guidance Update 2018
HRA	health risk assessment
I-	Interstate
ITP	Incidental Take Permit
KOPs	key observation points
kV	kilovolt
LiDAR	light detection and ranging
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MOU	memorandum of understanding
MWh	megawatt hours
NAAQS	national ambient air quality standards
NAIP	National Agriculture Imagery Program
NAVD88	North American Vertical Datum of 1988
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NO2	nitrogen dioxide
NOI	Notice of Intent
NOP	Notice of Preparation
NOX	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resource Conservation Service
O&M	operation and maintenance
OHWM	ordinary high water mark
OPC	Ocean Protection Council
Order No. 2009-0009-DWQ/NPDES Permit No. CAS000002	State Water Board's NPDES Stormwater General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities
PB	lead
PL	Public Law
PM	particulate matter
PM10	particulates 10 microns in diameter or less

PM2.5	particulates 2.5 microns in diameter or less
Porter-Cologne Act	Porter Cologne Water Quality Control Act of 1969
RHA	Rivers and Harbors Act of 1899
RKOPs	rendering or rendered KOPs
ROGs	reactive organic gases
RTM	reusable tunnel material
RWQCB	Central Valley Regional Water Quality Control Board
SCADA	supervisory control and data acquisition
SFBAAB	San Francisco Bay Area Air Basin
SIL	significant impact level
Skinner Fish Facility	John E. Skinner Fish Protective Facility
SMAQMD	Sacramento Metropolitan Air Quality Management District
SO2	sulfur dioxide
SR	State Route
SVAB	Sacramento Valley Air Basin
SVJAPCD	San Joaquin Valley Air Pollution Control District
SWP	State Water Project
SWPPPs	stormwater pollution prevention plans
TACs	toxic air contaminants
TBM	tunnel boring machine
TMDLs	total maximum daily loads
TSS	total suspended solids
Update 2020	Climate Action Plan Phase 1: Greenhouse Gas Emissions Reduction Plan Update 2020
UPRR	Union Pacific Railroad
USACE	U.S. Army Corps of Engineers
USC	United States Code
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VERA	voluntary emission reduction agreement
VMT	vehicle miles traveled
VOC	volatile organic compounds
WQCPs	Water Quality Control Plans
YSAQMD	Yolo Solano Air Quality Management District

Executive Summary

ES.1 Introduction

The California Department of Water Resources (DWR or applicant) is proposing to construct new water-conveyance facilities in the Sacramento–San Joaquin Delta (Delta). As the lead agency for the Delta Conveyance Project (project or *proposed action*), under the National Environmental Policy Act (NEPA), the U.S. Army Corps of Engineers (USACE) Sacramento District has prepared this Draft Environmental Impact Statement (Draft EIS) for construction of the proposed action. The analyses in this Draft EIS are intended to support a NEPA Record of Decision (ROD) and USACE decisions on a Section 408 permission request under Section 14 of the Rivers and Harbors Act (RHA), an application for a real estate outgrant, a Department of the Army (DA) permit application under Section 10 of the RHA, and a permit application under Section 404 of the Clean Water Act (CWA).

ES.1.1 Purpose and Need

ES.1.1.1 Purpose

The purpose of the Delta Conveyance Project is to improve diversion and conveyance facilities in the Delta to ensure the reliability of State Water Project (SWP) water deliveries south of the Delta.

ES.1.1.2 Needs and Objectives

The needs and objectives of the Delta Conveyance Project are as follows.

- To help address anticipated rising sea levels and other reasonably foreseeable consequences of climate change and extreme weather events.
- To minimize the potential for public health and safety effects from reduced quantity and quality of SWP water deliveries, and potentially Central Valley Project (CVP) water deliveries, south of the Delta as a result of a major earthquake that could cause breaching of Delta levees and the inundation of brackish water into the areas where existing SWP and CVP pumping plants operate in the southern Delta.
- To protect the ability of the SWP, and potentially CVP, to deliver water when hydrologic conditions result in the availability of sufficient amounts, consistent with the requirements of state and federal law, including the California and federal Endangered Species Acts and the Delta Reform Act, as well as the terms and conditions of water delivery contracts and other existing applicable agreements.
- To provide operational flexibility for improving aquatic conditions in the Delta and better manage risks of further regulatory constraints on project operations.

ES.1.2 Proposed Action

The Delta Conveyance Project (project or proposed action) consists of constructing new SWP water diversion and conveyance facilities in the Delta. Under the proposed action (DWR's Preferred Alternative), the new water-conveyance facilities would divert water from two new intakes along the Sacramento River between Freeport and the confluence with Sutter Slough. The water would travel through a single tunnel on the Bethany Reservoir alignment, which follows an eastern alignment from intakes to Lower Roberts Island, then extends to a new Bethany Reservoir Pumping Plant in the south Delta along Byron Highway for conveyance via a pipeline aqueduct to the Bethany Reservoir. The new pumping plant, aqueduct, and discharge structure are called the *Bethany Complex*.

Under Alternatives 1, 2b, 3, and 4b, either one or both of the same proposed new intakes would be constructed, but water would be conveyed in a single tunnel along either a central alignment or eastern alignment to a new Southern Forebay on Byron Tract, and from the Southern Forebay to existing SWP export facilities. The new Southern Forebay would provide an additional isolated south Delta water-balancing facility that would provide flexibility for operating both the new and existing facilities. These new facilities in the south Delta are collectively called the *Southern Complex*.

Under all of the action alternatives, operating the new conveyance facilities in conjunction with SWP's existing south Delta export facilities at Clifton Court Forebay would create a *dual conveyance* system. The principal differences among the action alternatives are the tunnel alignment and design capacities; each alignment would involve different locations of tunnel shaft sites. Differences in design capacity would affect tunnel diameter, the number and dimensions of intakes, size of shaft sites, and the number and size of pumps in the South Delta Pumping Plant under Alternatives 1, 2b, 3, and 4b (described in Appendix C, *Description of the Proposed Project and Alternatives*). These variations are directly linked to the magnitude of construction effects associated with each action alternative.

To review a permit application and start the NEPA review process, a proposed action is required by the applicant. While DWR is currently reviewing a range of alternatives in sufficient detail to comply with the California Environmental Policy Act (CEQA), the proposed action with a single corridor has (i.e., DWR's Preferred Alternative) been proposed for the purpose of initiating a permit application with USACE. DWR is currently preparing an environmental impact report (EIR) in compliance with CEQA and plans to make a final determination regarding the action alternative it approves at the close of the CEQA process.[1]

ES.1.3 Areas of Controversy

USACE prepared a Notice of Intent (NOI) describing the intent to prepare an EIS that was posted in the *Federal Register* on August 20, 2020. The 60-day comment period for the NOI was from August 20, 2020, to October 20, 2020. The NOI is provided in Appendix H, *Scoping Report*.

Additionally, proposed action scoping was undertaken by the applicant (DWR) and took place from January 15, 2020, to April 17, 2020. The scoping period was originally scheduled for 65 days, ending on March 20, 2020, but was extended 28 days to allow for additional time to review proposed action information and to accommodate the unprecedented conditions of the coronavirus disease 2019 (COVID-19) pandemic. More detailed information about DWR's scoping process is provided in Delta

[1] The Delta Conveyance Project Draft EIR is available for viewing online at https://www.deltaconveyanceproject.com/read-the-document. A "Change Sheet" identifying changes that will be made in the Final EIR is available on DWR's project website: https://cadwr.app.box.com/s/gyecr8xrc4gogrprmdnf2mxdipw4hnvg.

Conveyance Project Draft EIR Chapter 35, *Public Involvement* (California Department of Water Resources 2022).

The following areas of controversy include concerns raised during the scoping process for both the Draft EIS and the Delta Conveyance Project Draft EIR.

- **Purpose and objectives.** Commenters varied on whether they agreed with the purpose and objectives stated in the Notice of Preparation (NOP) under CEQA to prepare an EIR, with some expressing the opinion that SWP export areas should find alternative sources of water. Other commenters requested a broader project purpose and objectives that should include ecosystem restoration and flood safety. Some commenters requested that USACE expand its evaluation to cover operation of the project.
- **Range of alternatives.** The range and adequacy of alternatives is an issue of concern for the public, as well as for governmental agencies. The alternatives development and screening process is discussed in Appendix D, *Alternatives Screening Analysis,* which provides additional details on the information that was used to develop the alternatives.
- **Water supply and surface water resources.** Water supply and surface water resources—key drivers for development of the proposed action and its action alternatives—are controversial issues for many interested parties (e.g., agricultural interests, hunting and fishing interests, water agencies, local jurisdictions) because of the potential changes in Delta hydrodynamic conditions attributable to changes in the SWP points of diversion in the Delta. The applicant will seek to obtain authorization from the State Water Resources Control Board (State Water Board) for new SWP points of diversion. Such changes would not include changes in water rights; however, there are concerns that the project could result in the potential for increased exports and further reliance on water that moves through the Delta. Water supply and surface water effects on the Trinity and Klamath Rivers were of interest. There was also a focus on future effects both related and unrelated to the project operations (e.g., sea level rise, flooding, degradation of adjacent levees). These issues are addressed in Chapter 3, *Affected Environment and Environmental Consequences*, Section 3.18, *Surface Water*, and Section 3.22, *Water Supply.*
- **Flood protection.** Flood protection is a potentially controversial issue because implementation of the proposed action and action alternatives would entail modification of some existing levees, as well as changes in flood flow regimes. These issues are addressed in Chapter 3, *Affected Environment and Environmental Consequences*, Section 3.9, *Flood Protection.*
- **Water quality.** Water quality is an issue of concern because of uncertainties regarding construction activities associated with the conveyance facilities and facility operation that could potentially change surface water flows, which commenters allege could lead to discharge of sediment, possible changes in salinity patterns, and potential water quality changes. Constituents of primary interest to commenters were cyanobacteria harmful algal blooms (CHABs) and salinity. These issues are addressed in Chapter 3, *Affected Environment and Environmental Consequences*, Section 3.21, *Water Quality*.
- **Climate change.** The likely effects of climate changes on water supplies and the Delta ecosystem are of concern to interested parties. The potential effects of climate change on resources are factored into the analysis of each resource. Chapter 3, *Affected Environment and Environmental Consequences*, Section 3.6, *Climate Change,* presents the latest climate change science and discusses the effects of the action alternatives and climate change, and Delta Conveyance Project

Draft EIR Appendix 5A, *Modeling Technical Appendix* (California Department of Water Resources 2022), describes how climate change was modeled for the project.

- **Biological resources.** Concerns have been raised about the project's potential environmental effects on the aquatic ecosystem and fish species and on the terrestrial ecosystem and plant and wildlife species. For aquatic biological resources, there were concerns about fish in the Klamath, Trinity, Sacramento, American, and San Joaquin River watersheds. For terrestrial biological species, commenters expressed concern regarding effects on upland habitat, as well as effects on wetlands. The effects on fish and aquatic biological resources are addressed in Chapter 3, *Affected Environment and Environmental Consequences*, Section 3.4, *Fisheries and Aquatic Habitat*. The effects on terrestrial biological resources are addressed in Chapter 3, Section 3.5, *Natural Communities, Special-Status Terrestrial Species, and Wetlands and Other Waters*.
- **Agricultural resources.** Because the study area for agricultural resources is largely devoted to agricultural uses, the potential effects of the project on existing agricultural activities are a matter of concern, as expressed in scoping comments. In addition to conversion of agricultural lands to other uses (i.e., water-conveyance facilities and lands used for compensatory mitigation), the analysis also addresses other potential effects from construction and operation of the action alternatives. The effects on agricultural resources are addressed in Chapter 3, *Affected Environment and Environmental Consequences*, Section 3.2, *Agricultural Resources*.
- **Recreation and navigation.** Concerns relating to recreation include potential conflicts between construction and operation of new conveyance facilities and ongoing Delta recreational activities (e.g., boating, fishing, hunting, enjoyment of marinas). Commenters were especially interested in potential effects on navigable waterways. The effects are discussed in Chapter 3, *Affected Environment and Environmental Consequences*, Section 3.16, *Recreation*, and Section 3.14, *Navigation*.
- **Socioeconomics.** The key socioeconomic concerns involve the effects of construction activities on local Delta communities and the potential for loss of revenue and employment associated with a decrease in agricultural production resulting from conversion of agricultural land to other uses. A discussion of the socioeconomic effects that would result from implementation of the Delta Conveyance Project is provided in Chapter 3, *Affected Environment and Environmental Consequences*, Section 3.17, *Socioeconomics*.
- **Aesthetics and visual resources.** Potential effects of new facilities on aesthetics and visual resources are controversial to local Delta residents, as well as others (such as recreationists) who use the Delta. These concerns focus largely on the proposed intake facilities and other facilities such as the Southern Forebay. These concerns are discussed in Chapter 3, *Affected Environment and Environmental Consequences*, Section 3.1, *Aesthetics and Visual Resources*.
- **Environmental justice and disadvantaged communities.** The potential for the Delta Conveyance Project to induce disproportionately high environmental effects on minority and low-income communities is a concern that was raised during scoping. These issues are addressed in Chapter 3, *Affected Environment and Environmental Consequences*, Section 3.8, *Environmental Justice.*
- **Growth.** One of the project's purposes is to ensure the reliability of water supply to SWP contractors south of the Delta. Concerns regarding the potentially growth-inducing consequences of the Delta Conveyance Project generally focused on the potential effects of a stabilized water supply to the southern part of the state, as well as from roadway improvements

made to facilitate construction or to mitigate potential traffic effects in the Delta. The potential for growth resulting under each alternative is discussed in Chapter 4, *Other Statutory Requirements*.

- **Community issues.** Potential community issues, such as construction noise, air quality, and traffic circulation effects, conversion of existing land uses, access to private lands, and changes in the character of Delta communities are areas of concern for Delta residents. These issues have been addressed through evaluation of a wide range of resource effects addressed in Chapter 3, *Affected Environment and Environmental Consequences*, Section 3.15, *Noise*, Section 3.3, *Air Quality*, Section 3.19, *Transportation*, Section 3.13, *Land Use*, and Section 3.17, *Socioeconomics.*

ES.1.4 Cooperating Agency Actions

USACE sent letters to the National Marine Fisheries Service, the U.S. Fish and Wildlife Service, and the U.S. Environmental Protection Agency, inviting them to serve as NEPA Cooperating Agencies for the Delta Conveyance Project EIS. All three agencies accepted the invitation. In addition, the U.S. Bureau of Reclamation (Reclamation) reached out to USACE and requested to participate as a Cooperating Agency. NEPA Cooperating Agency invitations and agreements are included in Appendix H, *Scoping Report*.

ES.2 Alternatives

ES.2.1 Alternative Screening Process

The Council on Environmental Quality regulations for implementing NEPA (40 Code of Federal Regulations [CFR] § 1502.14) require all reasonable alternatives to be objectively evaluated in an EIS, so that each alternative is evaluated at an equal level of detail (40 CFR § 1502.14[b]). Although the No Action Alternative is not the baseline for evaluating environmental effects, the EIS must also evaluate the No Action Alternative to allow decision makers to compare the effects of approving the proposed action with the effects of not approving it.

On January 15, 2020, DWR issued an NOP under CEQA to prepare an EIR (California Department of Water Resources 2020). The proposed project identified in the NOP was described as new conveyance facilities in the Delta that would add to the existing SWP infrastructure. The NOP also stated that the new north Delta facilities would be sized to convey up to 6,000 cubic feet per second (cfs) of water from the Sacramento River to the SWP facilities in the south Delta. The NOP outlined that DWR was considering alternatives with capacities ranging from 3,000 to 7,500 cfs along either a central or an eastern alignment.

The two proposed actions (i.e., the Dual Conveyance Central Tunnel Alignment operating at 6,000 cfs and the Dual Conveyance Eastern Tunnel Alignment operating at 6,000 cfs) and six action alternatives were developed consistent with the NOP and the project’s purpose and need. The alternatives included variations of the proposed actions that were analyzed at various conveyance capacities within the range identified in the NOP.

The screening process for the Delta Conveyance Project focused on identifying alternatives to those identified in the NOP and was not a project development exercise. Therefore, screening started with the provision that the proposed action meets the Delta Conveyance Project’s purpose and need, and the alternatives were screened with these specific needs in mind. The alternatives identified in the NOP therefore served as the basis of comparison for evaluating other alternatives in the screening exercise. The range of conveyance capacities were described in the alternatives screening and evaluated in the Delta Conveyance Project Draft EIR along with an additional alternative (the Bethany Reservoir alignment) that was found to meet the project's purpose and need while minimizing environmental effects.

A total of 21 potential alternatives to the proposed action were screened through a two-level screening process. First-level screening assessed whether an alternative could meet the proposed action's purpose and most of the needs based on four related criteria. Second-level screening examined whether the remaining alternatives would avoid or lessen environmental consequences compared to the proposed action. Appendix D, *Alternatives Screening Analysis,* describes the alternatives development process, all alternatives considered, and the screening process.

Of the 21 individual or grouped alternatives, 11 alternatives or groups were eliminated in the first-level screening. The remaining alternatives underwent second-level screening to evaluate whether they lessened environmental effects compared to the proposed action. Only the Dual Conveyance Bethany Reservoir Alignment passed the second-level screening for its potential to avoid or reduce effects.

On November 22, 2021, the applicant notified USACE that DWR would be identifying the Bethany Reservoir alignment as the proposed project in the Delta Conveyance Project Draft EIR (California Department of Water Resources 2022) and that the applicant would like to amend their Section 404 permit application previously amended on June 15, 2020 to replace the previously identified eastern alignment with the Bethany Reservoir alignment for the proposed project. Therefore, the Dual Conveyance Bethany Reservoir Alignment has been carried forward in this EIS and is referred to as DWR's Preferred Alternative.

USACE has further screened potential alternatives and identified six of the alternatives (including the No Action Alternative) to be fully analyzed in the Draft EIS. While four additional alternatives are included in the Delta Conveyance Project Draft EIR, they are not included in the Draft EIS; however, USACE has identified a reasonable range of alternatives to analyze. In the case of Alternatives 2c and 4c (4,500-cfs alternatives with two intakes) it was determined that analysis of Alternatives 1 and 3 (the 6,000-cfs alternatives with two intakes) and Alternatives 2b and 4b (3,000-cfs alternatives with one intake) would provide sufficient bookends of effects that would capture the effects of Alternatives 2c and 4c (4,500 cfs with two intakes). Additionally, the effects of Alternatives 2c and 4c would be very similar to those for Alternatives 1 and 3 at 6,000 cfs because the same number of intakes would be used, and only the tunnel size would vary. In the case of Alternatives 2a and 4a (7,500 cfs with three intakes) it was determined the alternatives would result in additional adverse effects on the aquatic ecosystem beyond those of the proposed action due to the additional intake facility proposed and the subsequent increase in effects.

ES.2.1.1 No Action Alternative

Under the No Action Alternative, none of the Delta Conveyance Project's proposed facilities would be constructed and DWR would continue to operate the SWP to divert, store, and convey SWP water consistent with applicable laws and contractual obligations. DWR would also remain subject to the current take prohibition for listed species and other current endangered species act requirements.

The No Action Alternative assumptions include the following.

- Water conservation programs by public agencies aimed at water reduction/efficiency targeting landscaping and the commercial and multifamily housing sectors, as well as changing individual habits. This could include programs such as rebates or other incentives for water-saving devices, water use restrictions, and outreach campaigns.
- Water recycling projects involving further treatment of secondary treated wastewater that is currently discharged to the ocean, streams, or lands, and using it for non-potable uses such as landscape and agricultural irrigation, commercial, and industrial purposes. There is potential that, in the future, recycled water could eventually be used as a supply of potable water.
- Groundwater recovery projects involving treatment of high-salinity or contaminated groundwater for potable uses.
- Groundwater management consisting of use of existing groundwater supplies, but also conjunctive use of water, which refers to the use and storage of imported surface water supplies in groundwater basins and reservoirs during periods of abundance. This stored water is available for use during periods of low surface water supplies as a way of augmenting seasonal and multiyear shortages.
- Water transfers and exchanges or water purchases on the open market.

ES.2.1.2 Action Alternatives

The proposed action alternatives are as follows.

- Alternative 1. Central alignment, 6,000 cfs, Intakes B and C
- Alternative 2b[2]. Central alignment, 3,000 cfs, Intake C
- Alternative 3. Eastern alignment, 6,000 cfs, Intakes B and C
- Alternative 4b[2]—Eastern alignment, 3,000 cfs, Intake C
- DWR's Preferred Alternative. Bethany Reservoir alignment, 6,000 cfs, Intakes B and C

Table ES-1 presents a summary of key project features by alternative.

[2] Alternatives 2b and 4b include the letter "b" for consistency with the alternatives naming conventions in the Delta Conveyance Project Draft EIR (California Department of Water Resources 2022).

1 **Table ES-1. Summary of Key Project Features by Alternative**

Feature	Alternative 1	Alternative 2b	Alternative 3	Alternative 4b	DWR's Preferred Alternative
Conveyance capacity (cfs)	6,000	3,000	6,000	3,000	6,000
Alignment	Central	Central	Eastern	Eastern	Bethany Reservoir (eastern alignment from intakes to Lower Roberts Island, then extending to the Bethany Reservoir Pumping Plant and Surge Basin without use of a forebay)
Intakes and capacity (cfs)	• Intake B: 3,000 • Intake C: 3,000	• Intake C: 3,000	• Intake B: 3,000 • Intake C: 3,000	• Intake C: 3,000	• Intake B: 3,000 • Intake C: 3,000
Main tunnel diameter (feet)	• 36 feet inside • 39 feet outside	• 26 feet inside • 28 feet outside	• 36 feet inside • 39 feet outside	• 26 feet inside • 28 feet outside	• 36 feet inside • 39 feet outside
Main tunnel length (miles)	39	37	42	40	45
Dual tunnels at Southern Forebay Outlet Structure, each (diameter in feet, length in miles)	• 38 feet inside • 41 feet outside • 1.7 miles	• 38 feet inside • 41 feet outside • 1.7 miles	• 38 feet inside • 41 feet outside • 1.7 miles	• 38 feet inside • 41 feet outside • 1.7 miles	Not applicable

Feature	Alternative 1	Alternative 2b	Alternative 3	Alternative 4b	DWR's Preferred Alternative
Bethany Reservoir Aqueduct to Bethany Reservoir Discharge Structure	Not applicable	Not applicable	Not applicable	Not applicable	• 138 acres for construction; 63 acres post-construction. • Four pipelines, each 15 feet inside, 15.2 feet outside diameter. • 2.5 miles long. • Four tunnels (one for each pipeline) under CVP Jones discharge pipelines. • Four tunnels (one for each pipeline) under Bethany Reservoir Conservation Easement. • Riser shafts to Discharge Structure.

Note: Tunnel diameter and length are from intakes to Southern Forebay, except for DWR's Preferred Alternative.
cfs = cubic feet per second.

ES.3 EIS Process

ES.3.1 Draft EIS Process

The Notice of Availability (NOA) for this Draft EIS is being distributed to all cooperating, responsible, and trustee agencies, as well as to other potentially interested agencies and organizations, nongovernmental organizations, Native American Tribes, and individuals.

When the 60-day public comment period on the Draft EIS has concluded, USACE will consider and respond to all significant environmental comments and prepare a Final EIS.

ES.3.2 Final EIS Process

The Final EIS will be prepared and circulated in accordance with NEPA requirements and will include responses to comments on the Draft EIS. Once the Final EIS is complete, USACE will issue an NOA to be printed in the *Federal Register*. Upon publication of the NOA in the *Federal Register*, a 30-day public review period will begin. USACE will document its decision in a Record of Decision no sooner than 30 days following publication of the NOA for the Final EIS.

ES.3.3 Scoping and Consultation

ES.3.3.1 Public Scoping

In compliance with requirements set forth in NEPA, USACE prepared an NOI describing the intent to prepare an EIS under the authority of Section 14 of the RHA (33 United States Code [USC] § 408), Section 10 of the RHA, and Section 404 of the Clean Water Act. The NOI was posted in the *Federal Register* on August 20, 2020. Although there is no mandated time limit to submit comments in response to an NOI, USACE set a 60-day comment period. The 60-day comment period for the NOI was from August 20, 2020, to October 20, 2020. The NOI is provided in Appendix H, *Scoping Report*.

ES.4 Summary of Effects

Table ES-2 summarizes the effects of the No Action Alternative and the action alternatives for each environmental resource topic analyzed in this Draft EIS.

1 **Table ES-2. Summary of Effects**

Environmental Resource	Effects	No Action Summary of Effects	Action Alternatives	Level of Significance for Action Alternatives
Section 3.1, Aesthetics and Visual Resources	Impact AES-1: Substantially Degrade the Existing Visual Character or Quality of Public Views (from Publicly Accessible Vantage Points) of the Construction Sites and Visible Permanent Facilities and Their Surroundings in Nonurbanized Areas	Overall, the No Action Alternative would result in an array of effects on existing visual quality and character in the Delta and the four geographic regions affected by the need to implement water supply projects in lieu of the Delta Conveyance Project moving forward. Effects would occur at isolated sites that would be spread out over large geographic areas and would not involve one large-scale project that focuses on one specific region or a large area of one region (e.g., the Delta). Projects would involve relatively typical construction techniques and many of the ongoing programs include development of future projects that would be required to conform with the requirements of NEPA and/or federal, state, and local regulations protecting aesthetic and visual resources. In addition, mitigation measures would be developed to protect these resources.	All action alternatives	This impact may be significant.
	Impact AES-2: Substantially Damage Scenic Resources including, but Not Limited to, Trees, Rock Outcropping, and Historic Buildings Visible from a State Scenic Highway	Scenic resources visible from State Route 160 could be affected by the projects occurring under the No Action Alternative. The potential changes to the existing visual character and quality of views that could occur under the No Action Alternative are described under Impact AES-1.	All action alternatives	This impact may be significant.
	Impact AES-3: Have Substantial Effects on Scenic Vistas	Effects resulting from the No Action Alternative for this impact would be the same as described for Impact AES-1.	All action alternatives	This impact may be significant.
	Impact AES-4: Create New Sources of Substantial Light That Would Adversely Affect Day or Nighttime Views of the Construction Areas or Permanent Facilities	Overall, the No Action Alternative would result in an increase of the amount of light and glare present in the study area. The severity of such effects would depend on the density and appearance of new development. There is a higher likelihood that the project would result in adverse effects if new development projects were to be located on sites or in areas that are undeveloped. Such projects would introduce new sources of nighttime light and glare to areas that are unlit or lowly lit, which would negatively affect nighttime views of the dark sky and could negatively affect nearby viewers.	All action alternatives	This impact does not appear to be significant.
Section 3.2, Agricultural Resources	Impact AG-1: Convert a Substantial Amount of Prime Farmland, Unique Farmland, Farmland of Local Importance, or Farmland of Statewide Importance as a Result of Construction of Water-Conveyance Infrastructure	Continued activities related to operation of SWP and CVP facilities would not result in the conversion of any Important Farmland to nonagricultural use. If the project was not constructed and operated, other foreseeable state water supply projects would result in the conversion of Important Farmland.	All action alternatives	This impact may be significant.
	Impact AG-2: Convert a Substantial Amount of Land Subject to Williamson Act Contracts or Under Contract in Farmland Security Zones to	Same effects as AG- 1 but would occur on a smaller extent of land.	All action alternatives	This impact may be significant.

Environmental Resource	Effects	No Action Summary of Effects	Action Alternatives	Level of Significance for Action Alternatives
	a Nonagricultural Use as a Result of Construction of Water-Conveyance Facilities			
	Impact AG-3: Other Effects on Agriculture as a Result of Constructing and Operating the Water-Conveyance Infrastructure Prompting Conversion of Prime Farmland, Unique Farmland, Farmland of Local Importance, or Farmland of Statewide Importance	Effects would be the same or less than those described under Impacts AG-1 and AG-2.	All action alternatives	This impact does not appear to be significant.
Section 3.3, Air Quality	Impact AQ-1: Result in Effects on Regional Air Quality	Construction or operation and maintenance activities would generate criteria pollutants. The effect of increases in criteria pollutant emissions in excess of General Conformity de minimis thresholds would be adverse. This effect is expected to be further evaluated and identified in the subsequent project-level environmental analysis. Minimization measures and environmental commitments similar to those proposed for the Delta Conveyance Project are likely to be available to reduce emissions, but the extent of the reductions is unknown.	All action alternatives	This impact does not appear to be significant.
	Impact AQ-2: Result in Exposure of Sensitive Receptors to Substantial Localized Criteria Pollutant Emissions	Construction may generate emissions above the state and national standards. New facilities may also result in long-term emissions that could exceed standards. The effect of localized violations of the state and national standards would be adverse. This effect is expected to be further evaluated and identified in the subsequent project-level environmental analysis. Minimization measures and environmental commitments similar to those proposed for the Delta Conveyance Project are likely to be available to reduce localized pollutant concentrations, but the extent of the reductions is unknown.	All action alternatives	This impact may be significant.
	Impact AQ-3: Result in Exposure of Sensitive Receptors to Substantial Toxic Air Contaminant Emissions	Construction activities have the potential to generate diesel particulate matter that could expose nearby sensitive receptors to increased cancer and noncancer risks. The effect of increases in receptor cancer and noncancer health hazards above risk levels recommended by local air districts would be adverse. This effect is expected to be further evaluated and identified in the subsequent project-level environmental analysis. Minimization measures and environmental commitments similar to those proposed for the Delta Conveyance Project are likely to be available to reduce diesel particulate matter and other toxic air contaminants emissions, but the extent of the reductions is unknown.	All action alternatives	This impact does not appear to be significant.
	Impact AQ-4: Result in Exposure of Sensitive Receptors to Asbestos, Lead-Based Paint, or Fungal Spores That Cause Valley Fever	Construction activities can inadvertently disperse asbestos into the environment through demolition. The demolition of asbestos-containing material and lead-based paint is subject to the limitations of the National Emissions Standards for Hazardous Air Pollutants (40 CFR Parts 61 and	All action alternatives	This impact does not appear to be significant.

Environmental Resource	Effects	No Action Summary of Effects	Action Alternatives	Level of Significance for Action Alternatives
		63) regulations. Construction activities would also be subject to local air district rules, which often contain fugitive dust control and asbestos monitoring requirements for activities located in areas known to contain naturally occurring asbestos. Also, disturbance of soil containing the soil-dwelling fungal species through earthmoving activities or wind-blown fallowed fields could disperse fungal spores, which can then be inhaled by people in the area and cause the infection Coccidioidomycosis, referred to as valley fever.		
	Impact AQ-5: Result in Exposure of Sensitive Receptors to Substantial Odor Emissions	Construction and operations would not result in an increase of objectionable odor emissions that would affect a substantial number of receptors.	All action alternatives	This impact does not appear to be significant.
	Impact AQ-6: Result in Effects on Global Climate Change from Construction and Operations and Maintenance	Construction or operation activities would generate greenhouse gas (GHG) emissions. The effect of increases in GHG emissions would be adverse and is expected to be further evaluated and identified in the subsequent project-level environmental analysis. Mitigation measures and environmental commitments similar to those proposed for the Delta Conveyance Project are likely to be available to reduce emissions, but the extent of the reductions is unknown.	All action alternatives	This impact does not appear to be significant.
	Impact AQ-7: Result in Effects on Global Climate Change from Land Use Change	Construction activities have the potential to alter existing land use GHG emissions and sequestration. The effect of increases in GHG emissions from land use change would be adverse and is expected to be further evaluated and identified in the subsequent project-level environmental analysis. Mitigation measures and environmental commitments similar to those proposed for the Delta Conveyance Project are likely to be available to reduce emissions, but the extent of the reductions is unknown.	All action alternatives	This impact does not appear to be significant.
Section 3.4, Fisheries and Aquatic Habitat	Impact AQUA-1: Effects of Construction of Water-Conveyance Facilities on Fish and Aquatic Species	Foreseeable projects with in-water construction and maintenance activities could affect fish species through direct or indirect effects, and the potential to alter spawning, rearing and/or migration habitat of covered fish species through direct loss or modification. However, such projects would be subject to specific environmental permitting processes, which would minimize potential effects through the implementation of project-specific avoidance and minimization measures, best management practices (BMPs), environmental commitments, and/or mitigation measures.	All action alternatives	This impact does not appear to be significant.
	Impact AQUA-2: Long-Term Effects of Construction of the Water-Conveyance Facilities on Fish and Aquatic Species	Foreseeable projects that involve the construction of in- and over-water structures (e.g., docks and associated piles) could result in increased predation on covered fish species relative to the No Action Alternative. Any projects that include in-water construction and maintenance activities would have the potential to stress, injure, or kill covered fish	All action alternatives	This impact does not appear to be significant.

Environmental Resource	Effects	No Action Summary of Effects	Action Alternatives	Level of Significance for Action Alternatives
		species through direct or indirect effects, and the potential to alter spawning, rearing and/or migration habitat of covered fish species through direct loss or modification. However, effects on fish during in- or near-water maintenance activities would be minimized through adherence to applicable federal, state, and local regulations, project-specific designs, BMPs, and environmental commitments intended to avoid, prevent, or minimize turbidity.		
Section 3.5, Natural Communities, Special-status Terrestrial Species, and Wetlands and Other Waters	Impact BIO-1: Impacts of the Project on the Tidal Perennial Aquatic Natural Community	The extent of the tidal perennial aquatic community in the study area would not substantially change under the No Action Alternative because direct fill of this community would be limited to discrete areas relative to the extent of this community available in the study area and within the geographic regions analyzed. Periodic levee- and channel-maintenance activities associated with current strategies would result in localized disturbances to the tidal perennial aquatic natural community.	All action alternatives	This impact does not appear to be significant.
	Impact BIO-2: Impacts of the Project on Tidal Freshwater Emergent Wetlands	The extent of the tidal freshwater emergent wetlands in the study area would not substantially change under the No Action Alternative because direct fill of this community would be limited to small discrete areas relative to the extent of this community available in the study area and within the geographic regions analyzed. Periodic levee- and channel-maintenance activities associated with current strategies would result in localized disturbances to the tidal freshwater emergent wetlands.	All action alternatives	This impact does not appear to be significant.
	Impact BIO-3: Impacts of the Project on Valley/Foothill Riparian Habitat	The extent of the valley/foothill riparian community in the study area would not substantially change under the No Action Alternative when considering the balance of likely sources of loss and programs to protect and create riparian habitat in the Delta. Periodic levee- and channel-maintenance activities associated with current strategies would result in localized disturbances to this community.	All action alternatives	This impact does not appear to be significant.
	Impact BIO-4: Impacts of the Project on the Nontidal Perennial Aquatic Natural Community	The extent of the nontidal perennial aquatic community in the study area would not substantially change under the No Action Alternative because direct fill of this community would be limited to small discrete areas relative to the extent of this community available in the study area, which consists of conveyance channels, natural channels, and depressions (ponds).	All action alternatives	This impact does not appear to be significant.
	Impact BIO-5: Impacts of the Project on Nontidal Freshwater Perennial Emergent Wetland	The extent of the nontidal freshwater emergent wetlands in the study area would not substantially change under the No Action Alternative because direct fill of this community would be limited to small discrete areas relative to the extent of this community available in the study area.	All action alternatives	This impact does not appear to be significant.
	Impact BIO-6: Impacts of the Project on Nontidal Brackish Emergent Wetland	The extent of the nontidal brackish emergent wetlands in the study area would not substantially change under the No Action Alternative because	All action alternatives	This impact does not appear to be significant.

Environmental Resource	Effects	No Action Summary of Effects	Action Alternatives	Level of Significance for Action Alternatives
		direct fill of this community would be limited to small discrete areas relative to the extent of this community available in the study area. Periodic levee- and channel-maintenance activities associated with current strategies could result in localized disturbances to nontidal brackish emergent wetlands.		
	Impact BIO-7: Impacts of the Project on Alkaline Seasonal Wetland Complex	The extent of the alkaline seasonal wetland complex community in the study area would not substantially change under the No Action Alternative because potential effects would be limited to small discrete areas relative to the extent of this community available in the study area.	1, 2b, 3, and 4b	This impact does not appear to be significant.
			DWR's Preferred Alternative	This impact does not appear to be significant.
	Impact BIO-8: Impacts of the Project on Vernal Pool Complex	The extent of the vernal pool complex community in the study area would not substantially change under the No Action Alternative because potential effects would be limited to small discrete areas relative to the extent of this community available in the study area.	1, 2b, 3, and 4b	This impact does not appear to be significant.
			DWR's Preferred Alternative	This impact does not appear to be significant.
	Impact BIO-9: Impacts of the Project on Special-Status Vernal Pool Plants	The extent of the vernal pool special-status plants in the study area would not substantially change under the No Action Alternative because effects on this community would be limited to small discrete areas relative to the extent of this community available in the study area.	All action alternatives	This impact does not appear to be significant.
	Impact BIO-10: Impacts of the Project on Special-Status Alkaline Seasonal Wetland Complex Plants	The extent of the special-status alkaline seasonal wetland complex plants in the study area would not substantially change under the No Action Alternative because effects on this community would be limited to small discrete areas relative to the extent of this community available in the study area.	All action alternatives	This impact does not appear to be significant.
	Impact BIO-11: Impacts of the Project on Special-Status Grassland Plants	The extent of special-status grassland plants in the study area would not substantially change under the No Action Alternative because effects on this community would be limited to small discrete areas relative to the extent of this community available in the study area.	All action alternatives	This impact does not appear to be significant.
	Impact BIO-12: Impacts of the Project on Tidal Freshwater Emergent Wetland Plants	The extent of the tidal freshwater emergent wetland plants in the study area would not substantially change under the No Action Alternative because potential effects would be limited to small discrete areas relative to the extent of this community available in the study area and in the geographic regions analyzed. Periodic levee- and channel-maintenance activities associated with current strategies would result in localized disturbances to the tidal freshwater emergent wetland plants.	All action alternatives	This impact does not appear to be significant.
	Impact BIO-13: Impacts of the Project on Nontidal Wetland Plants	The extent of the nontidal wetland plants in the study area would not substantially change under the No Action Alternative because potential effects would be limited to small discrete areas relative to the extent of this community available in the study area.	1 and 2b	This impact does not appear to be significant.
			3, 4b, and DWR's Preferred Alternative	This impact does not appear to be significant.
	Impact BIO-14: Impacts of the Project on Vernal Pool Aquatic Invertebrates	The extent of the vernal pool aquatic invertebrate habitat in the study area would not substantially change under the No Action Alternative	1, 2b, 3, and 4b	This impact does not appear to be significant.

Environmental Resource	Effects	No Action Summary of Effects	Action Alternatives	Level of Significance for Action Alternatives
		because effects on this community would be limited to small discrete areas relative to the extent of this community available in the study area.	DWR's Preferred Alternative	This impact does not appear to be significant.
	Impact BIO-15: Impacts of the Project on Conservancy Fairy Shrimp	The extent of the Conservancy fairy shrimp habitat in the study area would not substantially change under the No Action Alternative because effects on this community would be limited to small discrete areas relative to the extent of this community available in the study area	All action alternatives	This impact does not appear to be significant.
	Impact BIO-16: Impacts of the Project on Vernal Pool Terrestrial Invertebrates	The extent of the vernal pool terrestrial invertebrate habitat in the study area would not substantially change under the No Action Alternative because effects on this community would be limited to small discrete areas relative to the extent of this community available in the study area.	1, 2b, 3, and 4b	This impact does not appear to be significant.
			DWR's Preferred Alternative	This impact does not appear to be significant.
	Impact BIO-17: Impacts of the Project on Sacramento and Antioch Dunes Anthicid Beetles	The extent of the Sacramento and Antioch Dunes anthicid beetle habitat in the study area would not substantially change under the No Action Alternative because effects on this community would likely be limited to small discrete areas.	All action alternatives	This impact does not appear to be significant.
	Impact BIO-18: Impacts of the Project on Valley Elderberry Longhorn Beetle	The extent of the valley elderberry longhorn beetle habitat in the study area would not substantially change under the No Action Alternative when considering the balance of likely sources of loss and programs to protect and create riparian habitat in the Delta. Periodic levee- and channel-maintenance activities associated with current strategies would result in localized disturbances to valley elderberry longhorn beetle habitat.	All action alternatives	This impact does not appear to be significant.
	Impact BIO-19: Impacts of the Project on Delta Green Ground Beetle	The extent of the delta green ground beetle habitat in the study area would not substantially change under the No Action Alternative because effects on this community would be limited to small discrete areas relative to the extent of this community available in the study area.	All action alternatives	This impact does not appear to be significant.
	Impact BIO-20: Impacts of the Project on Curved-Foot Hygrotus Diving Beetle	The extent of the curved-foot hygrotus diving beetle habitat in the study area would not substantially change under the No Action Alternative because effects on this habitat would be limited to small discrete areas relative to the extent of this community available in the study area.	All action alternatives	This impact does not appear to be significant.
	Impact BIO-21: Impacts of the Project on Crotch and Western Bumble Bees	The extent of the Crotch and western bumble bee habitat in the study area would not substantially change under the No Action Alternative because effects on this community would be limited to small discrete areas relative to the extent of this community available in the study area.	All action alternatives	This impact does not appear to be significant.
	Impact BIO-22: Impacts of the Project on California Tiger Salamander	The extent of the California tiger salamander habitat in the study area would not substantially change under the No Action Alternative because effects on this community would be limited to small discrete areas relative to the extent of this community available in the study area.	1, 2b, 3, and 4b	This impact does not appear to be significant.
			DWR's Preferred Alternative	This impact does not appear to be significant.
	Impact BIO-23: Impacts of the Project on Western Spadefoot Toad	The extent of the western spadefoot toad habitat in the study area would not substantially change under the No Action Alternative because effects	All action alternatives	This impact does not appear to be significant.

Environmental Resource	Effects	No Action Summary of Effects	Action Alternatives	Level of Significance for Action Alternatives
		on this community would be limited to small discrete areas relative to the extent of this community available in the study area.		
	Impact BIO-24: Impacts of the Project on California Red-Legged Frog	The extent of the California red-legged frog habitat in the study area would not substantially change under the No Action Alternative because effects on this community would be limited to small discrete areas relative to the extent of this community available in the study area.	All action alternatives	This impact does not appear to be significant.
	Impact BIO-25: Impacts of the Project on Western Pond Turtle	The extent of the western pond turtle habitat in the study area would not substantially change under the No Action Alternative because direct fill of this community would be limited to small discrete areas relative to the extent of this community available in the study area, which consists of tidal and nontidal aquatic habitat, emergent wetlands, ponds, and other bodies of water.	All action alternatives	This impact does not appear to be significant.
	Impact BIO-26: Impacts of the Project on Coast Horned Lizard	The extent of coast horned lizard habitat in the study area would not substantially change under the No Action Alternative because effects on this community would be limited to small discrete areas relative to the extent of this community available in the study area.	All action alternatives	This impact does not appear to be significant.
	Impact BIO-27: Impacts of the Project on Northern California Legless Lizard	The extent of Northern California legless lizard habitat in the study area would not substantially change under the No Action Alternative because effects on this community would be limited to small discrete areas relative to the extent of this community available in the study area.	All action alternatives	This impact does not appear to be significant.
	Impact BIO-28: Impacts of the Project on California Glossy Snake	The extent of California glossy snake habitat in the study area would not substantially change under the No Action Alternative because effects on this community would be limited to small discrete areas relative to the extent of this community available in the study area, which in itself is small.	1, 2b, 3, and 4b	This impact does not appear to be significant.
			DWR's Preferred Alternative	This impact does not appear to be significant.
	Impact BIO-29: Impacts of the Project on San Joaquin Coachwhip	The extent of San Joaquin coachwhip habitat in the study area would not substantially change under the No Action Alternative because effects on this community would be limited to small discrete areas relative to the extent of this community available in the study area.	All action alternatives	This impact does not appear to be significant.
	Impact BIO-30: Impacts of the Project on Giant Garter Snake	The gradual conversion of cultivated land under programs in the area could affect giant garter snake through the loss or conversion of agricultural ditch habitat. However, many of these programs also include the expansion emergent marsh, which would provide higher quality habitat that under many programs would be targeted to benefit giant garter snake.	All action alternatives	This impact does not appear to be significant.
	Impact BIO-31: Impacts of the Project on Western Yellow-Billed Cuckoo	The extent of the western yellow-billed cuckoo habitat in the study area would not substantially change under the No Action Alternative when considering the balance of likely sources of loss and programs to protect and create riparian habitat in the Delta. Periodic levee- and channel-	All action alternatives	This impact does not appear to be significant.

Environmental Resource	Effects	No Action Summary of Effects	Action Alternatives	Level of Significance for Action Alternatives
		maintenance activities associated with current strategies would result in localized disturbances to this western yellow-billed cuckoo habitat.		
	Impact BIO-32: Impacts of the Project on California Black Rail	The extent of the California black rail habitat in the study area would not substantially change under the No Action Alternative because direct fill of this community would be limited to small discrete areas relative to the extent of this community available in the study area.	All action alternatives	This impact does not appear to be significant.
	Impact BIO-33: Impacts of the Project on Greater Sandhill Crane and Lesser Sandhill Crane	The extent of the sandhill crane habitat in the study area would not substantially change under the No Action Alternative because direct fill of this community would be limited to small discrete areas relative to the extent of this community available in the study area.	All action alternatives	This impact does not appear to be significant.
	Impact BIO-34: Impacts of the Project on California Least Tern	The extent of California least tern habitat in the study area would not substantially change under the No Action Alternative because direct fill of this community would be limited to discrete areas relative to the extent of this community available in the study area and within the geographic regions analyzed. Periodic levee- and channel-maintenance activities associated with current strategies would result in localized disturbances to California least tern habitat.	All action alternatives	This impact does not appear to be significant.
	Impact BIO-35: Impacts of the Project on Rookeries	The extent of the valley/foothill riparian community that would support rookeries in the study area would not substantially change under the No Action Alternative when considering the balance of likely sources of loss and programs to protect and create riparian habitat in the Delta. Periodic levee- and channel-maintenance activities associated with current strategies would result in localized disturbances to this community.	All action alternatives	This impact does not appear to be significant.
	Impact BIO-36: Impacts of the Project on Osprey, White-Tailed Kite, and Cooper's Hawk	The extent of the habitat for osprey, white-tailed kite, and Cooper's hawk in the study area would not substantially change under the No Action Alternative when considering the balance of likely sources of loss and programs to protect and create riparian habitat in the Delta. Periodic levee- and channel-maintenance activities associated with current strategies would result in localized disturbances to this community.	All action alternatives	This impact does not appear to be significant.
	Impact BIO-37: Impacts of the Project on Golden Eagle and Ferruginous Hawk	The extent of golden eagle and ferruginous hawk habitat in the study area would not substantially change under the No Action Alternative because effects on this community would be limited to small discrete areas relative to the extent of this community available in the study area, which in itself is very small.	All action alternatives	This impact does not appear to be significant.
	Impact BIO-38: Impacts of the Project on Ground-Nesting Grassland Birds	The extent of ground-nesting grassland bird habitat in the study area would not substantially change under the No Action Alternative, because effects on this community would be limited to small discrete areas relative to the extent of this community available in the study area.	All action alternatives	This impact does not appear to be significant.

Environmental Resource	Effects	No Action Summary of Effects	Action Alternatives	Level of Significance for Action Alternatives
	Impact BIO-39: Impacts of the Project on Swainson's Hawk	The gradual conversion of cultivated land and grassland in the study area under programs in the area could affect Swainson's hawk through the loss of foraging habitat but there are also plans, however, to continue and expand partnerships with agricultural interests to manage croplands for wildlife-friendly crops. Despite the potential conversion of habitat, the concerted policies and programs would likely ensure that habitat persists in the study area.	All action alternatives	This impact does not appear to be significant.
	Impact BIO-40: Impacts of the Project on Burrowing Owl	The extent of burrowing owl habitat in the study area would not substantially change under the No Action Alternative because effects on this community would be limited to small discrete areas relative to the extent of this community available in the study area.	All action alternatives	This impact does not appear to be significant.
	Impact BIO-41: Impacts of the Project on Other Nesting Special-Status and Non–Special-Status Birds	The extent of areas that could support nesting birds in the study area would not substantially change under the No Action Alternative when considering the balance of likely sources of loss and programs to protect and create habitat in the Delta.	All action alternatives	This impact does not appear to be significant.
	Impact BIO-42: Impacts of the Project on Least Bell's Vireo	The extent of the least Bell's vireo habitat in the study area would not substantially change under the No Action Alternative when considering the balance of likely sources of loss and programs to protect and create riparian habitat in the Delta. Periodic levee- and channel-maintenance activities associated with current strategies would result in localized disturbances to this least Bell's vireo habitat.	All action alternatives	This impact does not appear to be significant.
	Impact BIO-43: Impacts of the Project on Suisun Song Sparrow and Saltmarsh Common Yellowthroat	The extent of the Suisun song sparrow and saltmarsh common yellowthroat habitat in the study area would not substantially change under the No Action Alternative because direct fill of this community would be limited to small discrete areas relative to the extent of this community available in the study area and in the geographic regions analyzed. Periodic levee- and channel-maintenance activities associated with current strategies would result in localized disturbances to habitat for Suisun song sparrow and saltmarsh common yellowthroat.	All action alternatives	This impact does not appear to be significant.
	Impact BIO-44: Impacts of the Project on Tricolored Blackbird	The gradual conversion of cultivated land and grassland in the study area under programs in the area could affect tricolored blackbird through the loss of foraging habitat but there are also plans; however, to continue and expand partnerships with agricultural interests to manage croplands for wildlife-friendly crops. Despite the potential conversion of habitat, the concerted policies and programs would likely ensure that habitat persists or tricolored blackbird in the study area.	All action alternatives	This impact does not appear to be significant.
	Impact BIO-45: Impacts of the Project on Bats	The extent of areas that could support bat habitat in the study area would not substantially change under the No Action Alternative when	All action alternatives	This impact does not appear to be significant.

Environmental Resource	Effects	No Action Summary of Effects	Action Alternatives	Level of Significance for Action Alternatives
		considering the balance of likely sources of loss and programs to protect and create habitat in the Delta.		
	Impact BIO-46: Impacts of the Project on San Joaquin Kit Fox	The extent of San Joaquin kit fox habitat in the study area would not substantially change under the No Action Alternative because effects on this community would be limited to small discrete areas relative to the extent of this community available in the study area, which in itself is very small.	1, 2b, 3, and 4b	This impact does not appear to be significant.
			DWR's Preferred Alternative	This impact does not appear to be significant.
	Impact BIO-47: Impacts of the Project on American Badger	The extent of American badger habitat in the study area would not substantially change under the No Action Alternative because effects on this community would be limited to small discrete areas relative to the extent of this community available in the study area.	All action alternatives	This impact does not appear to be significant.
	Impact BIO-48: Impacts of the Project on San Joaquin Pocket Mouse	The extent of San Joaquin pocket mouse habitat in the study area would not substantially change under the No Action Alternative because effects on this community would be limited to small discrete areas relative to the extent of this community available in the study area.	All action alternatives	This impact does not appear to be significant.
	Impact BIO-49: Impacts of the Project on Salt Marsh Harvest Mouse	The extent of the salt marsh harvest mouse habitat in the study area would not substantially change under the No Action Alternative because direct fill of this community would be limited to small discrete areas relative to the extent of this community available in the study area and within the geographic regions analyzed. Periodic levee- and channel-maintenance activities associated with current strategies would result in localized disturbances to habitat for salt marsh harvest mouse.	All action alternatives	There would be no impact.
	Impact BIO-50: Impacts of the Project on Riparian Brush Rabbit	The extent of the riparian brush rabbit habitat in the study area would not substantially change under the No Action Alternative when considering the balance of likely sources of loss and programs to protect and create riparian habitat in the Delta. Periodic levee- and channel-maintenance activities associated with current strategies would result in localized disturbances on riparian brush rabbit habitat.	All action alternatives	There would be no impact.
	Impact BIO-51: Substantial Adverse Effect on State- or Federally Protected Wetlands or Waters (Including, but Not Limited to, Marsh, Vernal Pool, Coastal, etc.) Through Direct Removal, Filling, Hydrological Interruption, or Other Means	The extent of aquatic resources in the study area would not substantially change under the No Action Alternative because direct fill of this community would be limited to small discrete areas relative to the extent of aquatic resources available in the study area and within the geographic regions analyzed. Periodic levee- and channel-maintenance activities associated with current strategies would result in localized disturbances on aquatic resources.	All action alternatives	This impact does not appear to be significant.

Environmental Resource	Effects	No Action Summary of Effects	Action Alternatives	Level of Significance for Action Alternatives
	Impact BIO-52: Impacts of Project Construction and Operations from Invasive Plant Species	The potential for the introduction of invasive plants under the No Action Alternative would be ongoing from the ongoing proposed actions, programs, and other activities.	All action alternatives	This impact does not appear to be significant.
	Impact BIO-53: Interfere Substantially with the Movement of Any Native Resident or Migratory Fish or Wildlife Species or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites	The extent of areas that could support wildlife connectivity in the study area would not substantially change under the No Action Alternative when considering the balance of likely sources of loss and programs to protect and create habitat in the Delta.	All action alternatives	This impact does not appear to be significant.
	Impact BIO-54: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local, Regional, or State Habitat Conservation Plan	Under the No Action Alternative, programs would take place within plan areas of several habitat conservation plans and natural community conservation plans. Being that the goals of many of these programs are to also contribute to the conservation sensitive biological resources they would generally not conflict with these plans.	All action alternatives	This impact does not appear to be significant.
	Impact BIO-55: Conflict with Any Local Policies or Ordinances Protecting Biological Resources, Such as a Tree Preservation Policy or Ordinance	Under the No Action Alternative, programs would take place within the jurisdiction of various local agencies. Being that the goals of many of these programs are to also contribute to the conservation sensitive biological resources they would generally not conflict with local policies and ordinances.	All action alternatives	This impact does not appear to be significant.
Section 3.6, Climate Change	Impact CC-1: Effects of Climate Change	Foreseeable effects due to climate change include a decrease in the amount of water in channels and associated infrastructure, sea level rise, salt water intrusion, warmer water temperatures, and their associated effects on the natural environment.	All action alternatives	This impact does not appear to be significant.
Section 3.7, Cultural Resources	Impact CUL-1: Effects on Unidentified Archaeological Resources That May Be Encountered in the Course of the Project	Foreseeable projects have the potential to adversely affect historic properties due to excavation and dredging during construction. Projects would comply with applicable laws and regulations related to cultural resources and implement standard BMPs, This would reduce the potential for effects on historic properties.	1	This impact may be significant
			2b	This impact may be significant
			3	This impact may be significant
			4b	This impact may be significant
			DWR's Preferred Alternative	This impact may be significant
	Impact CUL-2: Effects on Unidentified and Unevaluated Built-Environment Historical Resources Resulting from Construction and Operation	Foreseeable projects have the potential to adversely affect cultural resources due to excavation and dredging during construction. Projects would comply with applicable laws and regulations related to cultural resources and implement standard BMPs, This would reduce the potential for effects on cultural resources.	All action alternatives	This impact may be significant
	Impact CUL-3: Effects on Identified Archaeological Resources Resulting from the Project	Effects resulting from the No Action Alternative for this impact would be the same as described for Impact CUL-2.	All action alternatives	This impact may be significant

Environmental Resource	Effects	No Action Summary of Effects	Action Alternatives	Level of Significance for Action Alternatives
	Impact CUL-4: Effects on Unidentified Archaeological Resources That May Be Encountered in the Course of the Project	Effects resulting from the No Action Alternative for this impact would be the same as described for Impact CUL-2.	All action alternatives	This impact may be significant
Section 3.8, Environmental Justice	Impact EJ-1: Disproportionate Effect on Minority or Low-Income Populations/Communities from Agricultural Resources Effects	Some local plans call for Important Farmland to be converted to nonagricultural uses. The loss of Important Farmland could lead to loss of agricultural jobs and therefore be a disproportionately high and adverse environmental justice effect on low-income or minority workers and agricultural business owners. Some local plans call for restoring Prime Farmland, which could benefit minority or low-income populations by preserving or creating agricultural jobs. Projects could have adverse or beneficial effects. If projects convert farmland to nonagricultural uses, low-income agricultural workers or minority agricultural business owners might lose employment and income. If projects limit water uses in a way that reduces employment opportunities, such as by taking agricultural land out of production, effects could be adverse for minority or low-income individuals or businesses. Projects intended to conserve agricultural land would benefit these workers by retaining or expanding opportunities in agriculture. Reliable water supplies to farms would also be a benefit because it helps maintain or expand agricultural employment.	All action alternatives	This impact may be significant
	Impact EJ-2: Disproportionate Effect on Minority or Low-Income Populations/Communities from Aesthetic and Visual Resources Effects	Program projects could result in visual effects from the construction of water facilities and associated infrastructure. The effect on scenic resources could have a disproportionate effect on environmental justice if projects occur where minority or low-income populations are present. Development of water infrastructure facilities could potentially have adverse effects on scenic resources that minority or low-income communities value. Potential visual alterations could permanently change the aesthetic values, thus resulting in a disproportionate effect on minority and low-income populations.	All action alternatives	This impact may be significant
	Impact EJ-3: Disproportionate Effect on Minority or Low-Income Populations/Communities from Cultural Resources Effects	Development of program water infrastructure facilities could potentially have adverse effects on cultural resources that minority communities value. Effects on cultural resources that are associated with ethnic minority groups present in high proportions could potentially result in a disproportionate effect on these populations in the study area. Projects in coastal areas could temporarily or permanently obstruct access to coastal cultural resources. Coastal cultural resources such as	All action alternatives	This impact may be significant.

Environmental Resource	Effects	No Action Summary of Effects	Action Alternatives	Level of Significance for Action Alternatives
		archaeological sites could be damaged or destroyed, and access to traditional use areas could be restricted or entirely prohibited. These would be disproportionate effects on minority communities if they are present in or use the project area.		
	Impact EJ-4: Disproportionate Effect on Minority or Low-Income Populations/Communities from Transportation Effects	Program projects could result in disproportionate effects on low-income or minority communities from construction traffic because minority and low-income residents with limited English proficiency or limited internet access would not have equal access to the information. Construction of local water supply reliability projects could result in disproportionate effects on low-income or minority communities from construction traffic because minority and low-income residents with limited English proficiency or limited internet access would not have equal access to the information.	All action alternatives	This impact does not appear to be significant.
	Impact EJ-5: Disproportionate Effect on Minority or Low-Income Populations/Communities from Air Quality and Greenhouse Gases Effects	Where regulations, BMPs, and mitigation, avoidance, and minimization measures reduce adverse effects on resources, minority or low-income populations would generally benefit proportionally. Localized emissions of toxic air contaminants or diesel particulate matter during construction of individual projects would affect air quality and public health in the immediate vicinity of the construction. Low-income and minority populations often live in places where pollutant concentrations already exceed regulatory standards and suffer with respiratory conditions and lack of access to health care. If air emissions are not minimized sufficiently by implementation of required measures, they could have a disproportionate adverse effect on minority or low-income populations, if present. Construction of local water supply reliability projects could result in disproportionate effects on low-income or minority communities from construction air quality effects. Construction effects on air quality would be temporary and required to mitigate adverse effects, where feasible.	All action alternatives	This impact may be significant.
	Impact EJ-6: Disproportionate Effect on Minority or Low-Income Populations/Communities from Noise Effects	Construction effects on noise would be temporary and projects would be required to mitigate adverse effects, where feasible. Temporary adverse effects would likely affect both the general and minority or low-income populations equally, although effects that occur in areas with meaningfully greater minority and low-income populations would represent a disproportionate effect.	All action alternatives	This impact may be significant.

Environmental Resource	Effects	No Action Summary of Effects	Action Alternatives	Level of Significance for Action Alternatives
		Construction of water projects would result in temporary noise effects that would require the mitigation of adverse effects, where feasible. Temporary adverse effects would likely affect both the general and minority or low-income populations equally, although effects that occur in areas with meaningfully greater minority and low-income populations would represent a disproportionate effect.		
	Impact EJ-7: Disproportionate Effect on Minority or Low-Income Populations/Communities from Public Health Effects	Program projects would result in highly localized construction effects, such as emissions of toxic air contaminants or diesel particulate matter that could affect public health in the immediate vicinity of the construction. Low-income and minority populations often live in places where pollutant concentrations already exceed regulatory standards and suffer with respiratory conditions and lack of access to health care. If air emissions are not minimized sufficiently by implementation of required measures, they could have a disproportionate adverse effect on minority or low-income populations, if present. Water projects would result in temporary construction effects on public health that could affect minority or low-income populations if they are present in high numbers in the project area of effects.	All action alternatives	This impact does not appear to be significant.
	Impact EJ-8: Disproportionate Effect on Minority or Low-Income Populations/Communities from Climate Change Effects	Foreseeable effects due to climate change include a decrease in the amount of water in channels and associated infrastructure, sea level rise, salt water intrusion, warmer water temperatures, and their associated effects on the natural environment. Programs and projects could exacerbate these conditions and some effects may occur in areas with a meaningfully greater proportion of minority and low-income populations which would have a disproportionate effect on environmental justice.	All action alternatives	This impact does not appear to be significant.
Section 3.9, Flood Protection	Impact FP-1: Cause a Substantial Increase in Water Surface Elevations of the Sacramento River between the American River Confluence and Sutter Slough	Under the No Action Alternative, water surface elevations (WSEs) for the 100-year flood event could increase by approximately 0.40 feet (CVFPB river mile [RM] 45.6) in the urban leveed sections and 0.60 foot (RM 37.0) in the nonurban leveed sections when compared to existing conditions. Under the No Action Alternative, WSEs for the 200-year flood event could increase by approximately 0.70 foot (river mile [RM] 45.6) in the urban leveed sections and 0.90 foot (RM 37.0) in the nonurban leveed sections when compared to existing conditions. Under the No Action Alternative, increases in WSEs simulated in the Sacramento River could result in increases in flood risk in the Delta. These potential increases in WSEs are attributed to flood flows (due to changes in hydrology) and more so by	All action alternatives	This impact does not appear to be significant.

Environmental Resource	Effects	No Action Summary of Effects	Action Alternatives	Level of Significance for Action Alternatives
		sea level rise as a result of climate change since the high-water stage in the Delta channels are mostly influenced by tide.		
	Impact FP-2: Alter the Existing Drainage Pattern of the Site or Area, Including Through the Alteration of the Course of a Stream or River, or Substantially Increase the Rate or Amount of Surface Runoff in a Manner Which Would Result in Flooding On- or Offsite or Impede or Redirect Flood Flows	The No Action Alternative would not place structures within a 100-year special flood hazard area, which would impede or redirect flood flows. If a project did place structures within a 100-year special flood hazard area, the appropriate mitigation measures would be employed.	All action alternatives	This impact does not appear to be significant.
Section 3.10, Geology, Soils, and Paleontological Resources	Impact GEO-1: Loss of Property, Personal Injury, or Death from Structural Failure Resulting from Rupture of a Known Earthquake Fault or Based on Other Substantial Evidence of a Known Fault	Construction and operations could result in the loss of property, personal injury, or (in extreme cases) death from structural failure resulting from rupture of a known earthquake fault or based on other substantial evidence of a known fault.	All action alternatives	This impact does not appear to be significant.
	Impact GEO-2: Loss of Property, Personal Injury, or Death from Strong Earthquake-Induced Ground Shaking	Damage to the facilities from strong earthquake-induced ground shaking could cause an uncontrolled release of water and in extreme cases, cause an uncontrolled release of water from reservoirs, pipelines and canals resulting in loss of property, personal injury, or death.	All action alternatives	This impact does not appear to be significant.
	Impact GEO-3: Loss of Property, Personal Injury, or Death from Earthquake-Induced Ground Failure, including Liquefaction and Related Ground Effects	Seismically induced ground shaking could cause liquefaction and related ground effects at certain facilities, both during construction and operations. Failure of facilities could result in injury or loss of life and uncontrolled releases of water and flooding, resulting in loss of property, personal injury, or death.	All action alternatives	This impact does not appear to be significant.
	Impact GEO-4: Loss of Property, Personal Injury, or Death from Ground Settlement, Slope Instability, or Other Ground Failure	Construction-related excavation and dewatering of excavations could cause slope or sidewalls failure, potentially causing injury of workers at the construction sites.	All action alternatives	This impact does not appear to be significant.
	Impact GEO-5: Loss of Property, Personal Injury, or Death from Structural Failure Resulting from Proposed Action-Related Ground Motions	Impact pile-driving could cause vibrations that may initiate liquefaction and associated ground movements, which could cause personal injury or death and could damage nearby structures and levees.	All action alternatives	This impact does not appear to be significant.
	Impact GEO-6: Loss of Property, Personal Injury, or Death from Seiche or Tsunami	A tsunami would inundate facilities near coastlines and along bay shores, resulting in loss of property, personal injury, or death both during construction and operations. During operations, certain facilities may be subject to a seismically induced seiche and large and deep water bodies may generate reservoir-triggered seismicity, which may produce a seiche wave, potentially causing loss of property, personal injury, or death.	All action alternatives	This impact does not appear to be significant.
	Impact SOILS-1: Accelerated Soil Erosion Caused by Vegetation Removal and Other		1, 2b, 3, and 4b	This impact does not appear to be significant.

Environmental Resource	Effects	No Action Summary of Effects	Action Alternatives	Level of Significance for Action Alternatives
	Disturbances as a Result of Constructing the Proposed Water-Conveyance Facilities	Construction of facilities involving grading and vegetation removal could result in substantial accelerated water and wind erosion and subsequent effects on receiving waters.	DWR's Preferred Alternative	This impact does not appear to be significant.
	Impact SOILS-2: Loss of Topsoil from Excavation and Overcovering as a Result of Constructing the Proposed Water-Conveyance Facilities	Substantial areas of topsoil could be lost as a result of excavation and overcovering.	1, 2b, 3, and 4b	This impact does not appear to be significant.
			DWR's Preferred Alternative	This impact does not appear to be significant.
	Impact SOILS-3: Property Loss, Personal Injury, or Death from Instability, Failure, and Damage as a Result of Constructing the Proposed Water-Conveyance Facilities on or in Soils Subject to Subsidence	Some water-conveyance facilities could be constructed on soils that are subject to subsidence, which could cause facility damage.	All action alternatives	This impact does not appear to be significant.
	Impact SOILS-4: Risk to Life and Property as a Result of Constructing the Proposed Water-Conveyance Facilities in Areas of Expansive, Corrosive Soils	The integrity of a facility could be threatened by expansive soils and soils that are moderately or highly corrosive to concrete or to uncoated steel.	All action alternatives	This impact does not appear to be significant.
	Impact SOILS-5: Have Soils Incapable of Adequately Supporting the Use of Septic Tanks or Alternative Wastewater Disposal Systems Where Sewers Are Not Available for the Disposal of Wastewater	Construction of on-site wastewater disposal systems is not expected to be required at the facilities anticipated to be constructed.	All action alternatives	This impact does not appear to be significant.
	Impact PALEO-1: Result in Destruction of a Unique Paleontological Resource	Ground-disturbing activities related to construction could cause the destruction of unique paleontological resources. To protect these resources, construction techniques and mitigation measures conforming with the requirements of state and local regulations protecting paleontological resources would be implemented. In addition, these activities would occur in a wide variety of geologic units, and effects would not be focused on a single geologic unit sensitive for paleontological resources.	1 and 2b	This impact does not appear to be significant.
			3 and 4b	This impact does not appear to be significant.
			DWR's Preferred Alternative	This impact does not appear to be significant.
Section 3.11, Groundwater	Impact GW-1: Changes in Stream Gains or Losses in Various Interconnected Stream Reaches	Achievement of the sustainability goals contained in the groundwater sustainability plans for basins south of the Delta would be more difficult to achieve under the No Action Alternative without the reliable delivery of surface water south of the Delta. Specifically, the inability to reliably convey surface waters south of the Delta would result in a greater reliance on local groundwater resources.	All action alternatives	This impact does not appear to be significant.
	Impact GW-2: Changes in Groundwater Elevations	Effects resulting from the No Action Alternative for this impact would be the same as described for Impact GW-1.	All action alternatives	This impact does not appear to be significant.
	Impact GW-3: Reduction in Groundwater Levels Affecting Supply Wells	Effects resulting from the No Action Alternative for this impact would be the same as described for Impact GW-1.	All action alternatives	This impact does not appear to be significant.

Environmental Resource	Effects	No Action Summary of Effects	Action Alternatives	Level of Significance for Action Alternatives
	Impact GW-4: Changes to Long-Term Groundwater Storage	Effects resulting from the No Action Alternative for this impact would be the same as described for Impact GW-1.	All action alternatives	This impact does not appear to be significant.
	Impact GW-5: Increases in Groundwater Elevations Near Project Intake Facilities Affecting Agricultural Drainage	Effects resulting from the No Action Alternative for this impact would be the same as described for Impact GW-1.	All action alternatives	This impact does not appear to be significant.
	Impact GW-6: Damage to Major Conveyance Facilities Resulting from Land Subsidence	Effects resulting from the No Action Alternative for this impact would be the same as described for Impact GW-1.	All action alternatives	This impact does not appear to be significant.
	Impact GW-7: Degradation of Groundwater Quality	Effects resulting from the No Action Alternative for this impact would be the same as described for Impact GW-1.	All action alternatives	This impact does not appear to be significant.
Section 3.12, Hazards, Hazardous Materials, and Wildfire	Impact HAZ-1: Create a Substantial Hazard to the Public or the Environment through the Routine Transport, Use, or Disposal of Hazardous Materials	Construction, operation, and maintenance of foreseeable projects could have effects related to hazards and hazardous materials or accidental releases. Applicable laws and regulations related to hazards and hazardous materials as well as BMPs would be applied and reduce the potential for accidental spills or fires involving the use of hazardous materials or equipment.	All action alternatives	This impact does not appear to be significant.
	Impact HAZ-2: 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	All foreseeable projects would involve ground-disturbing activities. Ground-disturbing activities could expose workers to previously unknown soil and/or groundwater contaminants. Structure demolition could result in the release or disturbance of hazardous building materials. Applicable laws and regulations related to hazards and hazardous materials as well as BMPs would be applied and reduce the potential for accidental spills or fires involving the use of hazardous materials or equipment. Worker health and safety plans, testing for contamination, and consultation with agency websites would further reduce the potential to expose workers or the environment to contaminants	All action alternatives	This impact does not appear to be significant.
	Impact HAZ-3: Expose Sensitive Receptors at an Existing or Proposed School Located within 0.25 Mile of Project Facilities to Hazardous Materials, Substances, or Waste	Foreseeable projects may result in the potential for hazardous emissions and accidental release of hazardous materials near existing and proposed schools during either construction or operations due to the use and storage of hazardous materials. Applicable laws and regulations related to hazards and hazardous materials would be applied.	1, 2b, 3, and 4b	There would be no impact.
			DWR's Preferred Alternative	This impact does not appear to be significant.
	Impact HAZ-4: Be Located on a Site That Is Included on a List of Hazardous Materials Sites Compiled Pursuant to Government Code Section 65962.5 and, as a Result, Create a Substantial Hazard to the Public or the Environment	Foreseeable projects could be constructed near site(s) that are listed as hazardous materials sites. Existing regulations would ensure that sites containing hazardous materials be cleaned up to existing regulatory standards prior to development.	All action alternatives	This impact does not appear to be significant.
	Impact HAZ-5: Result in a Safety Hazard Associated with an Airport or Private Airstrip	Foreseeable projects which result in surface water storage near public airport could serve as a wildlife attractant, potentially endangering local aircraft due to the possibility of bird strike incidents. Potential projects	All action alternatives	This impact does not appear to be significant.

Environmental Resource	Effects	No Action Summary of Effects	Action Alternatives	Level of Significance for Action Alternatives
		would undergo environmental review and comply with comply with Federal Aviation Administration regulations.		
	Impact HAZ-6: Impair Implementation of or Physically Interfere with an Adopted Emergency Response Plan or Emergency Evacuation Plan	Foreseeable project construction could result in short- term, temporary traffic delays on existing roads potentially interfering with implementation of an emergency response plan and delay emergency responders. Preparation of transportation management plans and compliance with existing local requirements would ensure continued emergency and evacuation route access.	All action alternatives	This impact does not appear to be significant.
	Impact HAZ-7: Expose People or Structures, Either Directly or Indirectly, to a Substantial Risk of Loss, Injury, or Death Involving Wildland Fires	Foreseeable projects construction and maintenance activities could involve use of flammable chemicals which could be inadvertently ignited by sparks from equipment/machinery. Projects would comply with all pertinent fire prevention laws and regulations which would reduce risks associated with exposure to wildfire.	All action alternatives	This impact does not appear to be significant.
Section 3.13, Land Use	Impact LU-1: Incompatibility with Applicable Land Use Designations, Goals, and Policies as a Result of the Proposed Action	Foreseeable land use changes, such as habitat restoration and urban development projects, may be incompatible with applicable land use designations, goals, and policies.	All action alternatives	This impact does not appear to be significant.
	Impact LU-2: Conflicts with Existing Land Uses (including displacement of existing structures) as a Result of Construction of the Project	Changes to land use related to foreseeable urban development and habitat restoration projects would be expected to conflict with existing land uses and would include displacement of existing structures.	All action alternatives	This impact does not appear to be significant.
	Impact LU-3: Create Physical Structures Adjacent to and through a Portion of an Existing Community That Would Physically Divide the Community as a Result of the Project	Land use changes under the No Action Alternative would not be anticipated to result in the physical division of any existing communities.	All action alternatives	There would be no impact.
Section 3.14, Navigation	Impact NAV-1: Disruption of Marine Traffic during Construction	There would be no project-related change in the characteristics of navigation through Delta channels. No intake facilities or conveyance systems would be constructed that could result in short-term conflicts with users of the navigation corridors in the Delta.	All action alternatives	This impact does not appear to be significant.
	Impact NAV-2: Potential Effects on Navigation from Changes in Surface Water Elevations Caused by Construction of Water-Conveyance Facilities	Construction of reasonably foreseeable projects is not anticipated to result in changes to surface water elevations as a result of construction on in-water features.	All action alternatives	This impact does not appear to be significant.
	Impact NAV-3: Potential Effects of Navigation from Changes in Surface Elevations Caused by Operation of Intakes	There would be no change in surface elevations from activities associated with operations and maintenance of the existing SWP and CVP systems and facilities upstream of the Delta that could affect navigation in these areas. Construction of wildlife habitat would potentially create localized navigation effects.	All action alternatives	This impact does not appear to be significant.

Environmental Resource	Effects	No Action Summary of Effects	Action Alternatives	Level of Significance for Action Alternatives
	Impact NAV-4: Potential Effects on Navigation Caused by Sedimentation from Construction of Intakes	Projects and plans have the potential to cause an increase in sediment loads in the river channels of the study area. If a project were to create an uncontrolled discharge of sediment into the river, sediment could accumulate on the bottom of the river channel and impede navigation. It is assumed that all projects would implement BMPs to control erosion and sediment, as well as undergo the appropriate CEQA/NEPA analysis and permitting processes, which would be required to analyze and minimize those effects.	All action alternatives	This impact does not appear to be significant.
	Impact NAV-5: Potential Effects on Navigation Caused by Sedimentation from Operation of Intakes	No reasonably foreseeable projects would involve an operation of intakes which would cause notable changes to water column of bed load sediment dynamics.	All action alternatives	This impact does not appear to be significant.
Section 3.15, Noise	Impact NOI-1: Generate a Substantial Temporary or Permanent Increase in Ambient Noise Levels in the Vicinity of the Project in Excess of Standards Established in the Local General Plan or Noise Ordinance, or Applicable Standards of Other Agencies	Foreseeable projects could have effects related to noise. Construction would involve use of heavy earthmoving equipment and increased use of heavy trucks on haul routes and operation and maintenance could have continuous operation of facilities and maintenance vehicles. Best noise control practices and site-specific noise mitigation would be available to minimize noise during construction and operation, but not all measures would necessarily be feasible to implement in all cases.	1	This impact may be significant.
			2b	This impact may be significant.
			3	This impact may be significant.
			4b	This impact may be significant.
			DWR's Preferred Alternative	This impact may be significant.
	Impact NOI-2: Generate Excessive Groundborne Vibration or Groundborne Noise Levels	Foreseeable projects could have effects related to groundborne noise and vibration. Construction could result in localized and temporary vibration due to ground-disturbing activities and heavy machinery while maintenance may require use of heavy equipment and other vibration-generating activities. Environmental commitments and BMPs would be available to minimize vibration during construction and operation, but these may not be feasible to implement in all cases.	1, 2b, 3, and 4b	This impact does not appear to be significant.
			DWR's Preferred Alternative	This impact does not appear to be significant.
	Impact NOI-3: Place Project-Related Activities in the Vicinity of a Private Airstrip or an Airport Land Use Plan, or, Where Such a Plan Has Not Been Adopted, within 2 Miles of a Public Airport or Public Use Airport, Resulting in Exposure of People Residing or Working in the Study Area to Excessive Noise Levels	Foreseeable projects could be conducted in the vicinity of airports; noise effects would be expected to be further analyzed prior to project construction or implementation. Environmental commitments and BMPs would be available to minimize noise effects during construction and operation.	All action alternatives	There would be no impact.
Section 3.16, Recreation	Impact REC-1: 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	Foreseeable projects could involve relocation or temporary closure of some recreation access routes during construction; however, most of the programs and plans in the long run could provide new or improved recreation opportunities such as wildlife viewing or new and improved public access points and trails and involve habitat restoration or projects designed to avoid or mitigate past environmental effects.	All action alternatives	This impact does not appear to be significant.

Environmental Resource	Effects	No Action Summary of Effects	Action Alternatives	Level of Significance for Action Alternatives
	Impact REC-2: Include Recreational Facilities or Require the Construction or Expansion of Recreational Facilities That Might Have an Adverse Physical Effect on the Environment	Foreseeable projects could involve construction near recreation areas, which could reduce the quality of experiences for recreationists from auditory and visual intrusions during construction. Habitat restoration, projects designed to avoid or mitigate environmental effects, and projects directly addressing recreational or tourism improvements would likely improve local recreation opportunities and the quality of experience for recreationists.	All action alternatives	This impact does not appear to be significant.
Section 3.17, Socioeconomics and Public Health	Impact ECON-1: Changes in Regional Economics and Employment in the Study Area	Potential changes in expenditures related to recreation, municipal, and industrial water uses, as well as potential changes in the value of agricultural production could result in changes to regional employment and income in the Delta region. The scale of the economy would change with population growth; however, the structure of the economy (i.e., large proportion of employment in services, government, trade, and construction) would not.	All action alternatives	There would be no impact.
	Impact ECON-2: Changes in Population and Housing in the Delta Region	It is anticipated that trends in housing demand and supply would correspond to population trends. It is expected that the growth in housing would support the growth in population. Some county general plans include growth management programs for unincorporated areas that could provide beneficial effects with respect to population and housing changes.	All action alternatives	This impact does not appear to be significant.
	Impact ECON-3: Changes in Community Character in the Statutory Delta	Projects and programs would not be anticipated to create adverse effects on the character of Delta communities. The exception could be the Sustainable Groundwater Management Act (SGMA), which could have effects on community character in conjunction with potential effects on agricultural economics in the Delta if Groundwater Sustainability Plans currently under development lead to reductions in agricultural production. However, at this time, implementation of these plans is not expected to have an adverse effect on Delta agriculture. The Delta Plan, as well as county general plans, include programs to protect the Delta as a unique and historical place, which should help to maintain the community character.	All action alternatives	This impact does not appear to be significant.
	Impact ECON-4: Changes in Local Government Fiscal Conditions in the Delta Region	Changes in land use, population, and other economic activity could affect property and sales tax revenue; however, the overall effects are not anticipated to be adverse.	All action alternatives	This impact does not appear to be significant.
	Impact ECON-5: Changes in Recreational Economics in the Delta Region	Projects anticipated to create potential benefits to wildlife observation opportunities may lead to increased economic activity associated with recreation in the Delta. While outside factors including changes to fisheries could alter the quality of recreational resources, based on	All action alternatives	This impact does not appear to be significant.

Environmental Resource	Effects	No Action Summary of Effects	Action Alternatives	Level of Significance for Action Alternatives
		consideration of ongoing measures to support recreation, adverse effects would not be anticipated.		
	Impact ECON-6: Changes in Agricultural Economics in the Delta Region	Crop acreage will adjust over time in response to market conditions, but at this time these changes are unknown, so current acreages are a reasonable prediction of 2040 acreages. Unlike some areas farther south in the San Joaquin Valley, the Delta is outside of critically overdrafted groundwater basins, and local draft Groundwater Sustainability Plans indicate that crop acreages in the Delta are not expected to be substantially affected by SGMA implementation by 2040. County general plans include programs to protect Delta agriculture, which should help maintain favorable conditions for agricultural economics.	All action alternatives	This impact does not appear to be significant.
	Impact ECON-7: Socioeconomic Effects in the SWP/CVP Export Service Areas	Effects that result from operation of the action alternatives are not within USACE's authority and are not covered by this EIS. Brief descriptions of the effects of operations are included in Chapter 3, where appropriate; however, they will not be included here. For more information on the effects of operations as a result of operation of the action alternatives, see the Delta Conveyance Project Draft EIR (California Department of Water Resources 2022).		
	Impact PH-1: Increase in Vector-Borne Diseases	Water ponding during construction could increase standing water after rain events and thereby create mosquito habitat. However, these inundated areas would likely be relatively small, localized, and temporary and would not adversely affect public health due to vector-borne disease exposure. Habitat restoration in the study area that may occur would generally be located in areas that are already potential sources of vectors, such as existing channels or agricultural areas. While these projects may increase habitat suitable to mosquitoes, habitat would be designed to maximize water exchange and flow, and thereby minimize stagnant water and mosquito production. In addition, all of the restoration activities would occur in consultation with local mosquito and vector control districts (MVCDs); therefore, it is not expected that habitat restoration would result in a substantial increase in the public's risk of exposure to vector-borne diseases. Operation of water supply reliability projects would not result in an increase in the public's risk of exposure to vector-borne diseases. Operation of groundwater recharge sites would likely create standing pools of water (e.g., recharge basins), which could create mosquito breeding habitat, an increase in mosquitoes and subsequent exposure of the public to vector-borne diseases. Climate change would also be expected to affect the occurrence of vector-borne diseases relative to existing conditions. Local MVCDs would exercise their authority to conduct surveillance for vectors, prevent the occurrence of vectors, and abate production of vectors and project proponents would also be responsible for mosquito abatement. Therefore, there would not be an	All action alternatives	This impact does not appear to be significant.

Environmental Resource	Effects	No Action Summary of Effects	Action Alternatives	Level of Significance for Action Alternatives
		adverse effect on public health due to increases in mosquitoes and vector-borne diseases.		
	Impact PH-2: Exceedance(s) of Water Quality Criteria for Constituents of Concern Such That Drinking Water Quality May be Affected	Trace metal and pesticide concentrations would not differ substantially from what occurs under existing conditions. As such, there would be no adverse effect on public health from these constituents.	All action alternatives	This impact does not appear to be significant.
	Impact PH-3: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate	Projects would not result in an adverse effect on public health from mercury exposure due to consumption of study area fish.	All action alternatives	This impact does not appear to be significant.
	Impact PH-4: Adversely Affect Public Health Due to Exposing Sensitive Receptors to New Sources of EMF	Projects would not result in an adverse effect on public health with respect to electromagnetic field (EMF) exposure.	All action alternatives	This impact does not appear to be significant.
	Impact PH-5: Impact Public Health Due to an Increase in Microcystis Bloom Formation	Cyanobacteria harmful algal blooms (CHABs) would be expected to occur with similar or greater frequency throughout the study area under the No Action Alternative relative to existing conditions. Projects that have the potential to affect the five key drivers of CHABs (i.e., water temperature, residence time, nutrients, water velocities and associated turbulence and mixing, and water clarity and associated irradiance) such that conditions become more conducive to CHAB formation could also contribute to CHABs and cyanotoxins in the study area, and there could be consequent adverse effects on public health.	All action alternatives	This impact does not appear to be significant.
Section 3.18, Surface Water	Effects that result from operation of the action alternatives are not within USACE's authority and are not covered by this EIS. Brief descriptions of the effects of operations are included in Chapter 3, where appropriate; however, they will not be included here. For more information on the effects of operations as a result of operation of the action alternatives, see the Delta Conveyance Project Draft EIR (California Department of Water Resources 2022).			
Section 3.19, Transportation	Impact TRANS-1: Increased Construction Vehicle Trips Resulting in Unacceptable Roadway Level of Service Conditions	Under No Action Alternative conditions, 40 roadway segments would exceed the acceptable level of service (LOS) thresholds for at least 1 hour during the 6:00 a.m. to 7:00 p.m. analysis period.	All action alternatives	This impact does not appear to be significant.
	Impact TRANS-2: Increased Construction Vehicle Trips Exacerbating Unacceptable Intersection Level of Service Conditions	Under No Action Alternative conditions, 8 of the 44 study intersections, or 18% are projected to exceed LOS standards during morning and afternoon peak hours.	All action alternatives	This impact does not appear to be significant.
	Impact TRANS-3: Conflict with a Program, Plan, Ordinance or Policy Addressing the Circulation System	Foreseeable transportation changes associated with the No Action Alternative in the study area could be incompatible with applicable transportation programs, plans, ordinances, or policies. Construction of large-scale projects could result in an increase in an exceedance of LOS on roadways and at intersections which would violate local programs, plans, ordinances, or policies. Depending on the project's location and other characteristics, habitat restoration, construction of facilities in the Delta, and urban development projects may result in incompatibilities.	All action alternatives	This impact does not appear to be significant.
	Impact TRANS-4: Substantially Increase Hazards from a Geometric Design Feature	Under the No Action Alternative, no construction-related effects would occur and existing operation and maintenance practices would continue.	All action alternatives	This impact does not appear to be significant.

Environmental Resource	Effects	No Action Summary of Effects	Action Alternatives	Level of Significance for Action Alternatives
	(e.g., Sharp Curves or Dangerous Intersections) or Incompatible Uses (e.g., Farm Equipment)	Projects and programs implemented under the No Action Alternative are not anticipated to involve geometric design features or incompatible uses which would substantially increase hazards.		
	Impact TRANS-5: Result in Inadequate Emergency Access	Under the No Action Alternative, no construction-related effects would occur and existing operation and maintenance practices would continue. Construction of large-scale projects would potentially impede emergency access if roadways and intersections are overwhelmed with additional vehicles, slowing down emergency vehicle response time. However, the access to and egress from the future project construction sites are anticipated to be designed to meet local and regional emergency access requirements.	All action alternatives	This impact does not appear to be significant.
Section 3.20, Public Services, Utilities, and Energy	Impact UT-1: Result in Substantial Physical Impacts Associated with the Provision of, or the Need for, New or Physically Altered Governmental Facilities, the Construction of Which Could Cause Significant Environmental Impacts on Public Services Including Police Protection, Fire Protection, Public Schools, and Other Public Facilities (e.g., Libraries, Hospitals)	The foreseeable projects would not result in a change in the demand for public services or require new or altered governmental facilities. Construction activities could result in additional traffic; however, minimization measures would reduce conflicts with emergency services.	All action alternatives	This impact does not appear to be significant.
	Impact UT-2: Require or Result in the Relocation or Construction of New or Expanded Service System Infrastructure, the Construction or Relocation of Which Could Cause Significant Environmental Impacts for Any Service Systems Such as Water, Wastewater Treatment, Stormwater Drainage, Electric Power Facilities, Natural Gas Facilities, And Telecommunications Facilities	Construction of foreseeable projects could involve grading, tunneling, boring, and other groundwork which may result in the interruption or relocation of an existing utilities. Projects would comply with applicable laws and regulations related to utilities and would coordinate with agencies during the design phase; thereby, reducing the potential to interrupt our relocate utility service systems.	All action alternatives	This impact does not appear to be significant.
	Impact UT-3: Exceed the Capacity of the Wastewater Treatment Provider(s) that Would Serve the Action Alternative's Anticipated Demand in Addition to the Provider's Existing Commitments	The foreseeable projects are unlikely to require additional wastewater infrastructure or services. Future projects would undergo environmental review and comply with applicable laws and regulations related to wastewater.	All action alternatives	This impact does not appear to be significant.
	Impact UT-4: Generate Solid Waste in Excess of Federal, State, or Local Standards, or Be in Excess of the Capacity of Local Infrastructure,	Foreseeable projects could generate solid waste during construction; waste would be transported to a local landfill with sufficient capacity. Therefore, the No Action Alternative would not violate federal, state, or local standards or exceed the capacity of an existing landfill.	All action alternatives	This impact does not appear to be significant.

Environmental Resource	Effects	No Action Summary of Effects	Action Alternatives	Level of Significance for Action Alternatives
	or Otherwise Impair the Attainment of Solid Waste Reduction Goals			
	Impact ENG-1: Result in Substantial Environmental Impacts Due to Wasteful, Inefficient, or Unnecessary Consumption of Energy Resources, during Project Construction or Operation	Construction of foreseeable projects would result in the short-term consumption of energy. Increases in long-term operational energy consumption would be expected, however not to the extent that regional supplies would be substantially affected.	All action alternatives	This impact does not appear to be significant.
	Impact ENG-2: Conflict With or Obstruct Any State/Local Plan, Goal, Objective or Policy for Renewable Energy or Energy Efficiency	Foreseeable projects would have energy requirements; however, key state programs would increase energy resiliency. Therefore, the No Action Alternative would not conflict or obstruct a state/local plan, goal, objective or policy for renewable energy or energy efficiency.	All action alternatives	There would be no impact.
Section 3.21, Water Quality	Impact WQ-1: Effects on Water Quality Resulting from Construction of the Water-Conveyance Facilities	There would be no construction of conveyance facilities with the No Action Alternative.	All action alternatives	This impact does not appear to be significant.
	Impact WQ-2: Effects on Boron Resulting from Compensatory Mitigation	Increases in boron concentrations could occur but would likely be less than applicable water quality criteria and objectives.	All action alternatives	This impact does not appear to be significant.
	Impact WQ-3: Effects on Bromide Resulting from Compensatory Mitigation	Monthly average bromide concentrations could increase in the Sacramento River and San Joaquin River as a result of climate change and sea level rise.	All action alternatives	This impact does not appear to be significant.
	Impact WQ-4: Effects on Chloride Resulting from Compensatory Mitigation	Monthly average chloride concentrations could increase in the Sacramento River and San Joaquin River as well as a potential for increased frequency of exceeding the Bay-Delta Water Quality Control Plan at Contra Costa Pumping Plant #1 as a result of climate change and sea level rise. Additional chloride concentration increases could occur in Suisun Marsh.	All action alternatives	This impact does not appear to be significant.
	Impact WQ-5: Effects on Electrical Conductivity Resulting from Compensatory Mitigation	Monthly average electrical conductivity levels could increase in the Sacramento River, San Joaquin River, and Suisun Marsh as a result of climate change and sea level rise.	All action alternatives	This impact does not appear to be significant.
	Impact WQ-6: Effects on Mercury Resulting from Compensatory Mitigation	Long-term average water column concentrations of mercury and methylmercury could increase at various locations in the study area and decrease in others.	All action alternatives	This impact does not appear to be significant.
	Impact WQ-7: Effects on Nutrients Resulting from Compensatory Mitigation	The changes in Delta source waters under the No Action Alternative, relative to existing conditions, would have varying effects on nutrients. Areas of the Delta that have a reduced proportion of Sacramento River water coupled with a higher proportion of San Joaquin River water could have higher concentrations of total nitrogen and total phosphorus under the No Action Alternative, because of the relatively higher concentrations in San Joaquin River water.	All action alternatives	This impact does not appear to be significant.

Environmental Resource	Effects	No Action Summary of Effects	Action Alternatives	Level of Significance for Action Alternatives
	Impact WQ-8: Effects on Organic Carbon Resulting from Compensatory Mitigation	Monthly average dissolved organic carbon concentrations under the No Action Alternative would differ minimally from the concentrations under existing conditions at most Delta assessment locations.	All action alternatives	This impact does not appear to be significant.
	Impact WQ-9: Effects on Dissolved Oxygen Resulting from Compensatory Mitigation	Of the factors that primarily influence dissolved oxygen concentrations in the Delta, channel velocities and presence of oxygen-demanding substances would be similar to existing conditions, and water temperatures would be slightly higher, which could slightly decrease in dissolved oxygen saturation concentrations.	All action alternatives	This impact does not appear to be significant.
	Impact WQ-10: Effects on Selenium Resulting from Compensatory Mitigation	Long-term average selenium concentrations under the No Action Alternative would differ minimally from concentrations under existing conditions at all Delta assessment locations.	All action alternatives	This impact does not appear to be significant.
	Impact WQ-11: Effects on Pesticides Resulting from Compensatory Mitigation	No substantial changes in Delta pesticide concentrations would occur under the No Action Alternative, relative to existing conditions.	All action alternatives	This impact does not appear to be significant.
	Impact WQ-12: Effects on Trace Metals Resulting from Compensatory Mitigation	Trace metals concentrations under the No Action Alternative would differ negligibly from concentrations that occur under existing conditions.	All action alternatives	This impact does not appear to be significant.
	Impact WQ-13: Effects on Turbidity/Total Suspended Solids Resulting from Compensatory Mitigation	TSS and turbidity levels under the No Action Alternative could increase relative to existing conditions throughout the Delta. This potential increase is based on a recent study that projects climate change will cause increases in large precipitation events that will drive flow increases and subsequently cause more sediment to be deposited within the Delta over the next century.	All action alternatives	This impact does not appear to be significant.
	Impact WQ-14: Effects on Cyanobacteria Harmful Algal Blooms (CHABs) Resulting from Compensatory Mitigation	CHABs would be expected to occur with similar or greater frequency throughout the study area for the No Action Alternative, relative to existing conditions. With climate change associated with the No Action Alternative in 2040, there would be the potential for earlier *Microcystis* bloom initiation in Delta waters and also the potential for more frequent large blooms. This would be driven by climate change that would increase water temperatures in the Lower Sacramento River, San Joaquin River, and Delta.	All action alternatives	This impact does not appear to be significant.
	Impact WQ-15: Risk of Release of Pollutants from Inundation of Project Facilities	There would be no effect on the risk of release of pollutants from inundation of project facilities, because there would be no new conveyance facilities under the No Action Alternative.	All action alternatives	This impact does not appear to be significant.
	Impact WQ-16: Effects on Drainage Patterns as a Result of Project Facilities	There would be no effect on drainage patterns, because there would be no new conveyance facilities under the No Action Alternative.	All action alternatives	This impact does not appear to be significant.
	Impact WQ-17: Consistency with Water Quality Control Plans	There would be no effect on consistency with water quality control plans, because there would be no new conveyance facilities under the No Action Alternative.	All action alternatives	This impact does not appear to be significant.

Environmental Resource	Effects	No Action Summary of Effects	Action Alternatives	Level of Significance for Action Alternatives
Section 3.22, Water Supply	Effects that result from operation of the action alternatives are not within USACE's authority and are not covered by this EIS. Brief descriptions of the effects of operations are included in Chapter 3, where appropriate; however, they are not included in this table. For more information on the effects of operations as a result of operation of the action alternatives, see the Delta Conveyance Project Draft EIR (California Department of Water Resources 2022).			

ES.5 Mitigation Approaches

Specific measures are proposed when necessary to avoid, reduce, minimize, or compensate for adverse environmental effects of the action alternatives. To the extent possible, the action alternatives were designed to avoid and minimize surface effects through site optimization, use of subsurface tunnels for water conveyance, reduced space requirements for intake screens, and through evaluation of a range of conveyance capacities.

ES.5.1 Environmental Commitments and Best Management Practices

Environmental commitments and best management practices (BMPs), as described in this Draft EIS are certain project components that have been incorporated into the project design and construction. Environmental commitments are typically engineering related and are intended to avoid, reduce, or minimize environmental or community impacts; BMPs are typically generalized measures not specific to the project location and are well-established practices or requirements that are incorporated into the proposed action construction process. Environmental commitments and BMPs will be implemented as part of the project if it is approved. Environmental commitments and BMPs are described in Appendix C1, *Environmental Commitments and Best Management Practices.*

ES.5.2 Compensatory Mitigation

Compensatory mitigation for the proposed action is described in Appendix C3, *Compensatory Mitigation Plan for Special-Status Species and Aquatic Resources*. The purpose of compensatory mitigation is to address effects on habitat for special-status species, as well as on jurisdictional wetlands and other waters that may result from the construction of the project. The compensatory mitigation approach outlines three primary approaches for providing compensatory mitigation to offset effects associated with the construction and operation of the action alternatives. These approaches include habitat restoration areas proposed on Bouldin Island and state-owned properties in Sacramento County west of I-5 (i.e., I-5 ponds), use of existing or proposed mitigation banks, and a mitigation framework under which future compensatory mitigation actions may be delivered.

ES.5.3 Mitigation Measures

The term *mitigation measure* is specifically applied in this Draft EIS to designate measures to reduce residual environmental effects, after considering the application of all environmental commitments, BMPs, and compensatory mitigation. Mitigation measures are considered elements of the proposed action and are presented in each resource area as ways to avoid, minimize, and reduce effects of the proposed action. Mitigation measures are presented in Appendix C2, *Mitigation Measures.*

ES.6 Public Review of the Draft EIS

The Notice of Availability (NOA) for this Draft EIS is being distributed to all cooperating, responsible, and trustee agencies, as well as to other potentially interested agencies, interested organizations, nongovernmental organizations, Native American Tribes, and individuals.

This Draft EIS is available for review online at USACE's website: https://www.spk.usace.army.mil/Missions/Regulatory/Delta-Conveyance/. Electronic copies of the Draft EIS will also be available at locations identified in the NOA. This Draft EIS is also being distributed for a 60-day review period following the publication of the NOA in the *Federal Register*. The purpose of public review of the Draft EIS is to receive comments from the public on the document's completeness and adequacy in disclosing potential environmental effects of the project.

If submitting a Draft EIS comment via email, please include the project title in the subject line (i.e., Delta Conveyance Project), attach comments to the email as a separate file in Microsoft Word document format, and include the commenter's mailing address.

Draft EIS comments should be sent to the following address.

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USACE anticipates hosting public meetings to provide information and receive comments on the Draft EIS. These public meetings will be held virtually and information about the meeting dates, times, sign-up, and comment process will be posted online at the USACE website: https://www.spk.usace.army.mil/Missions/Regulatory/Delta-Conveyance/.

Chapter 1
Introduction and Purpose and Need

1.1 Introduction and Project Requiring Environmental Analysis

The California Department of Water Resources (DWR or the applicant) is proposing to construct new conveyance facilities in the Sacramento–San Joaquin Delta (Delta). As the lead agency for the Delta Conveyance Project (project or proposed action), the U.S. Army Corps of Engineers (USACE) Sacramento District has prepared an environmental impact statement (EIS) for construction of the action alternatives. This Draft EIS analyzes the applicant's proposed action and alternatives, which include intake facilities on the Sacramento River, tunnel reaches and tunnel shafts, a southern forebay and pumping plant, and south Delta conveyance facilities that would connect to the existing State Water Project (SWP) infrastructure.

Because construction of the proposed action and action alternatives would alter federal levees, permission from USACE is required under Section 14 of the Rivers and Harbors Act (RHA) (33 United States Code [USC] § 408) (Section 408). Construction of the proposed action and action alternatives would cross under the Stockton Deep Water Ship Channel (a federal navigation project); therefore, a real estate outgrant[1] from USACE would be required. In addition, the proposed work in navigable waters of the United States requires authorization from USACE under Section 10 of the RHA (33 USC § 403), and discharge of dredged or fill material into waters of the United States requires authorization from USACE under Section 404 of the Clean Water Act (CWA) (33 USC § 1344). DWR is the *requester* under Section 408 and the *applicant* under Section 10, Section 404, and the real estate outgrant.

Once constructed, the new facilities that comprise the proposed action would become part of the SWP. Operation of the SWP, including the facilities proposed in this project, is outside USACE authority under Section 408, Section 10, and Section 404. Therefore, the Draft EIS focuses only on those actions requiring USACE authorization or approval.

Operations are discussed briefly and qualitatively throughout the Draft EIS. Readers should refer to the *Delta Conveyance Project Draft Environmental Impact Report* (Delta Conveyance Project Draft EIR) (California Department of Water Resources 2022) for a more in-depth analysis of operations and associated effects on the environment.[2] Where noted, this Draft EIS incorporates by reference portions of the Delta Conveyance Project Draft EIR (California Department of Water Resources 2022).

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[1] A real estate outgrant is an instrument that authorizes a private or public entity, that is not USACE, to access federally controlled property for non-mission-related purposes pursuant to Army Regulation 405-80 *Management of Title and Granting Use of Real Property*.

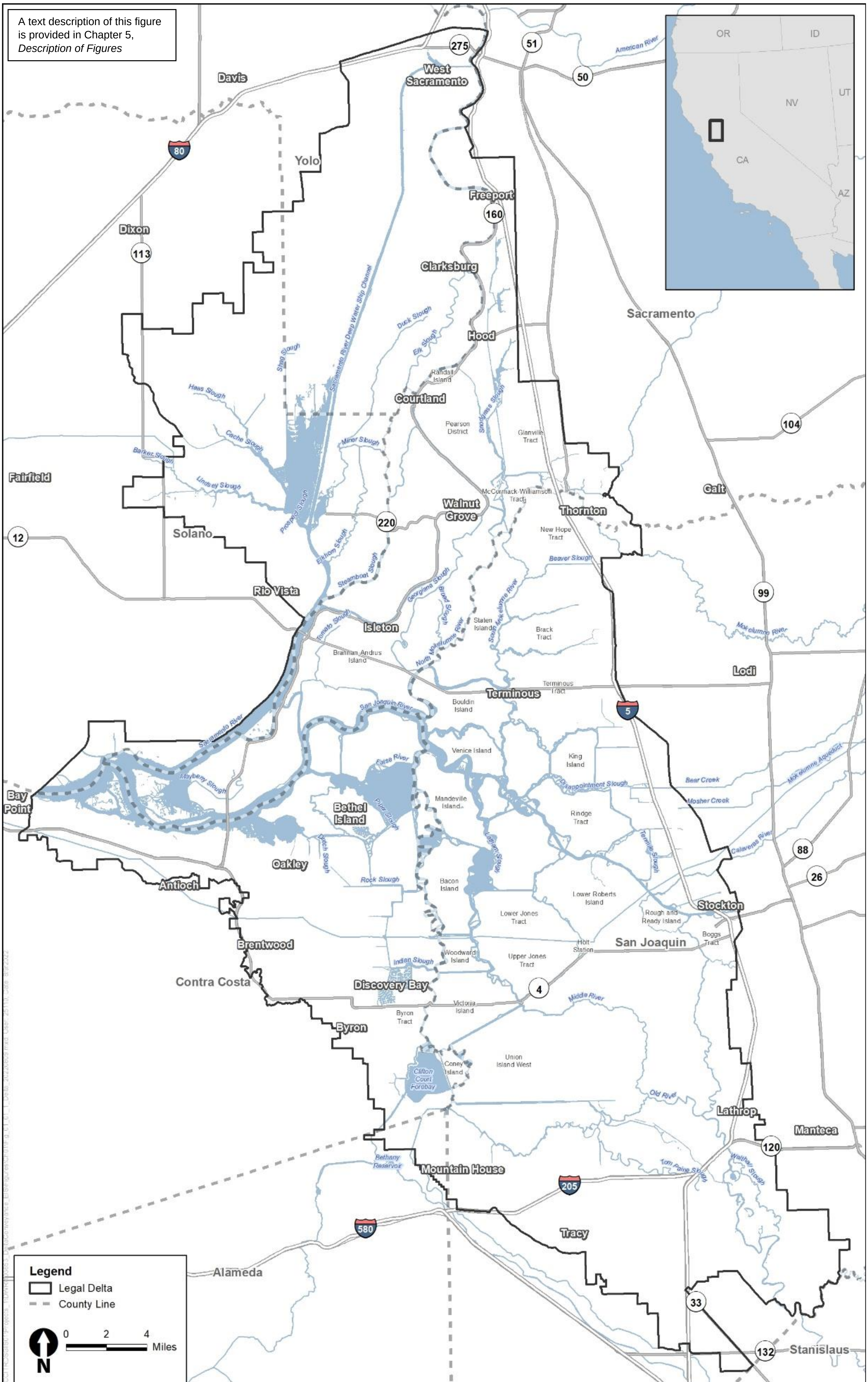
[2] The Delta Conveyance Project Draft EIR is available for viewing online at https://www.deltaconveyanceproject.com/read-the-document. A "Change Sheet" identifying changes that will be made in the Final EIR is available on DWR's project website: https://cadwr.app.box.com/s/gyecr8xrc4gogrprmdnf2mxdipw4hnvg.

Water deliveries associated with the Delta Conveyance Project are beyond the scope of USACE and water diversions are dependent on several factors not under the control or influence of USACE. Information regarding the amounts of water delivered by the state can be found at the following website: https://water.ca.gov/Library/Modeling-and-Analysis/Central-Valley-models-and-tools/CalSim-3/DCR2021. A brief discussion of proposed increases in water deliveries is presented in Chapter 3, *Affected Environment and Environmental Consequences*, Section 3.22.2.1, *Effects and Mitigation,* in this Draft EIS.

The action alternatives include the construction of new intake facilities, a tunnel, and a forebay. Two new intake facilities would be located in the north Delta along the east bank of the Sacramento River between the communities of Hood and Courtland. The new conveyance facilities would include a tunnel to convey water from the new intakes to a pumping plant and new southern forebay on Byron Tract, immediately west of the existing Clifton Court Forebay. A dual tunnel would connect the new facilities to the existing SWP Banks Intake Canal in the south Delta. The new facilities would provide the SWP with an alternate location for diversion of water from the Delta and would be operated in coordination with the existing SWP south Delta pumping facilities, resulting in a system also known as *dual conveyance* because there would be two complementary methods to divert and convey water. Under the applicant's proposed action, the new north Delta intake facilities would be sized to convey up to 6,000 cubic feet per second (cfs) of water from the Sacramento River to the SWP facilities in the south Delta.

1.2 Project Location

The Delta (Figure 1-1) is an expansive inland river delta and estuary in Northern California. Portions of six counties—Alameda, Contra Costa, Sacramento, San Joaquin, Solano, and Yolo—make up the Delta. The Delta is formed at the western edge of the Central Valley by the confluence of the Sacramento and San Joaquin Rivers and lies just east of where the rivers enter Suisun Bay. The new intake facilities would be located along the east bank of the Sacramento River between the communities of Hood and Courtland. The new conveyance facilities would be located within a tunnel corridor east of the Delta that would extend 42 miles from the new intakes on the Sacramento River to the pumping plant and new southern forebay. A new dual tunnel would connect the new facilities to the existing SWP Banks Intake Canal in the south Delta.



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2 **Figure 1-1. The Sacramento–San Joaquin Delta**

1.3 Background and History

The watersheds of the Sacramento and San Joaquin Rivers are at the core of California's water system, which conveys water to millions of Californians throughout the San Francisco Bay Area (Bay Area), the Central Valley, the Central Coast, and Southern California. However, the Delta is also important to the State of California and the region for reasons other than water supply. For example, the Delta is a recreational destination. Its waterways and wetlands support many activities including fishing, boating, and hunting. In addition, it sustains distinctive geographical and cultural characteristics and is home to extensive infrastructure of statewide importance, such as aqueducts, natural gas pipelines, and electricity transmission lines; railroads, commercial navigation (ports and shipping channels); recreational navigation (marinas, docks, launch ramps); agricultural production and distribution; wildlife refuges; public and private levee systems; and highways. The ports of Stockton and West Sacramento are focal points of regional economic development and rely on through-Delta shipping channels. State Route (SR) 12, SR 4, and through-Delta railways are also important links in the Delta transportation system (Delta Protection Commission 2012:207). The Delta also provides important ecological benefits: within a complicated and valuable system of wetlands it provides water quality benefits, aquatic and terrestrial species habitat, and various ecological resources.

1.4 Document Purpose

An EIS is an environmental document required by the National Environmental Policy Act (NEPA) for actions that would significantly affect the quality of the human environment (42 USC § 4332). This EIS is intended to satisfy the NEPA requirements for disclosing the environmental effects of the action alternatives. It will also support USACE's NEPA Record of Decision (ROD) and decisions on the applicant's Section 408 permission request and Section 10 and Section 404 permit applications. The EIS also may be used as an informational document by federal NEPA cooperating agencies that could have permitting or approval authority for various components of the action alternatives.

DWR has prepared an EIR) under the California Environmental Quality Act (CEQA), which provides additional detail and analysis. In the interest of streamlining the NEPA EIS, information from the EIR is incorporated by reference where appropriate. Although the EIS and EIR are being prepared independently, this EIS relies upon information provided by DWR, and USACE and the applicant are coordinating to ensure consistency between the two documents for ease of public review.

1.5 Purpose and Need

1.5.1 Project Purpose

The purpose of the project is to improve diversion and conveyance facilities in the Delta to ensure the reliability of SWP water deliveries south of the Delta.

1.5.2 Project Needs and Objectives

Factors such as the continuing subsidence of lands, risk of seismic activity and levee failures within the Delta, sea level rise, precipitation change, warmer temperatures, and wider variations in hydrologic conditions associated with climate change threaten the reliability of the current SWP water conveyance system. Additionally, pumping restrictions applied by regulatory agencies to address water quality and aquatic species concerns at the south Delta diversion continue to prevent the SWP from reliably capturing water when it is available, especially from storm events. Constraints on groundwater use imposed by the Sustainable Groundwater Management Act of 2014 could also increase the need for reliable SWP surface water supplies over time.

DWR's current proposal is informed by past efforts undertaken to address the long-standing issues SWP faces, including those undertaken through the CALFED Bay-Delta Program, the Delta Risk Management Strategy, and the Bay Delta Conservation Plan/California WaterFix planning process. The need for new Delta water conveyance infrastructure to help achieve California's coequal goals of "providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem" (Pub. Resources Code § 29702(a)) was recognized by the California State legislature when it adopted the Sacramento–San Joaquin Delta Reform Act of 2009 (Water Code § 85000 *et seq*.).

DWR's fundamental purpose in proposing to develop new diversion and conveyance facilities in the Delta is to restore and protect the reliability of SWP water deliveries and, potentially, Central Valley Project (CVP) water deliveries south of the Delta, consistent with the state's Water Resilience Portfolio in a cost-effective manner.

The previously stated purpose, in turn, gives rise to several related objectives of the project, as follows.

1. To help address anticipated rising sea levels and other reasonably foreseeable consequences of climate change and extreme weather events, which could reduce the ability to operate the SWP.
2. To minimize the potential for public health and safety impacts from reduced quantity and quality of SWP water deliveries, and potentially CVP water deliveries, south of the Delta as a result of a major earthquake that could cause breaching of Delta levees and the inundation of brackish water into the areas where existing SWP and CVP pumping plants operate in the southern Delta.
3. To protect the ability of the SWP, and potentially CVP, to deliver water when hydrologic conditions result in the availability of sufficient amounts of water, consistent with the requirements of state and federal law, including the California and federal Endangered Species Acts and Delta Reform Act, as well as the terms and conditions of water delivery contracts and other existing applicable agreements.
4. To provide operational flexibility to improve aquatic conditions in the Delta and better manage risks of further regulatory constraints on project operations.

1.6 National Environmental Policy Act Process

This section describes the role of the federal NEPA lead agency and other federal cooperating agencies participating in preparation of this EIS. Details on the public scoping process and opportunities for the public to review and comment on the Draft EIS are also provided.

1.6.1 Lead Agency

USACE is the federal lead agency for the project under NEPA and is responsible for ensuring that all NEPA requirements have been met.

1.6.2 Cooperating Agencies

Under NEPA, a cooperating agency is any federal agency other than the federal lead agency that has jurisdiction by law or special expertise with respect to any environmental effect involved in an action requiring an EIS. Under NEPA, cooperating agencies are encouraged to actively participate in the NEPA process of the federal lead agency, review the NEPA documents of the federal lead agency, and use the documents when necessary if making decisions on the project. The National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS), U.S. Environmental Protection Agency (USEPA), and Bureau of Reclamation (Reclamation) are NEPA cooperating agencies for this EIS.

1.6.3 Public Scoping

In compliance with requirements set forth in NEPA, USACE prepared a Notice of Intent (NOI) to prepare an EIS. The NOI described the project and included information regarding the applicant and contact information for submitting public comments. The NOI was posted in the *Federal Register* on August 20, 2020. Although there is no mandated time limit to submit comments in response to an NOI, USACE set a 60-day comment period. The 60-day comment period for the NOI was August 20, 2020, to October 20, 2020. Additional detail on the public scoping process and comments received are provided in Appendix H, *Scoping Report*.

1.6.4 Draft Environmental Impact Statement Public Comment Period

The Notice of Availability (NOA) for this Draft EIS is being distributed to all cooperating, responsible, and trustee agencies, as well as to other potentially interested agencies, interested organizations, nongovernmental organizations, Native American Tribes, and individuals.

This Draft EIS is available for review online at USACE's website: https://www.spk.usace.army.mil/Missions/Regulatory/Delta-Conveyance/. Electronic copies of the Draft EIS will also be available at locations identified in the NOA. This Draft EIS is also being distributed for a 60-day review period following the publication of the NOA in the *Federal Register*. The purpose of public review of the Draft EIS is to receive comments from the public on the document's completeness and adequacy in disclosing potential environmental effects of the project.

If submitting a Draft EIS comment via email, please include the project title in the subject line (i.e., Delta Conveyance Project), attach comments to the email as a separate file in Microsoft Word document format, and include the commenter's mailing address.

Draft EIS comments should be sent to the following address.

Zachary Simmons
U.S. Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, CA 95814-2922
Email: mailto:DLL-DCP-EIS@usace.army.mil

1.6.5 Public Meetings

USACE anticipates hosting public meetings to provide information and receive comments on the Draft EIS. These public meetings will be held virtually and information about the meeting dates, times, sign up, and comment process will be posted online at the USACE website: https://www.spk.usace.army.mil/Missions/Regulatory/Delta-Conveyance/.

1.7 Regulatory Requirements, Permissions, Permits, Authorizations, and Approvals

The project is dependent on federal action and would require federal permits for one or more of the following activities: (1) permission to alter a federal levee or channel under Section 408, (2) discharges of dredged or fill material into waters of the United States (Section 404 of the CWA), (3) work or construction of a structure in or over any navigable water of the United States (Section 10 of the RHA), (4) activities within the federal navigation channel near the City of Stockton, (5) activities affecting plant or animal species protected by the federal Endangered Species Act (ESA) (16 USC § 1531 *et seq*.), and (6) activities affecting cultural resources that are listed or are eligible for listing in the National Register of Historic Places for compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (16 USC § 470). USACE specific regulatory authority is discussed in further detail in Section 1.8, *U.S. Army Corps of Engineers' Authority*.

The regulatory setting of the project is discussed in detail in Appendix G, *Potentially Relevant Laws, Regulations, and Programs.*

1.7.1 Changes to the National Environmental Policy Act Regulations

On July 16, 2020, the Council on Environmental Quality (CEQ) published its final rule modernizing and clarifying its procedural regulations implementing NEPA. The final rule entitled *Update to the Regulations Implementing the Procedural Provisions of the National Environmental Policy Act*, is the first major revision to CEQ's NEPA regulations in over 40 years. This final rule went into effect on September 14, 2020.

All new NEPA documents begun on or after September 14, 2020, are required to use the revised CEQ NEPA regulations published in the *Federal Register* on July 16, 2020 (Council on Environmental

Quality 2020). For purposes of determining when an EIS has begun, the new regulations state that the EIS begins on the date that its NOI is published in the *Federal Register* (85 FR § 43304). Under the new regulations, federal agencies may either continue completing EISs initiated prior to September 14, 2020, as planned under the previous CEQ NEPA regulations, or they may apply the new requirements to these ongoing NEPA documents.

USACE initiated the public scoping process for the EIS with publication of the NOI in the *Federal Register* on August 20, 2020. Consequently, this EIS began before CEQ's revised, final regulations went into effect, and this EIS complies with the CEQ NEPA regulations in effect at the time of the publication of the NOI.

On April 20, 2022, the CEQ issued *National Environmental Policy Act Implementing Regulations Revisions* final rule, which went into effect on May 20, 2022. The amendment generally restored provisions that were in effect before being modified in 2020. As this EIS was not required to comply with the 2020 regulations, this final rule did not affect the Delta Conveyance Project EIS.

1.8 U.S. Army Corps of Engineers' Authority

The large-scale operation of the SWP, including the facilities proposed in this project, is outside USACE authority under Section 408, Section 404, and Section 10. Therefore, while the effects of project operations are discussed briefly and qualitatively in this Draft EIS, a more in-depth analysis of project operations and associated effects on the environment is provided in the Delta Conveyance Project Draft EIR (California Department of Water Resources 2022). This Draft EIS focuses only on those actions under USACE authority.

USACE has regulatory authority over certain activities within waters located in the project area. Depending on the activity and the location of that activity in relation to particular resources, USACE may be required to evaluate a permit application for that activity under Section 408, Section 10, and Section 404, as described below.

1.8.1 Section 404 of the Clean Water Act

Activities that would result in the discharge of dredged or fill material into waters of the United States must obtain authorization from USACE pursuant to Section 404 of the CWA (33 USC § 1251 *et seq*.). A permit issued under Section 404 can take the form of either a General Permit or an Individual Permit. Individual Permits are designed for activities that otherwise do not qualify to proceed under a General Permit. The discharge activities that would occur associated with any of the action alternatives, would require an Individual Permit.

1.8.2 Section 10 of the Rivers and Harbors Act

Activities that would involve work or the construction of a structure affecting a navigable water of the United States must obtain authorization from USACE pursuant to Section 10 of the RHA of 1899 (33 USC § 403 *et seq*.; 33 CFR Part 322 *et seq*.). Structures or work outside the limits defined for navigable waters of the United States require a Section 10 permit if "the structure or work affects the course, location, or condition of the water body" (33 CFR § 322.3(a)). The law applies to any dredging or disposal of dredged materials, excavation, filling, recanalization, or any other modification of a navigable water of the United States, and applies to all structures, from the smallest floating dock to the largest commercial undertaking (33 CFR § 322.2(b)).

The Delta Conveyance Project consists of activities that fall under both Section 10 and Section 404. Therefore, the process for obtaining a permit under Section 10 of the RHA will be combined with the process for obtaining a permit under Section 404 of the CWA. Compliance with the 404 permitting criteria will cover the substantive requirements of the Section10 permitting process. The applicant would apply to USACE for issuance of one Department of the Army permit consistent with both Section 10 of the RHA and Section 404 of the CWA.

1.8.3 Section 14 of the Rivers and Harbors Act

Section 14 of the RHA (33 USC § 408) (Section 408) requires permission from the Secretary of the Army, acting through USACE, to alter an existing USACE civil works project. To grant permission under Section 408, USACE must determine that the proposed alteration does not impair the usefulness of the USACE project and would not be injurious to the public interest. This is generally referred to as *Section 408 permission*. Section 408 permission would be required for alteration or modification of federally constructed levees and channels associated with the proposed action or any of the action alternatives. The informational requirements under the Section 408 process necessarily includes a detailed level of engineering design, as well as a detailed level of analysis related to effects on USACE civil works projects and indirect hydraulic effects.

1.8.4 Real Estate Outgrant

Use of government property under the stewardship of the U.S. Army Corps of Engineers, requires the issuance of a real estate outgrant by the USACE Real Estate Division in accordance with Army Regulation 405-80 *Management of Title and Granting Use of Real Property*.

A real estate outgrant “authorizes the right to use Army controlled real property. It is a written legal document that establishes the timeframe, consideration, conditions, and restrictions on the use of Army property” (U.S. Army Corps of Engineers 1996). An outgrant is typically in the form of a lease, easement or license authorized by 16 USC Section 460d, 10 USC Section 2667, 10 USC Section 2668, and 30 USC Section 185. All new non-recreational outgrant requests for use of USACE fee owned lands and water by the public, federally recognized Indian tribes, private sector, quasi-public entities, or individuals at civil works water resources projects operated and maintained by USACE must obtain a real estate outgrant.

As a USACE real estate decision and Section 408 decision are both needed, USACE will conduct these evaluations in a coordinated and concurrent manner to the maximum extent practicable. While evaluations will be conducted concurrently, final decision making requires that the Section 408 decision be rendered before or concurrent with, but not after, the USACE real estate decisions to ensure the real estate decision would not be detrimental to the federal project or harmful to the public. Implementing regulations and policies for the real estate decisions require the evaluation of proposed activities and their compatibility with the project needs and objectives (U.S. Army Corps of Engineers 2018).

1.9 Environmental Impact Statement Organization

The content and organization of the EIS are designed to meet the requirements of NEPA, USACE NEPA regulations, and applicable NEPA regulations issued by CEQ. This EIS is organized as follows.

- *Executive Summary.* The Executive Summary provides an overview of the alternatives under consideration, the elements of the project description, and the content of the EIS.
- Chapter 1, *Introduction and Purpose and Need*. Chapter 1 (this chapter) explains the NEPA process, the purpose and need of the project, the various agencies involved in the EIS, USACE's authority over the project, and the EIS organization.
- Chapter 2, *Project Description and Alternatives*. Chapter 2 provides detailed descriptions of the actions that would be undertaken under each action alternative, as well as the No Action Alternative. Mitigation measures that would avoid, minimize, rectify, reduce, or compensate for potentially adverse effects are included as part of the action alternatives. This chapter also discusses the alternatives considered but eliminated from further consideration.
- Chapter 3, *Affected Environment and Environmental Consequences*. Chapter 3 is divided into multiple sections. The introduction to Chapter 3 provides the introduction materials, as well as information on topics with a less-than-significant or no effect from the action alternatives, which are not discussed further. The remainder of the chapter (Sections 3.1 through 3.22) is divided by environmental resource area and provides an analysis of effects at an equal level of detail for all alternatives. Each section also contains a cumulative effects analysis.
- Chapter 4, *Other Statutory Requirements*. Chapter 4 contains the analysis of growth-inducing effects, irreversible or irretrievable commitment of resources, and compliance with applicable executive orders.
- Chapter 5, *Description of Figures.* Chapter 5 contains descriptive text specifically for readers who may benefit from descriptive text of figures but do not use assistive devices for screen reading.
- Appendix A, *References Cited*. Appendix A provides a bibliography of sources cited in this EIS.
- Appendix B, *List of Preparers*. Appendix B provides a list of individuals who were involved in the preparation or oversight of this EIS and their respective education and years of experience.
- Appendix C, *Description of the Proposed Project and Alternatives*. Appendix C provides additional detail about the alternatives described in Chapter 2, *Project Description and Alternatives*, and analyzed throughout the EIS.
    - Appendix C1, *Environmental Commitments and Best Management Practices.* Appendix C1 provides details about the best management practices and environmental commitments implemented as part of the action alternatives.
    - Appendix C2, *Mitigation Measures.* Appendix C2 provides descriptions of the mitigation measures anticipated to be implemented as part of the action alternatives.
    - Appendix C3, *Compensatory Mitigation Plan for Special-Status Species and Aquatic Resources.* Appendix C3 provides a technical memorandum identifying the potential compensatory mitigation options and approaches, which are analyzed as part of the action alternatives.
- Appendix D, *Alternatives Screening Analysis.* Appendix D provides additional detail about the alternatives development and screening analysis processes.

- Appendix E, *No Action Alternative and Cumulative Projects*. Appendix E provides a detailed description of the No Action Alternative assumptions, a list of projects included in the No Action Alternative, and a cumulative analysis for each resource area.
- Appendix F, *Public Involvement*. Appendix F provides a summary of consultation and coordination with other federal, state, regional, and local agencies.
- Appendix G, *Potentially Relevant Laws, Regulations, and Programs.* Appendix G provides the regulatory setting for each resource area.
- Appendix H, *Scoping Report.* Appendix H provides a copy of the Public Scoping Report, which includes a description of the public scoping process, a list of commenters, and copies of the comments received during the scoping period.
- Appendix I1, *Natural Communities, Special-Status Terrestrial Species, and Wetlands and Other Waters Supporting Appendix*. Appendix I1 provides tables that support the biological resources analysis in Chapter 3, *Affected Environment and Environmental Consequences*, Section 3.5, *Natural Communities, Special-Status Terrestrial Species, and Wetlands and Other Waters*.
- Appendix I2, *Special-Status Species with Potential to Occur in the Study Area.* Appendix I2 presents special-status plant and wildlife species considered for inclusion in the analysis in Chapter 3, *Affected Environment and Environmental Consequences*.
- Appendix I3, *Species Accounts*. Appendix I3 presents species accounts for special-status terrestrial species that have the potential to occur in the study area.
- Appendix J, *General Conformity Determination.* Appendix J provides the general conformity determination as required by Section 176 of the Clean Air Act.

Chapter 2
Project Description and Alternatives

2.1 Introduction

This chapter describes the No Action Alternative and five action alternatives that are evaluated in detail in this Delta Conveyance Project Draft Environmental Impact Statement (Draft EIS). The analyses in this Draft EIS meet the requirements of the National Environmental Protection Act (NEPA) and are intended to support a NEPA Record of Decision (ROD) and USACE decisions on a Section 408 permission request under Section 14 of the Rivers and Harbors Act (RHA), an application for a real estate outgrant, a Department of the Army (DA) permit application under Section 10 of the RHA, and a permit application under Section 404 of the Clean Water Act (CWA).

While this chapter contains abridged descriptions of the action alternatives, a complete description of the action alternatives as provided by the applicant (California Department of Water Resources [DWR]) is contained in Appendix C, *Description of the Proposed Project and Alternatives*. This EIS incorporates by reference the *Delta Conveyance Project Draft Environmental Impact Report* (Delta Conveyance Project Draft EIR) (California Department of Water Resources 2022) and includes all of its mapbooks, appendices, and attachments. The Delta Conveyance Project Draft EIR provides a detailed project description of nine project alternatives and a no-project alternative, and analysis of the environmental impacts on each resource potentially affected. The Delta Conveyance Project Draft EIR also proposes environmental commitments and best management practices to avoid or reduce impacts, and a compensatory mitigation program and individual mitigation measures to reduce significant impacts. The Delta Conveyance Project Draft EIR is available for public review at https://www.deltaconveyanceproject.com/.[1]

The proposed action and alternatives evaluated in this Draft EIS involve constructing new conveyance facilities for the movement of water entering the Sacramento–San Joaquin Delta (Delta) from the Sacramento Valley watershed to the existing State Water Project (SWP) in the south Delta, which would result in a dual-conveyance system in the Delta. The operation of the SWP, including the facilities proposed in this project, is outside U.S. Army Corps of Engineers (USACE) authority under Section 408, Section 10, and Section 404. Therefore, although the effects of project operations are discussed briefly and qualitatively in this Draft EIS, a more in-depth analysis of project operations and associated effects on the environment is provided in the Delta Conveyance Project Draft EIR (California Department of Water Resources 2022). This Draft EIS focuses only on those actions under USACE authority. Actions under USACE authority are limited to alterations to the Sacramento River Flood Control Project under Section 408; a real estate outgrant for the crossing under the Stockton Deep Water Ship Channel in the San Joaquin River regulated under Army Regulation 405-80 *Management of Title and Granting Use of Real Property*; work in navigable waters of the United States under Section 10; and the discharge of dredged or fill material into waters of the United States under Section 404.

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[1] A "Change Sheet" identifying changes that will be made in the Final EIR is available on DWR's project website: https://cadwr.app.box.com/s/gyecr8xrc4gogrprmdnf2mxdipw4hnvg.

This chapter also discusses the process through which the action alternatives were developed and provides an overview of the alternatives eliminated from further consideration. Additional detail is presented in Appendix C, *Description of the Proposed Project and Alternatives*, Section 3.2, *Alternatives Development Process*, and Section 3.2.1, *Alternatives Screening Analysis*, as well as Appendix D, *Alternatives Screening Analysis* (California Department of Water Resources 2022). The alternatives analyzed in this Draft EIS are described at a similar level of detail to provide for a robust comparison of action alternatives, as NEPA requires.

2.2 NEPA Requirements for Evaluation of Alternatives

The Council of Environmental Quality (CEQ) regulations for implementing NEPA (40 Code of Federal Regulations [CFR] § 1502.14) require that a range of reasonable alternatives be evaluated in an EIS and considered in an equal level of detail. Alternatives that do not meet the project purpose and need do not require detailed study; however, reasons for their elimination should be briefly discussed.

2.3 Project Overview

The Delta Conveyance Project (project or proposed action) consists of constructing new SWP water diversion and conveyance facilities in the Delta. Under the proposed action (DWR's Preferred Alternative), the new water conveyance facilities would divert water from two new intakes along the Sacramento River between Freeport and the confluence with Sutter Slough. The water would travel through a single tunnel on the Bethany Reservoir alignment, which follows an eastern alignment from intakes to Lower Roberts Island, then extends to a new Bethany Reservoir Pumping Plant in the south Delta along Byron Highway for conveyance via a pipeline aqueduct to the Bethany Reservoir. The new pumping plant, aqueduct, and discharge structure are called the *Bethany Complex*.

Under Alternatives 1, 2b, 3, and 4b, either one or both of the same proposed new intakes would be constructed, but water would be conveyed in a single tunnel along either a central alignment or eastern alignment to a new Southern Forebay on Byron Tract, and from the Southern Forebay to existing SWP export facilities. The new Southern Forebay would provide an additional isolated south Delta water-balancing facility that would provide flexibility for operating both the new and existing facilities. These new facilities in the south Delta are collectively called the *Southern Complex*.

Under all of the action alternatives, operating the new conveyance facilities in conjunction with SWP's existing south Delta export facilities at Clifton Court Forebay would create a *dual conveyance* system. The principal differences among the action alternatives are the tunnel alignment and design capacities; each alignment would involve different locations of tunnel shaft sites. Differences in design capacity would affect tunnel diameter, the number and dimensions of intakes, size of shaft sites, and the number and size of pumps in the South Delta Pumping Plant under Alternatives 1, 2b, 3, and 4b (described in Appendix C, *Description of the Proposed Project and Alternatives*). These variations are directly linked to the magnitude of construction effects associated with each action alternative.

The applicant directed the preparation of engineering project reports (EPRs) for the central and eastern alignment alternatives (C-E EPR) and the Bethany Reservoir alignment (Bethany EPR) and associated technical memoranda (Delta Conveyance Design and Construction Authority 2022a, 2022b, respectively). The information in this chapter is based on these EPRs and technical memoranda unless cited otherwise. These documents are available for public review on the Delta Conveyance Design and Construction Authority website at https://www.dcdca.org/info-center/document-library/#Engineering-Project-Reports.

As required by CEQ regulations (40 CFR Parts 1500–1508) for implementation of NEPA, the NEPA analysis includes a No Action Alternative. The No Action Alternative captures a reasonably foreseeable future in the event the proposed action or action alternatives are not approved, which includes reasonably foreseeable plans and projects, as well as projects that may be implemented in the absence of the action alternatives. Because the effects of climate change and sea level rise are reasonably foreseeable, they are included in the No Action Alternative. Projects assumed to be included in the No Action Alternative are provided in the effects analysis for each resource area.

The applicant's proposed action (i.e., 6,000-cubic feet per second [cfs] conveyance capacity along the Bethany Reservoir alignment) and the other action alternatives are listed below and described in Section 2.6, *Action Alternatives*. The No Action Alternative is described in Section 2.5, *No Action Alternative*.

- Alternative 1—Central Alignment, 6,000 cfs, Intakes B and C
- Alternative 2b—Central Alignment, 3,000 cfs, Intake C
- Alternative 3—Eastern Alignment, 6,000 cfs, Intakes B and C
- Alternative 4b—Eastern Alignment, 3,000 cfs, Intake C
- DWR's Preferred Alternative — Bethany Reservoir Alignment, 6,000 cfs, Intakes B and C (proposed action)

Table 2-1 summarizes key proposed water conveyance features and characteristics (e.g., dimensions, volumes) by alternative. Table 2-2 summarizes key features of the intakes for all action alternatives.

Figure 2-1 shows each proposed alignment and major facilities.

A text description of this figure is provided in Chapter 5, *Text Descriptions of Figures*.

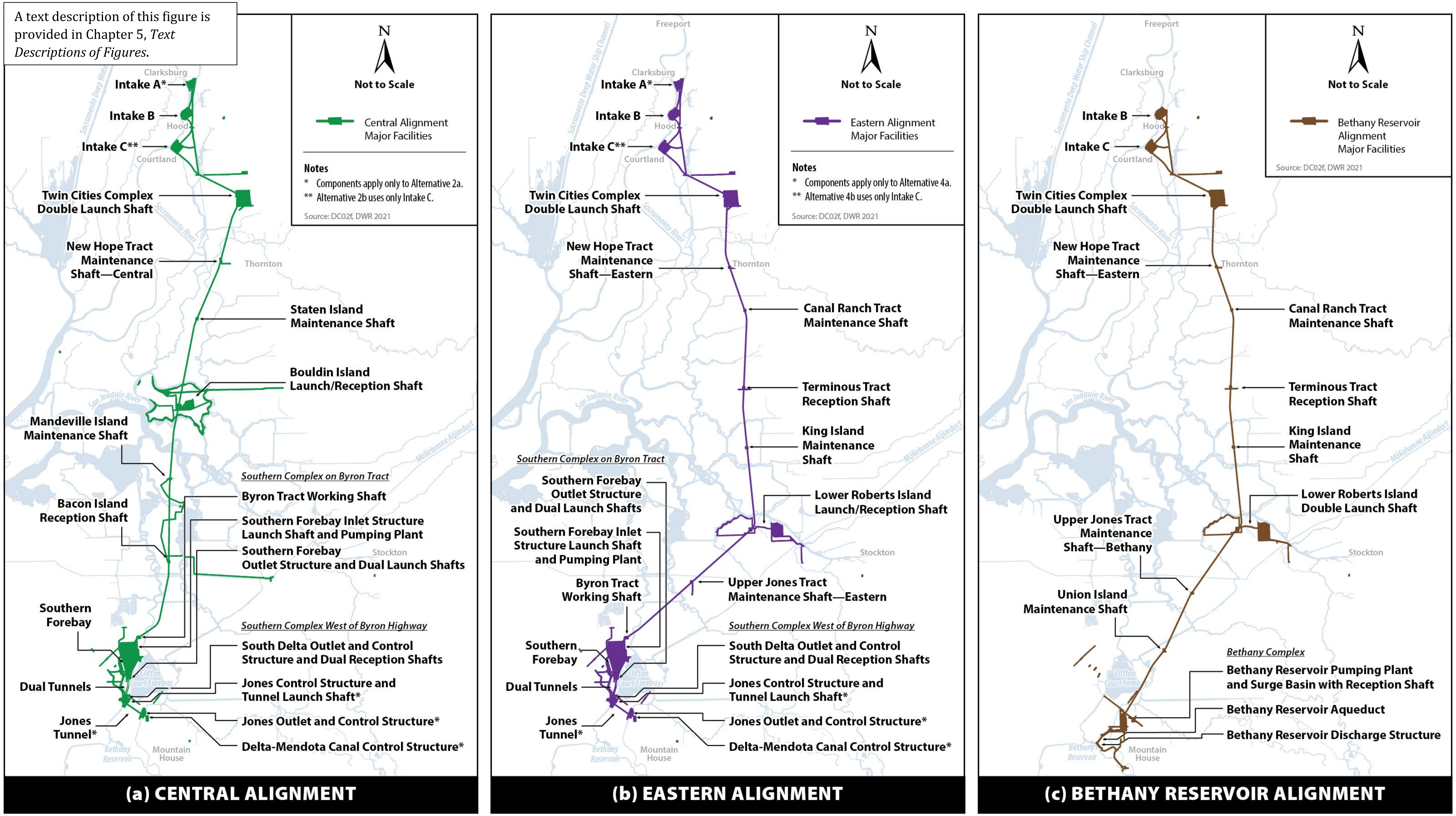

Figure 2-1. Project Alignments

1 **Table 2-1. Key Project Features by Alternative**

Items	Alternative 1	Alternative 2b	Alternative 3	Alternative 4b	DWR's Preferred Alternative
Conveyance capacity (cfs)	6,000	3,000	6,000	3,000	6,000
Alignment	Central	Central	Eastern	Eastern	Bethany Reservoir (eastern alignment from intakes to Lower Roberts Island, then extending to the Bethany Reservoir Pumping Plant and Surge Basin without use of a forebay)
Intakes and capacity (cfs)	• Intake B: 3,000 • Intake C: 3,000	• Intake C: 3,000	• Intake B: 3,000 • Intake C: 3,000	• Intake C: 3,000	• Intake B: 3,000 • Intake C: 3,000
Main tunnel diameter (feet)	• 36 feet inside • 39 feet outside	• 26 feet inside • 28 feet outside	• 36 feet inside • 39 feet outside	• 26 feet inside • 28 feet outside	• 36 feet inside • 39 feet outside
Main tunnel length (miles)	39	37	42	40	45
Lambert Road Concrete Batch Plants	2 plants: • 15 acres for construction. • 14 acres post-construction.	1 plant: • 8 acres for construction. • 7 acres post-construction.	2 plants: • 15 acres for construction. • 14 acres post-construction.	1 plant: • 8 acres for construction. • 7 acres post-construction.	2 plants: • 15 acres for construction. • 14 acres post-construction.
Bethany Complex Concrete Batch Plants	Not applicable	Not applicable	Not applicable	Not applicable	2 plants: approximately 11.5 acres at Bethany Reservoir Pumping Plant and Surge Basin.

Items	Alternative 1	Alternative 2b	Alternative 3	Alternative 4b	DWR's Preferred Alternative
South Delta Pumping Plant at the Northern Southern Forebay Embankment	• Seven pumps at 960 cfs, each, including two standby pumps. • Three pumps at 600 cfs, each, including one standby pump. • Two portable pumps to dewater tunnel.	• Five pumps at 960 cfs, each, including up to two standby pumps. • Three pumps at 600 cfs, each, including one standby pump. • Two portable pumps to dewater tunnel.	• Seven pumps at 960 cfs, each, including two standby pumps. • Three pumps at 600 cfs, each, including one standby pump. • Two portable pumps to dewater tunnel.	• Five pumps at 960 cfs, each, including up to two standby pumps. • Three pumps at 600 cfs, each, including one standby pump. • Two portable pumps to dewater tunnel.	Not applicable
Southern Forebay	Normal operating capacity: 9,000 acre-feet. Surface area: approximately 750 acres. Average surface water elevation: 11.5 feet, or approximately the halfway point within the normal operating elevation range of 5.5 to 17.5 feet. Area: approximately 1,000 acres.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1	Not applicable
Dual tunnels at Southern Forebay Outlet Structure, each (diameter in feet; length in miles)	• 38 feet inside • 41 feet outside • 1.7 miles	• 38 feet inside • 41 feet outside • 1.7 miles	• 38 feet inside • 41 feet outside • 1.7 miles	• 38 feet inside • 41 feet outside • 1.7 miles	Not applicable

Items	Alternative 1	Alternative 2b	Alternative 3	Alternative 4b	DWR's Preferred Alternative
Bethany Reservoir Pumping Plant and Surge Basin	Not applicable	Not applicable	Not applicable	Not applicable	• 14 pumps at 500 cfs, each, including two standby pumps. • Four 75-foot diameter by 20-foot-high one-way surge tanks connected to the pumping plant's discharge pipelines. • Two portable 60 cfs pumps to dewater main tunnel for inspection and maintenance. • Four rail-mounted 100 cfs pumps to dewater Surge Basin. • One 815-foot-by-815-foot surge basin with surge overflow capacity.
Bethany Reservoir Aqueduct to Bethany Reservoir Discharge Structure	Not applicable	Not applicable	Not applicable	Not applicable	• 138 acres for construction; 63 acres post-construction. • Four pipelines, each 15-feet inside, 15.2 feet outside diameter. • 2.5 miles long. • Four tunnels (one for each pipeline) under CVP Jones discharge pipelines. • Four tunnels (one for each pipeline) under Bethany Reservoir Conservation Easement. • Riser shafts to Discharge Structure.

Items	Alternative 1	Alternative 2b	Alternative 3	Alternative 4b	DWR's Preferred Alternative
Bethany Reservoir Discharge Structure	Not applicable	Not applicable	Not applicable	Not applicable	15 acres for construction; 13 acres postconstruction

Note: Tunnel diameter and length are from intakes to Southern Forebay, except for DWR's Preferred Alternative.
cfs = cubic feet per second; CVP = Central Valley Project; I-5 = Interstate 5; SR = State Route.

Table 2-2. Intake Characteristics

Feature	Intake B	Intake C
Maximum capacity	3,000 cfs	3,000 cfs
Size of site during construction	Approximately 242 acres	Approximately 239 acres
Size of permanent site postconstruction	Approximately 123 acres	Approximately 109 acres
Intake structure length	1,574 feet along river including training walls 964 feet along river for concrete structure only	1,528 feet along river including training walls 964 feet along river for concrete structure only
Cylindrical tee screen assembly	30 fish screen units	30 fish screen units
Sedimentation basin dimensions (basin would be divided into two cells divided by a turbidity curtain)	Each cell = 1,300 feet long and 650 feet wide at top of the embankment Each cell = 990 feet long and 500 feet wide at bottom of the embankment Water surface elevation would vary from about 3 to 27 feet	Each cell = 1,300 feet long and 645 feet wide at top of the embankment Each cell: = 990 feet long and 495 feet wide at bottom of the embankment Water surface elevation would vary from about 3 to 26 feet
Sediment Basin Radial Gate Flow Control Structure at the junction with the Outlet Structure and Intake Outlet Shaft	Four large radial gates: 30 feet wide and 40 feet tall, each One small radial gate: 15 feet wide and 8 feet tall Top elevation of flow control structure = 30.3 feet Bottom elevation of flow control structure = –8.8 feet	Four large radial gates: 30 feet wide and 40 feet tall, each One small radial gate: 15 feet wide and 8 feet tall Top elevation of flow control structure = 29.3 feet Bottom elevation of flow control structure = –9 feet
Sediment drying lagoons dimensions (four sediment drying lagoons at each intake)	Each approximately 146 feet wide and 350 feet long at the bottom of the embankment Each approximately 15 to 18 feet deep, containing an average of 10 to 12 feet of water when in use	Same as Intake B

Feature	Intake B	Intake C
Sediment drying lagoons outlet structure (to convey water from the lagoons to a pump to return any water to the sediment basin)	Each lagoon outlet structure = approximately 15 feet wide by 15 feet tall Top elevation at the top of lagoon embankment Bottom elevation 20 to 25 feet below top elevation	Same as Intake B
Intake outlet channel from flow control structure to intake outlet shaft	Bottom and inside of embankment = 750 feet long and 146 feet wide	Same as Intake B
Length of temporary levee (SR 160 Levee)	4,250 feet along the centerline	4,200 feet along the centerline
Ground improvement under the levees and facilities embankments	Approximately 1.5 to 2.0 million cubic yards of deep mechanically mixed (DMM) wall sections and approximately 250,000 to 350,000 tons of cement	Same as Intake B
Length of permanent levee	7,600 feet along the centerline	6,200 feet along the centerline
Top elevation of permanent levee	30.3 feet (20–23 feet above toe of temporary levee fill)	29.3 feet (20–23 feet above toe of temporary levee fill)
Cofferdam	Length = 2,942 feet (including sheet piles and DMM wall) Elevation at the top of cofferdam = about 25 feet	Length = 2,897 feet (including sheet piles and DMM wall) Elevation at the top of cofferdam = about 25 feet
Cofferdam impact pile driving duration (total hours; vibratory pile driving hours not included)	15	14
On-site electrical substations facilities footprint	Facilities contained within a 75-foot-wide by 125-foot-long enclosure with a separate safety and security fence Smaller transformers less than 10 feet wide by 10 feet long would be positioned at several locations around the site	Same as Intake B
Standby engine generator/fuel tank (during construction and operation)	1 megawatt standby engine generator with a 1528 horsepower engine, installed inside a fenced area of about 30 feet by 30 feet at each electrical building, including both the generator and the fuel tank	Same as Intake B

Feature	Intake B	Intake C
Appurtenant structures dimensions (during construction)	Office trailers, showers/ washrooms, canteen and common area, and bus shelter Most of these buildings would be 15 feet tall or less (one story) Other buildings for warehousing for materials and temporary work enclosures would be less than 20 feet tall	Same as Intake B
Appurtenant structures dimensions (during operation)	One of the construction buildings would be converted for indoor storage of portable equipment and vehicles used for maintenance of all intakes	Same as Intake B
Land reclamation	Approximately 119 acres	Approximately 130 acres

cfs = cubic feet per second; DMM = deep mixing method; SR = State Route.

2.4 Alternatives Development Process

The CEQ regulations for implementing NEPA (40 CFR § 1502.14) require all reasonable alternatives to be objectively evaluated in an EIS, so that each alternative is evaluated at an equal level of detail (40 CFR § 1502.14[b]). Although the No Action Alternative is not the baseline for evaluating environmental effects, the EIS must also evaluate the No Action Alternative to allow decision makers to compare the effects of approving an action alternative with the effects of not approving it.

As described in Chapter 1, *Introduction and Purpose and Need*, this Draft EIS analyzes the applicant's proposed action and action alternatives and is intended to satisfy NEPA requirements. The following sections present a brief overview of the alternatives development approach that was undertaken by the applicant. The alternatives development process is described in greater detail in Appendix D, *Alternatives Screening Analysis,* and summarized in Appendix C, *Description of the Proposed Project and Alternatives*, Section 3.2*, Alternatives Development Process*, and Section 3.2.1, *Alternatives Screening Analysis.*

2.4.1 Alternatives Screening Analysis

On January 15, 2020, DWR issued a Notice of Preparation (NOP) under the California Environmental Quality Act (CEQA) to prepare an EIR (California Department of Water Resources 2020a). The proposed project identified in the NOP was described as new conveyance facilities in the Delta that would add to the existing SWP infrastructure. The NOP also stated that the new north Delta facilities would be sized to convey up to 6,000 cfs of water from the Sacramento River to the SWP facilities in the south Delta. The NOP outlined that DWR was considering alternatives with capacities ranging from 3,000 to 7,500 cfs, along either a central or an eastern alignment.

The two proposed actions (i.e., the Dual Conveyance Central Tunnel Alignment operating at 6,000 cfs and Dual Conveyance Eastern Tunnel Alignment operating at 6,000 cfs) and five action alternatives were developed consistent with the NOP and the project's purpose and need. The alternatives include variations of the proposed actions that were analyzed at various conveyance capacities within the range identified in the NOP.

The screening process for the Delta Conveyance Project focused on identifying alternatives to those identified in the NOP and was not a project development exercise. Therefore, screening started with the provision that the proposed action meets the Delta Conveyance Project's purpose and need, and the alternatives were screened with these specific needs in mind. The alternatives identified in the NOP therefore served as the basis of comparison for evaluating other alternatives in the screening exercise. The range of conveyance capacities were described in the alternatives screening and evaluated in the Delta Conveyance Project Draft EIR along with an additional alternative (the Bethany Reservoir alignment) that was found to meet the project's purpose and need while minimizing environmental effects.

A total of 21 alternatives to the proposed action were screened through a two-level screening process. The first-level screening assessed whether an alternative could meet the proposed action's purpose and most of the needs based on four related criteria. The second-level screening examined whether the remaining alternatives would avoid or lessen environmental consequences compared to the proposed action. Appendix D, *Alternatives Screening Analysis,* describes the alternatives development process, all alternatives considered, and the screening process.

Of the 21 individual or grouped alternatives, 11 alternatives or groups were eliminated in the first-level screening. The remaining alternatives underwent a second-level screening to evaluate whether they lessened environmental effects compared to the proposed action. Only the Dual Conveyance Bethany Reservoir alignment passed the second-level screening for its potential to avoid or reduce effects.

On November 22, 2021, the applicant notified USACE that DWR would be identifying the Bethany Reservoir alignment as the proposed project in the Draft Delta Conveyance Project EIR (California Department of Water Resources 2022) and that applicant would like to amend its Section 404 permit application previously amended on June 15, 2020, to replace the previously identified eastern alignment with the Bethany Reservoir alignment for the proposed project. Therefore, the Dual Conveyance Bethany Reservoir alignment has been carried forward in this EIS and is referred to as DWR's Preferred Alternative.

USACE has further screened potential alternatives and identified six of the alternatives (including the No Action Alternative) to be fully analyzed in the Draft EIS. While four additional alternatives are included in the EIR, they are not included in the Draft EIS; however, USACE has identified a reasonable range of alternatives to analyze. In the case of Alternatives 2c and 4c (4,500 cfs alternatives with two intakes) it was determined that analysis of Alternatives 1 and 3 (the 6,000 cfs alternatives with two intakes) and Alternatives 2b and 4b (3,000 cfs alternatives with one intake) would provide sufficient bookends of effects that would capture the effects of Alternatives 2c and 4c (4,500 cfs with two intakes). Additionally, the effects of Alternatives 2c and 4c would be very similar to those for Alternatives 1 and 3 at 6,000 cfs because the same number of intakes would be used, and only the tunnel size would vary. In the case of Alternatives 2a and 4a (7,500 cfs with three intakes), it was determined the alternatives would result in additional adverse effects on the aquatic ecosystem beyond those in the proposed action due to the additional intake facility proposed and the subsequent increase in effects. The range of alternatives to be evaluated by USACE in the Draft EIS is limited to the alternatives shown in Table 2-3 and crosswalked to their corresponding alternatives in the Delta Conveyance Project Draft EIR.

Table 2-3. Alternatives Evaluated by USACE in the Draft EIS

Alternative Analyzed in the Draft EIS	Alternative in the Draft EIR
No Action Alternative	No Project Alternative
Alternative 1—Central Alignment, 6,000 cfs, Intakes B and C	Alternative 1
Alternative 2b—Central Alignment, 3,000 cfs, Intake C	Alternative 2b [a]
Alternative 3—Eastern Alignment, 6,000 cfs, Intakes B and C	Alternative 3
Alternative 4b—Eastern Alignment, 3,000 cfs, Intake C	Alternative 4b [a]
DWR's Preferred Alternative—Bethany Reservoir Alignment, 6,000 cfs, Intakes B and C	Alternative 5

[a] Alternatives 2b and 4b include the letter "b" for consistency with the alternatives naming conventions used in the Delta Conveyance Project Draft EIR (California Department of Water Resources 2022).

2.4.2 Alternatives Considered but Rejected

Below is a list of the alternatives eliminated during first- and second-level screening. For complete details regarding the reasons for elimination, please see Appendix D, *Alternatives Screening Analysis*.

2.4.2.1 Alternatives Eliminated at First-Level Screening

The initial screening eliminated the following alternatives because they did not meet two or more of the Filter 1 screening criteria, as shown in Table 2-4.

Table 2-4. Alternatives Eliminated at First Level Screening

Alternative	Reasons for Elimination (criteria not met)
Dual Conveyance with New Intakes at Decker Island	• Climate resiliency. • Seismic resiliency. • Operational resiliency. • Water supply reliability. • Other considerations.
Dual Conveyance Tunnel with New Intakes at Fremont Weir and Decker Island	• Climate resiliency. • Seismic resiliency. • Operational resiliency. • Water supply reliability. • Other considerations.
Isolated Conveyance Tunnel with New Intakes at Fremont Weir and Decker Island	• Climate resiliency. • Seismic resiliency. • Water supply reliability. • Operational resiliency.
Isolated Conveyance with San Joaquin River Intake (and desalination facilities)	• Climate resiliency. • Seismic resiliency. • Operational resiliency. • Other considerations.
Western Delta Intake Concept	• Climate resiliency. • Seismic resiliency. • Water supply reliability. • Other considerations.
SolAgra Water Solution Alternative	• Climate resiliency. • Seismic resiliency. • Operational resiliency.
Portfolio-Based Proposal including Water Conveyance Facilities	• Water supply reliability. • Seismic resiliency. • Operational resiliency. • Other considerations.
Through-Delta Conveyance with No Diversion Facility • Western Delta Salinity Control Barrier • 1957 DWR Evaluation of Salinity Control Barriers • Eco-Crescent/Middle River Corridor Conveyance • Separated Delta Corridors for Water Supply Conveyance and Fish Passage	• Water supply reliability. • Climate resiliency. • Seismic resiliency. • Operational flexibility.
Through-Delta Conveyance with New Fish Handling Facilities at Clifton Court Forebay	• Climate resiliency. • Operational flexibility. • Water supply reliability. • Seismic resiliency.
Portfolio Approach without New Water Conveyance Facilities	• Climate resiliency. • Water supply reliability.

Alternative	Reasons for Elimination (criteria not met)
	• Seismic resiliency. • Operational resiliency. • Other considerations.
Integration of Water Conveyance with Other Projects	• Operational resiliency. • Climate resiliency. • Seismic resiliency. • These options would not provide any water supply reliability in that they do not protect the ability of the SWP to deliver water. • Other considerations.

2.4.2.2 Alternatives Eliminated at Second-Level Screening

The following alternatives were eliminated during the second-level screening process because they did not avoid or lessen potential significant environmental consequences compared to the proposed project.

- Dual Conveyance East Canal
- Dual Conveyance West Tunnel and Canal
- Dual Conveyance with New Intakes at Sacramento Weir
- Isolated Conveyance Tunnel with Sacramento River Intakes
- Isolated Conveyance West Canal with Sacramento River Intakes
- Isolated Conveyance East Canal with Sacramento River Intakes
- Isolated Conveyance East Canal with Feather River Intakes
- A Water Plan for All of California
- Alternative Locations for Diversion facilities in the North Delta

2.4.2.3 Alternatives Eliminated for the EIS

The following alternatives were eliminated from the range of alternatives to be analyzed in the EIS. These alternatives are evaluated in the Delta Conveyance Project Draft EIR (California Department of Water Resources 2022). USACE is not required to analyze all potential alternatives to the proposed action, but has selected a reasonable range of alternatives for analysis. In the case of Alternatives 2c (Central Alignment, 4,500 cfs, Intakes B and C) and 4c (Eastern Alignment, 4,500 cfs, Intakes B and C), it was determined that analysis of Alternatives 1 (Central Alignment, 6,000 cfs, Intakes B and C) and 3 (Eastern Alignment, 6,000 cfs, Intakes B and C) and Alternatives 2b (Central Alignment, 3,000 cfs, Intake C) and 4b (Eastern Alignment, 3,000 cfs, Intake C) would provide sufficient bookends of effects that would capture the effects of Alternatives 2c and 4c at 4,500 cfs. Additionally, the effects of Alternatives 2c and 4c would be very similar to those for Alternatives 1 and 3 at 6,000 cfs because the same number of intakes would be used, and only the tunnel size would vary. In the case of Alternatives 2a and 4a (Central or Eastern Alignment, respectively, 7,500 cfs, Intakes A, B, and C), it was determined the alternatives would result in additional adverse effects on the aquatic ecosystem beyond those in the proposed action due to the additional intake facility proposed and the subsequent increase in effects.

- Alternative 2a—Central Alignment, 7,500 cfs, Intakes A, B, and C
- Alternative 2c—Central Alignment, 4,500 cfs, Intakes B and C
- Alternative 4a—Eastern Alignment, 7,500 cfs, Intakes A, B, and C
- Alternative 4c—Eastern Alignment, 4,500 cfs, Intakes B and C

2.4.3 Design for Climate Change and Sea Level Rise

Climate change and sea level rise during construction and operational periods were considered during action alternative design. Sea level rise projections used during the modeling analysis were acquired from the California Ocean Protection Council (OPC) *State of California Sea-Level Rise Guidance Update 2018* (Guidance) (California Natural Resources Agency and California Ocean Protection Council 2018). The Guidance includes science-based methodology for state and local governments to use when analyzing and assessing risks associated with sea level rise, and to incorporate sea level rise into their planning, permitting, and investment decisions. The Guidance provides a range of sea level rise projections and associated probabilities for future years based on accepted low and high greenhouse gas (GHG) emissions scenarios. It also provides projections for a scenario in which melting of Antarctic ice sheet accelerates sea level rise much higher and faster than rates experienced over the last century. This scenario, called H++, has no associated probability of occurring because model predictions of the impact of ice sheet collapse on sea level rise remain uncertain and predictions about the retreat of Antarctic ice vary considerably. H++ is considered the most conservative, risk-averse scenario and OPC recommends that it be considered for projects with a lifespan beyond 2050 with extreme risk aversion and for critical assets in the coastal zone and in potentially affected inland areas. Conservatively, the applicant used the H++ values of 1.8 feet of sea level rise in 2040 and 10.2 feet in 2100 as projected at the tide gage for San Francisco in its modeling. Year 2100 was selected as the horizon year because there is increased uncertainty around projections beyond 2100, and making use of projections beyond 2100 would be speculative.

Earthen shaft pads at reception and maintenance shaft sites would provide an elevated working platform for construction of shaft diaphragm walls to minimize groundwater from entering the shaft construction site (Section 2.6.1.3, *Tunnel Shafts*, and two sections in Appendix C, *Description of the Proposed Project and Alternatives* [Section 3.3.1, *Design for Climate Change and Sea Level Rise,* and Section 3.4.3, *Tunnel Shafts*], for details on proposed earthen shaft pads). Shaft pads would also serve as a refuge for workers during construction in the event of a levee breach that inundates the surrounding land up to a 100-year water surface elevation plus sea level rise and 2 feet of freeboard. These elevations should be considered a minimum to provide flood protection during site construction. During the design phase, future calculations may necessitate higher elevations as additional information related to climate change and sea level rise becomes available. At the end of construction, shaft pads would remain in place and maintenance and reception shafts themselves would be raised above the top of the shaft pads to a height determined sufficient to protect the facilities from the 200-year flood plus sea level rise at year 2100 and 3 feet of freeboard. Each shaft would have a cover that could be removed by a crane if access to the shaft or tunnel is needed in the future.

At the intakes, the Southern Forebay Inlet Shaft Structure, Southern Forebay Outlet Structure, and South Delta Outlet and Control Structure, the earthen shaft pads would be removed and the tops of the shafts would be protected within the new concrete structures. Under DWR's Preferred Alternative, the top of the ultimate reception shaft in the surge basin would be flush with the floor of the surge basin, 35 feet below ground surface.

Launch shaft sites at Twin Cities Complex, Bouldin Island, and Lower Roberts Island (Figure 2-1) would be much larger and would involve more personnel and equipment than maintenance and reception shaft construction sites. Accordingly, the applicant proposes to build a ring levee (at Twin Cities) or improve existing levees (at Bouldin or Lower Roberts Islands) to protect workers and facilities at those locations. After construction, the ring levee at Twin Cities Complex would be deconstructed except for a portion adjacent to the reusable tunnel material (RTM) storage area. Levee modifications at Bouldin or Lower Roberts Islands would remain in place, providing a higher level of flood protection to surrounding areas than currently exists. Shafts at Byron Tract would be protected by levees that have already been repaired, and Bethany Complex is at an elevation not subject to flooding. These facilities are described in Section 2.6.1, *Common Features of the Action Alternatives*, and Section 2.6.6, DWR's Preferred Alternative—*Bethany Reservoir Alignment, 6,000 cfs, Intakes B and C*.

The applicant determined the 100-year and 200-year flood water surface elevations by hydraulic modeling, using historical 100-year and 200-year flood flows recorded at the Martinez tide gage, plus extreme sea level rise projections for 2040 and 2100, scaled to account for how water surface elevations decrease with distance inland from the tide gage. These elevations were determined using Delta Simulation Model II (DSM2) with scaled 1997 flood events to represent 100-year and 200-year flows. The incremental effect of sea level rise was found to be around 1.2 feet for most locations in the south Delta, and about 0.3 feet near the proposed intake locations. The incremental effect of sea level rise is based on DSM2 modeling for flows representing the 100-year event and 1.8 feet of sea level rise. Modeling also considered inflows from the Yolo Bypass and the Sacramento, San Joaquin, Calaveras, Cosumnes, and Mokelumne Rivers (California Department of Water Resources 2020b). The Delta Conveyance Project Draft EIR Appendix 5A, *Modeling Technical Appendix*, provides modeling information (California Department of Water Resources 2022).

Chapter 3, *Affected Environment and Environmental Consequences*, Section 3.6, *Climate Change*, of this Draft EIS discusses current climate change science and the risks and benefits of the action alternatives in the context of climate change.

2.5 No Action Alternative

Under the No Action Alternative, none of the Delta Conveyance Project's proposed facilities would be constructed, and the applicant would continue to operate the SWP to divert, store, and convey SWP water consistent with applicable laws and contractual obligations. The applicant would also remain subject to the current take prohibition for listed species, and other current Endangered Species Act requirements. For this analysis, No Action Alternative assumptions are limited to existing conditions, programs adopted during the early stages of development of the Draft EIS, facilities that are permitted or under construction during the early stages of development of the Draft EIS, projects that are permitted or are assumed to be constructed by 2040,[2] and changes

[2] The year 2040 was selected for the No Action Alternative as a reasonable date at which it is assumed construction of the Delta Conveyance Project would be complete and the facilities would be operational.

resulting from climate change and assumed extreme sea level rise that would occur with or without the proposed action or action alternatives.

The analysis also takes into account the types of actions that project participants other than the applicant might undertake to address local supply issues under a long-term scenario in which the Delta Conveyance Project is not approved or implemented. These assumptions represent continuation of the existing plans, policies, and operations and conditions that represent continuation of trends in nature, as well as a future scenario that addresses water supply reliability needs. These include the following.

- Water conservation programs by public agencies aimed at water reduction/efficiency targeting landscaping and the commercial and multifamily housing sectors, as well as changing individual habits. This could include programs such as rebates or other incentives for water saving devices, water use restrictions, and outreach campaigns.
- Water recycling projects involving further treatment of secondary treated wastewater that is currently discharged to the ocean, streams, or lands, and using it for non-potable uses such as landscape and agricultural irrigation, commercial, and industrial purposes. There is potential that, in the future, recycled water could eventually be used as a supply of potable water.
- Groundwater recovery projects involving treatment of high salinity or contaminated groundwater for potable uses.
- Groundwater management consisting of use of existing groundwater supplies, but also conjunctive use of water, which refers to the use and storage of imported surface water supplies in groundwater basins and reservoirs during periods of abundance. This stored water is available for use during periods of low surface water supplies as a way of augmenting seasonal and multiyear shortages.
- Water transfers and exchanges or water purchases on the open market.

Projects pursued would primarily depend on the geographic location of the water agency. For purposes of this analysis, water agencies that have signed on to the Agreement in Principle[3] with the applicant as of the date of the release of this Draft EIS have been divided into four geographic areas: northern coastal, northern inland, southern coastal, and southern inland. Projects most likely pursued by the various geographies are as follows.

- **Northern coastal** (Alameda County Water District; Santa Clara Valley Water District)
    - Desalination
    - Recycling
    - Water conservation/water use efficiency
    - Groundwater recovery
- **Northern inland** (Alameda County Flood Control and Water Conservation District [Zone 7 Water Agency])

[3] A series of public negotiations were held following publication of the NOP for the Delta Conveyance Project Draft EIR, which resulted in an Agreement in Principle among DWR and the public water agencies that describes a conceptual approach to cost allocation and the related financial and water management matters, if a new Delta Conveyance facility is approved (California Department of Water Resources 2022).

- Desalination
- Recycling

- **Southern coastal** (Metropolitan Water District; San Luis Obispo County Flood Control and Water Conservation District; Ventura County Water Protection District; Santa Clarita Valley Water Agency)
  - Desalination
  - Recycling
  - Water conservation/water use efficiency
  - Groundwater recovery
  - Groundwater management
- **Southern inland** (Antelope Valley–East Kern Water Agency; Coachella Valley Water District; Crestline–Lake Arrowhead Water Agency; Desert Water Agency; Dudley Ridge Water District; Kern County Water Agency; Mojave Water Agency; Palmdale Water District; San Bernardino Valley Municipal Water District; San Gabriel Valley Municipal Water District; San Gorgonio Pass Water Agency)
  - Groundwater recovery
  - Recycling
  - Groundwater management
  - Water conservation/water use efficiency

Projects currently in development or in exploratory phases are outlined in the most current Urban or Agricultural Water Management Plan for each of these water agencies. However, because it is not possible to know precisely what projects or combinations of projects water suppliers would undertake, the impact analyses are general in nature and do not contain detailed project-specific analysis.

A list of projects and programs included in the No Action Alternative is presented in Appendix E, *No Action Alternative and Cumulative Projects*, as well as for each resource area in Chapter 3, *Affected Environment and Environmental Consequences,* Sections 3.1 through 3.22.

2.6 Action Alternatives

2.6.1 Common Features of the Action Alternatives

Because the action alternatives have many features in common, this section describes the major facilities that are present in multiple action alternatives. Not all action alternatives involve all the common features. Table 2-1 provides a comparison of key features of the action alternatives. All of the action alternatives include new north Delta intakes on the Sacramento River, tunnel shafts used to lower, remove, and maintain a tunnel boring machine (TBM) that would bore a single tunnel to convey water, and a new pumping plant and appurtenant facilities in the south Delta (Figure 2-1). Alternatives 1, 2b, 3 and 4b would include a Southern Complex consisting of a new pumping plant and Southern Forebay as a water-balancing facility on Byron Tract and other facilities west of Byron

Tract to convey water to the SWP Harvey O. Banks (Banks) Pumping Plant. These facilities are collectively called the *Southern Complex*. DWR's Preferred Alternative would not include the Southern Complex, but would involve the same intakes, tunnel, and most of the shafts associated with the eastern alignment north of Lower Roberts Island. Additionally, DWR's Preferred Alternative would include the new Bethany Reservoir Pumping Plant and Surge Basin, Bethany Reservoir Aqueduct, and Bethany Reservoir Discharge Structure. These facilities are collectively called the *Bethany Complex.* The following sections describe the features common to all action alternatives except where noted; the unique features of each action alternative are described in individual sections (Sections 2.6.2 through 2.6.6). Mapbooks for the Delta Conveyance Project Draft EIR show the proposed facilities superimposed on aerial imagery for each alignment: Mapbook 3-1 for the central alignment Alternatives 1 and 2b; Mapbook 3-2 for the eastern alignment Alternatives 3 and 4b; and Mapbook 3-3 for the Bethany Reservoir alignment Alternative 5 (California Department of Water Resources 2022).[4]

2.6.1.1 North Delta Intakes

The north Delta intakes would result in the relocation of a federal levee and would involve work and fill within the Sacramento River. The levee that would be relocated is part of the Sacramento River Flood Control Project. The proposed work is described in the *Temporary and Permanent Flood Control* section below; Appendix C, *Description of the Proposed Project and Alternatives*, Section 3.4.1.3, *Temporary and Permanent Flood Control Levees and State Route 160*; and the C-E EPR Attachment A technical memoranda.[5] Final footprints of the intakes are still being designed. Because the Delta Conveyance Project would alter federal levees, permission from USACE is required under Section 14 of the RHA (Section 408).[6] In addition, the proposed work in navigable waters and discharge of dredged or fill material into waters of the United States requires authorization from USACE under Section 10 of the RHA (33 USC § 403) and Section 404 of the CWA (33 USC § 1344). Because the project would pass under the Stockton Deep Water Ship Channel in the San Joaquin River (Figure 3.14-1), a real estate outgrant from USACE would be required pursuant to Army Regulation 405-80 *Management of Title and Granting Use of Real Property*. Chapter 3, *Affected Environment and Environmental Consequences,* Section 3.9, *Flood Protection*, of this Draft EIS describes the affected environment and analyzes effects that could occur. The information will also be used for permitting purposes.

Under all of the action alternatives, Intakes B and C (alone or in combination, depending on the alternative) on the east bank of the Sacramento River between Freeport and the confluence with Sutter Slough would divert water and convey it through a single main tunnel. Intake B would be north of Hood, and Intake C would be between Hood and Courtland (California Department of Water Resources 2022: Mapbook 3-3, Sheets 2 and 3).[7] Each intake facility would be sized to divert up to 3,000 cfs of Sacramento River water. Table 2-2 provides a summary comparison of intake characteristics. Operated in a coordinated manner with the existing facilities, the north Delta

[4] Mapbooks for the Delta Conveyance Project Draft EIR are available for public viewing at https://cadwr.app.box.com/s/36n8ugxlg2ntot31xvj92csan2ln41u5.

[5] C-E EPR is available for public review at https://www.dcdca.org/info-center/document-library/#Engineering-Project-Reports.

[6] This requirement was established in Section 14 of the Rivers and Harbors Act of 1899, which has since been amended several times and is codified at 33 USC § 408 (Section 408) (U.S. Army Corps of Engineers 2022).

[7] Mapbooks for the Delta Conveyance Project Draft EIR are available for public viewing at https://cadwr.app.box.com/s/36n8ugxlg2ntot31xvj92csan2ln41u5.

facilities would provide flexibility to alter the location, amount, timing, and duration of diversions. Details on the north Delta intakes can be found in the C-E EPR.[8]

At each intake, water would flow through cylindrical tee fish screens mounted on the intake structure to a sedimentation basin before reaching the intake outlet (tunnel inlet) shaft at each site (Figures 2-2 and 2-3). The intake outlet shaft would serve as the TBM reception or maintenance shaft during construction and as the intake outlet shaft and maintenance access during operation.

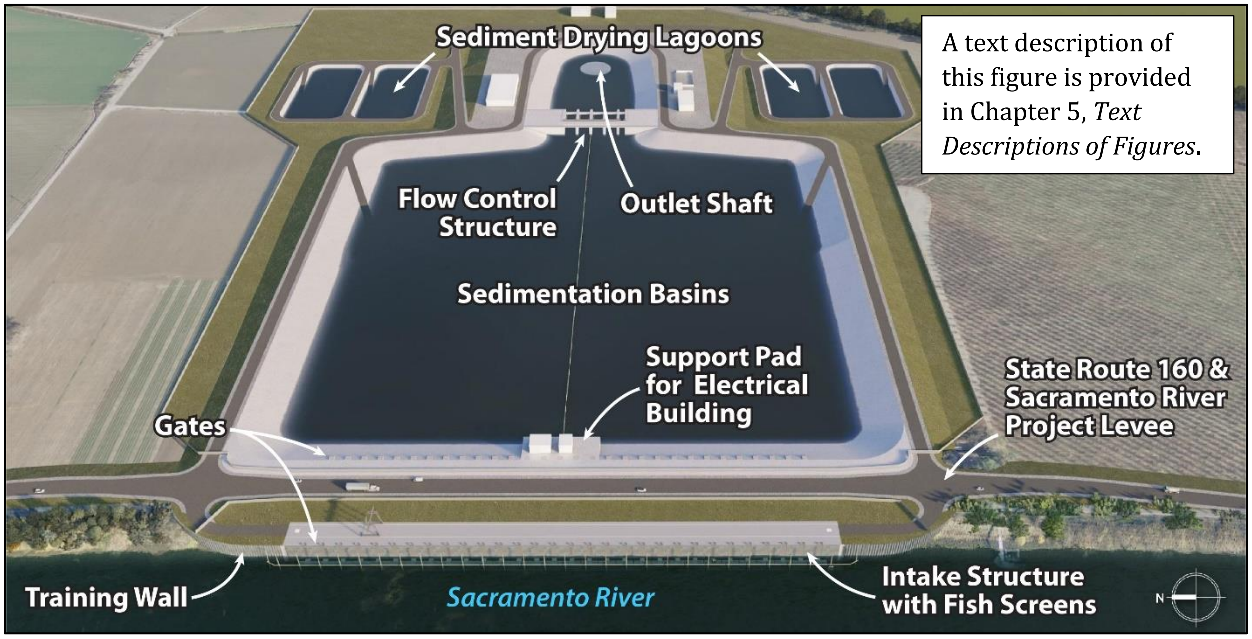

Figure 2-2. Typical Intake Configuration

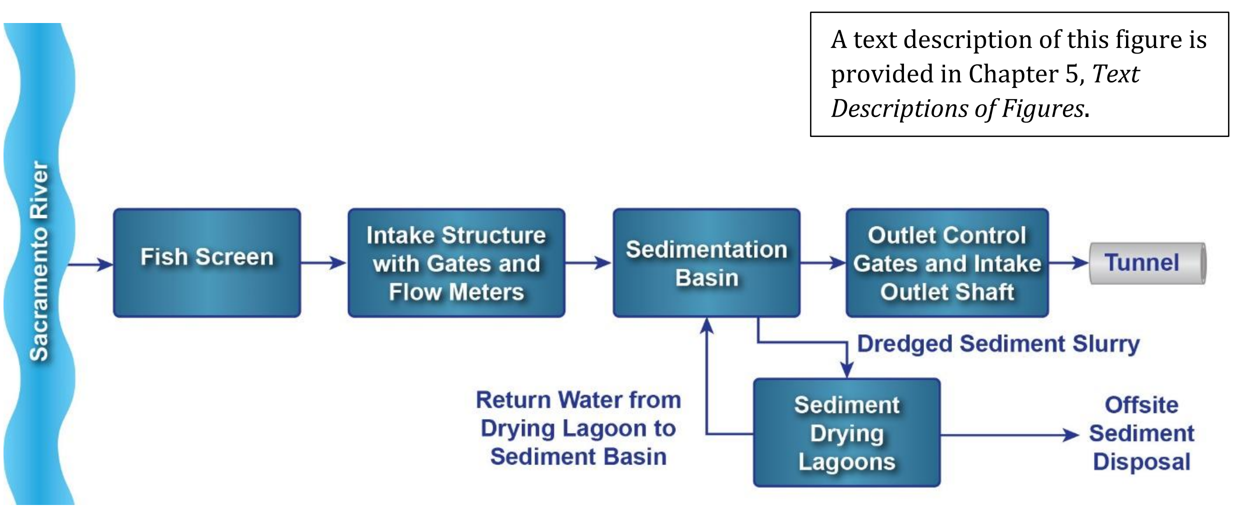

Figure 2-3. Schematic of Delta Conveyance Project Intake Facilities

[8] C-E EPR is available for public review at https://www.dcdca.org/info-center/document-library/#Engineering-Project-Reports.

From the intake outlet shaft, water would flow into a single-bore main tunnel that connects the intakes to the Twin Cities Complex, from which the tunnel route would extend south on a central, eastern, or Bethany Reservoir alignment. The Twin Cities Complex is described in Section 2.6.1.3, *Tunnel Shafts*.

Intake features would include state-of-the-art cylindrical tee fish screens, intake structures, sedimentation basins, sediment drying lagoons, flow control structures, intake outlet channel and intake outlet shaft, embankments, and other appurtenant structures. Intakes would also include associated facilities to support construction and operations of the intakes. Construction access to the intake sites would be by means of new access/haul roads (Section 2.6.1.7, *Access Roads*). Permanent intake footprints when construction is complete would be smaller once certain construction-related features are removed (Table 2-2).

Cylindrical Tee Fish Screens

Fish screens installed on intake structures prevent aquatic species from being carried into the intake facilities along with the diverted water. The intake screens are designed to draw in water at reduced velocities to reduce potential effects on the subset of fish exposed to the intake screens.

The intake fish screens are part of an overall intake system that includes the screen units and an integrated screen cleaning system, piping, and flow control features. The “tee-shaped” screen units would consist of two fish screen cylinders installed on either side of a center manifold that would be connected to the facility’s intake opening. Each intake fish screen would extend about 12 feet from the vertical face of the intake structure into the river. During diversion operations, water would flow from the Sacramento River through the fish screens and a 60-inch-diameter pipe and discharge into the sedimentation basins. Control gates would regulate the flow through each screen unit to the sedimentation basin. Appendix C, *Description of the Proposed Project and Alternatives*, and the C-E EPR[9] explain the structure and operation of the cylindrical tee fish screens in greater detail.

Installing the intake facility would require construction of a temporary cofferdam for in-river portions of intake construction to divert water and aquatic organisms around the work site and create a dry work. Portions of the cofferdam would consist of interlocking steel sheet piles installed using a combination of vibratory and impact pile driving. Vibratory pile driving is a method in which the pile is vibrated into the soil beneath the site as opposed to being hammered in as with impact pile driving. Noise associated with the vibratory pile driving is considerably lower than noise associated with impact hammer pile driving. To minimize disturbances from pile driving, vibratory pile driving would be used to the extent possible when supported by additional geotechnical information. C-E EPR Attachment A[10], *Conceptual Intake Cofferdam Construction (Final Draft)* (Delta Conveyance Design and Construction Authority 2022a) provides detailed analysis of cofferdam construction methods and timing. Effects of noise and vibration from pile driving are addressed in Chapter 3, *Affected Environment and Environmental Consequences*, Section 3.4, *Fisheries and Aquatic Habitat*.

[9] C-E EPR is available for public review at https://www.dcdca.org/info-center/document-library/#Engineering-Project-Reports.

[10] C-E EPR is available for public review at https://www.dcdca.org/info-center/document-library/#Engineering-Project-Reports.

Sedimentation Basins and Drying Lagoons

Diverted water would contain sediment suspended in the river water, a portion of which would be collected in a concrete-lined sedimentation basin. A deep soil-cement-bentonite perimeter wall (cutoff wall) would serve to isolate the sediment basins from the local groundwater and the Sacramento River. Each intake would have one sedimentation basin divided into two cells by a turbidity curtain (Figure 2-2). Water would flow from the intake through the sedimentation basin and through a flow control structure with radial gates into the outlet channel and shaft structure that would be connected to the tunnel system. Tunnel and aqueduct velocity would be sufficient to transport these smaller particles to the Southern Forebay or Bethany Reservoir. The effects of sediment entrainment are discussed in Chapter 3, *Affected Environment and Environmental Consequences*, Section 3.4, *Fisheries and Aquatic Habitat*.

Each intake would have four concrete-lined sediment drying lagoons, each approximately 15 feet deep, containing an average of 10 to 12 feet of water within its embankments when in use. Once a year, during the summer months, the sedimentation basin would be dredged, one half at a time, and sediment slurry discharged to drying lagoons, dewatered, and allowed to dry naturally. Water drained from the sediment drying lagoon outlet structures and underdrains would be pumped back into the sedimentation basin. The sediment remaining would be dried to reduce its moisture content to a point at which it can be removed and transported without creating dust. The dried sediment would be removed by truck for disposal at a permitted disposal site or used for beneficial uses off-site. The volume of sediment collected would depend upon the volume, suspended sediment concentration, and flow rate of water diverted at the intake.

Temporary and Permanent Flood Control Levees and State Route 160

Constructing the intakes along the riverbank would require relocating the jurisdictional levee and State Route (SR) 160 prior to building the intake structure and fish screens. The jurisdictional levee was constructed as part of the Sacramento River Flood Control Project Levee program established by USACE to provide flood management for surrounding lands. Altering a jurisdictional levee requires approval by USACE with a Section 408 permission, and the Central Valley Flood Protection Board prior to undertaking any modifications and requires that conformance with flood control criteria be maintained continuously during construction of any modifications. A temporary jurisdictional levee would be built at the intake sites east of the existing levee to reroute SR 160 and maintain continuous flood protection during construction of the new intake facilities (Figure 2-4).

The temporary levee would also facilitate construction sequencing of the permanent jurisdictional levee around the perimeter of the intake sedimentation basin. Construction details are provided in the C-E EPR.[11] The level of flood control afforded by the existing Sacramento River Flood Control Project Levee program would be maintained during and after construction.

[11] C-E EPR is available for public review at https://www.dcdca.org/info-center/document-library/#Engineering-Project-Reports

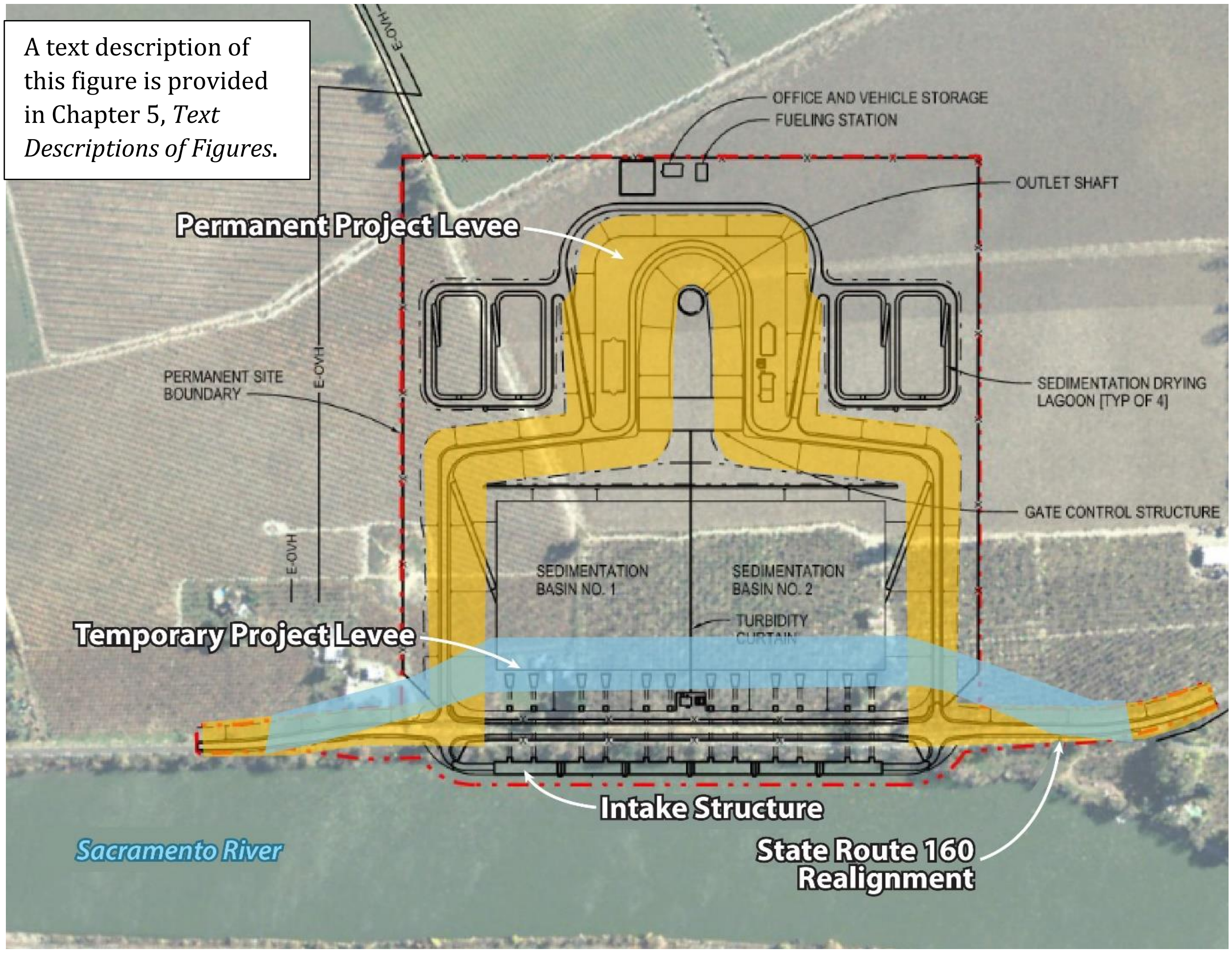

Figure 2-4. Schematic of Permanent and Temporary Levees

Between the temporary jurisdictional levee and the Sacramento River, a cofferdam would be constructed along the water side of the Sacramento River riverbank adjacent to the existing SR 160 to provide a dry workspace for constructing the intake structure. Postconstruction, the area to the east of the intake structure would be backfilled, and SR 160 would be relocated on top of the backfill along the Sacramento River.

The intake structure and the temporary and permanent levees, including the sedimentation basin, radial gate structure, and intake outlet channel embankments, would be designed to protect the site and surrounding area from the 200-year flood event with climate change. Modeling for design assumed the most extreme sea level rise of 10.2 feet at year 2100, scaled to how it would affect conditions in the Sacramento River, as described in Section 2.4.3, *Design for Climate Change and Sea Level Rise,* and defined in the *Preliminary Flood Water Surface Elevations* memorandum (California Department of Water Resources 2020b). This level of protection exceeds the requirements of both USACE and the Central Valley Flood Protection Board. The final configuration of the levee embankment around the intake outlet channel and shaft would protect the channel and shaft opening from the 200-year peak flood elevations plus extreme sea level rise assumed for year 2100 and 3 feet of freeboard during operations (Figure 2-4).

On-Site Roads at the Intakes

Permanent paved roads and gravel-surfaced roads and work areas would be constructed at the intakes for use during construction and later during operations (Figure 2-2). Roads leading to the access road would be paved. Appendix C, *Project Description and Alternatives*, Section 3.4.1.4, *On-Site Roads at the Intakes,* provides further details about these roads. Off-site access roads are described in Section 2.6.1.7, *Access Roads*.

2.6.1.2 Tunnels

The proposed tunnel routes would cross under the Stockton Deep Water Ship Channel, a federal navigation project in the San Joaquin River (Figure 3.14-1); therefore a real estate outgrant would need to be obtained prior to making an alteration to USACE-owned property. Chapter 3, *Affected Environment and Environmental Consequences,* Section 3.14, *Navigation*, of this EIS describes the affected environment for navigation and analyzes effects that could occur. The crossing locations of the Stockton Deep Water Ship Channel in the San Joaquin River for Alternatives 1 and 2b are shown in the Delta Conveyance Project Draft EIR Mapbook 3-1, Sheet 11; for Alternatives 3 and 4b in Mapbook 3-2, Sheet 11; for DWR's Preferred Alternative in Mapbook 3-3, Sheet 12 (California Department of Water Resources 2022).[12]

The tunnel route from the intakes to the Twin Cities Complex would be the same under all action alternatives (Figure 2-1). Under Alternatives 1, 2b, 3, and 4b, the bottom elevations of the main tunnel would range from –143 to –163 feet (North American Vertical Datum of 1988 [NAVD88]), with a top elevation near sea level. It would convey water from the intakes to the proposed new Southern Forebay Inlet Structure in the south Delta, to be distributed via the Southern Forebay and additional facilities composing the Southern Complex (Appendix C, *Description of the Proposed Project and Alternatives*, Section 3.4.5, *Southern Complex on Byron Tract*). Under DWR's Preferred Alternative, the bottom elevations of the tunnel between the Twin Cities Complex and the Bethany Complex would range from –145 to –164 feet (NAVD88). The inside diameter of the tunnel would be 26 feet under Alternative 2b or 4b, and 40 feet under Alternatives 1, 3, or 5. The length of the main tunnel would range from 37 to 45 miles, depending on alternative, as shown in Table 2-1.

At the south end of the Southern Forebay under Alternatives 1, 2b, 3, and 4b, dual tunnels would connect the Southern Forebay to the SWP Banks Pumping Plant approach channel, a distance of 1.7 miles. Two parallel tunnels are proposed to allow conveyance of the full design capacity of the SWP Banks Pumping Plant, and secondarily so that one tunnel could be removed from service for inspection and cleaning while maintaining half-capacity service in the other tunnel (Appendix C, *Description of the Proposed Project and Alternatives*, Section 3.4.6, *Southern Complex West of Byron Highway*). Under DWR's Preferred Alternative, the main tunnel would go directly to the Bethany Reservoir Pumping Plant from Lower Roberts Island, without the Southern Complex dual tunnels.

2.6.1.3 Tunnel Shafts

Tunnel shafts and staging areas are anticipated to affect waters of the United States, which requires authorization from USACE under Section 10 of the RHA (33 USC § 403) and Section 404 of the CWA (33 USC § 1344).

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[12] Mapbooks for the Delta Conveyance Project Draft EIR are available for public viewing at https://cadwr.app.box.com/s/36n8ugxlg2ntot31xvj92csan2ln41u5.

TBMs would be used to bore the tunnels. Tunnel shafts to launch, remove, and/or maintain the TBMs would be constructed at intakes, along the alignment, and at the Southern Complex or Bethany Complex. The TBM would be lowered into a launch shaft and bore horizontally toward a reception shaft (Figure 2-5). Reception shafts would be used to remove the TBM from the tunnel at the end of each drive. Because the TBM cutterhead would need inspection and maintenance at least every 6 miles, maintenance shafts would be located approximately every 4 to 6 miles between launch and reception shafts to provide access for TBM maintenance, repair, evacuation, and logistic support in a free-air (not pressurized) environment. The northernmost intake shaft for each action alternative would serve as the reception shaft and TBM maintenance access during construction. During operations, shafts at intakes would serve as intake outlet shafts to convey water into the tunnel system, as well as for maintenance access to the tunnel. All tunnel shafts would be maintained during operations to provide access as needed. Construction and permanent acreages of shaft sites on each alignment are provided in Appendix 3D of the Delta Conveyance Project Draft EIR.

A text description of this figure is provided in Chapter 5, *Text Descriptions of Figures*.

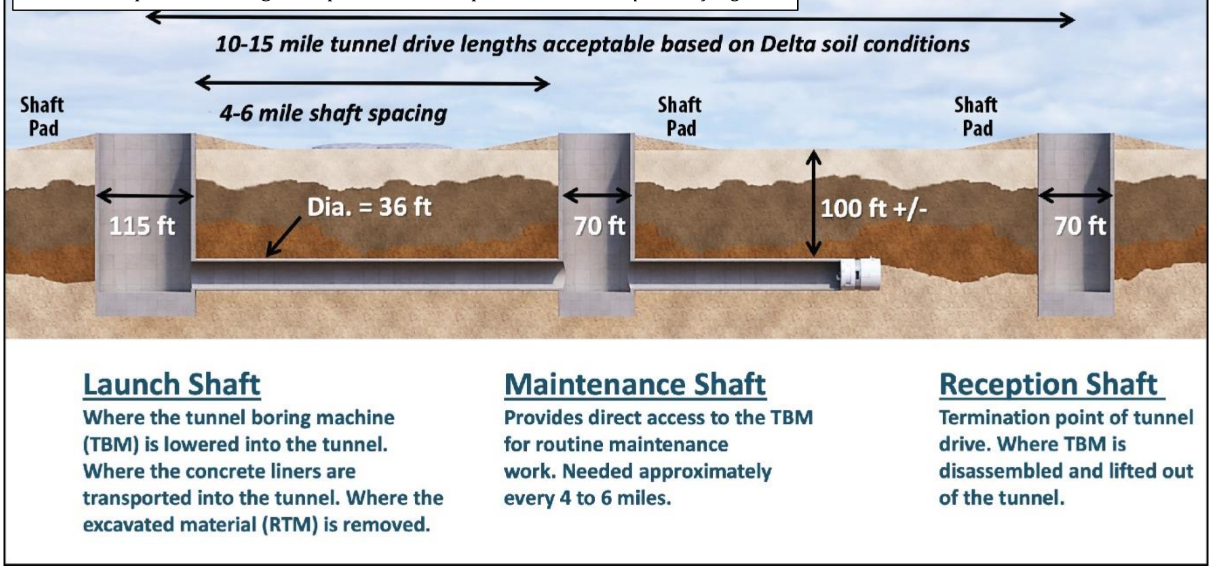


Figure 2-5. Key Components of a Tunnel Drive (6,000-cfs alternatives)

Most shafts would require construction of a shaft pad. Tunnel shaft pads would be constructed above the ground surface to an elevation approximately equal to the adjacent levee system on the island or tract. The height of the shaft pad would be sufficient to protect tunnel and construction personnel from localized flooding but would be lower than the top of the shaft postconstruction to reduce the need for imported fill, which reduces related potential environmental effects. The final postconstruction shaft would be raised above the shaft pad to an elevation above the maximum water surface in the tunnel for hydraulic surge events or a Sacramento River 200-year flood event with sea level rise and climate change hydrology for 2100, whichever is higher, including freeboard criteria (California Department of Water Resources 2020b). Notably, the Sacramento River flood event water level is higher than the local 200-year flood event with sea level rise and climate change hydrology for year 2100 (including wind fetch wave run-up) at all of the tunnel shaft sites, so the river flood level controls over the local flood level for setting the tops of structures. A concrete cover with air-venting provisions would be placed over the top of the shaft. Cranes would be used to move the concrete cover and move any needed equipment and personnel into and out of the tunnel during operations.

Tunnel launch shafts would generally have a finished inside diameter of 110 or 115 feet, depending on conveyance capacity, and 8-foot-thick walls. Tunnel launch shaft sites would include a shaft pad for the tunnel launch shaft with adjacent areas for equipment to excavate and support the shaft, cranes, and appurtenant items to move equipment into and out of the tunnel shaft, equipment holding areas, and areas to receive and manage the excavated soils and RTM. Tunnel launch shaft sites would also accommodate tunnel liner segment storage, aggregate storage, slurry/grout batch plants, electrical substation and electrical building, workshops and offices, water treatment tanks, access roads, and RTM handling, drying, and storage areas. Construction activities at the launch shafts would continue for 7 to 9 years. Tunnel launch shaft characteristics for each alignment are provided under Alternatives 1, 2b, 3, 4b, and 5 (Tables 2-5, 2-6, 2-7, 2-8, and 2-9, respectively); shaft site dimensions would vary somewhat by alternative according to conveyance capacity and amount of RTM generated.

There would be daily inspection and security checks at shaft sites. Depending on the activity, grounds maintenance would take place quarterly (e.g., mowing, weed maintenance) every 1 to 2 years, and repaving every 15 years.

Double Launch Shaft at Twin Cities Complex

All alternatives would include the double launch shaft at the Twin Cities Complex. The double launch shaft would be constructed in a figure eight configuration with inside diameters of 110 to 120 feet (depending on conveyance capacity) to allow TBMs to excavate in both north and south directions. This double launch shaft would be part of a larger complex that houses other construction components to facilitate tunnel excavation at this site. The Twin Cities Complex would be located off Twin Cities Road approximately 0.5 miles northeast of the interchange with Interstate (I)-5. Its northern boundary would fall between Dierssen and Lambert Roads, its eastern boundary along Franklin Boulevard, and a majority of the southern boundary at Twin Cities Road. During construction, depending on alternative, the Twin Cities Complex would occupy from 322 to 586 acres. Permanent site size would range from 26 to 302 acres depending on alternative (Figure 2-6).

The Twin Cities Complex would be surrounded by a ring levee, with height varying from about 3.5 feet to 11.5 feet, designed to protect the facilities from the 100-year flood event with the Delta-specific Public Law 84-99 equivalent standards (i.e., 1.5 feet of freeboard above the 100-year Federal Emergency Management Agency [FEMA] flood elevation with 2:1 [i.e., horizontal to vertical] exterior slopes and 3:1 interior slopes). During construction the Twin Cities Complex would contain the double launch shaft, tunnel segment storage, a slurry/grout mixing plant, shops and offices for construction crews, parking, material laydown and erection areas, access roads, RTM conveyor and handling facilities, a water treatment plant, emergency response facilities, and a helipad during the 7-to-9-year tunnel construction period. Additional details about the Twin Cities Complex can be found in Appendix C, *Description of the Proposed Project and Alternatives,* Section 3.4.3.1, *Tunnel Launch Shafts*, under *Double Launch Shaft at Twin Cities Complex,* and the Delta Conveyance Project Draft EIR Mapbook 3-1, Sheet 6 (California Department of Water Resources 2022).[13]

[13] Mapbooks for the Delta Conveyance Project Draft EIR are available for public viewing at https://cadwr.app.box.com/s/36n8ugxlg2ntot31xvj92csan2ln41u5.

Tunnel segments, TBM machinery, and other equipment would be delivered to the Twin Cities Complex by railroad at the rail-served materials depot in Alternatives 1, 2b, 3, and 4b, and by road in DWR's Preferred Alternative. Rail-served materials depots would be constructed on tunnel launch shaft sites with new tracks connecting to the existing main rail lines serving the area, where needed. Section 2.6.1.8, *Rail-Served Materials Depots*, describes these new rail facilities.

The railroad would also be used to transport RTM to the Southern Complex to construct portions of the Southern Forebay embankments for the central and eastern alignments. Excavated soil and RTM from the Twin Cities Complex would be used for constructing the on-site ring levee and tunnel shaft pad at the Twin Cities Complex and for constructing shaft pads on New Hope Tract, Staten Island, and Bouldin Island (central alignment), or shaft pads on New Hope Tract, Canal Ranch Tract, Terminous Tract, and King Island (eastern alignment). No ground improvement would be expected for construction at the Twin Cities Complex because underlying soils appear to have low compressibility and are not anticipated to be subject to liquefaction.

The permanent size of the Twin Cities Complex would vary depending on alternative. Under Alternatives 2b and 4b the permanent size would be 26 acres, while under Alternatives 1, 3, and DWR's Preferred Alternative the permanent size would be 141 acres, 172 acres, and 222 acres, respectively. The smaller permanent size of the Twin Cities Complex under Alternatives 2b and 4b is primarily due to the reduced need for long-term on-site RTM storage. Project features that would remain at the Twin Cities Complex following tunnel construction include the double launch shaft (which would be converted to a maintenance shaft), access roads, and the long-term RTM stockpile area (Figure 2-6). After tunnel construction is completed, the ring levee surrounding the Twin Cities Complex would be deconstructed, except for the portion of the levee adjacent to the RTM stockpile area. Unused areas of the Twin Cities Complex would be restored for future agricultural or habitat uses. The RTM stockpile area would be planted with an erosion-control seed mix to stabilize the stockpile and avoid dust generation.

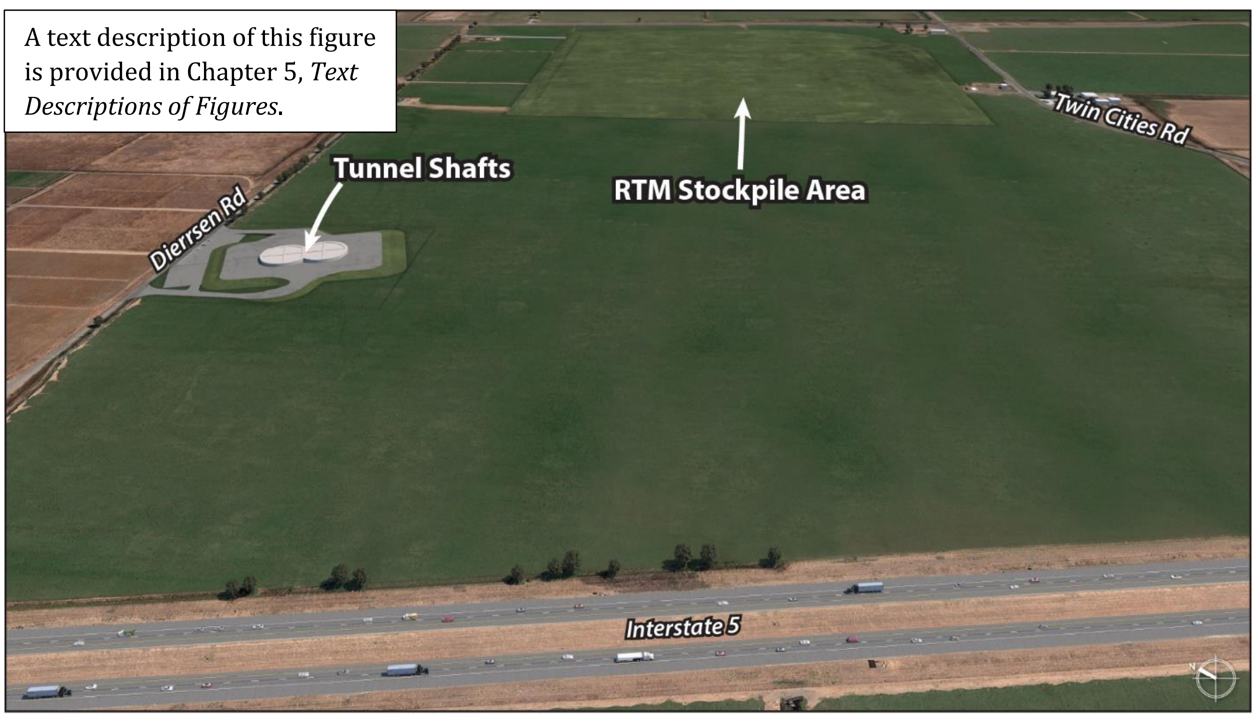


Figure 2-6. Twin Cities Double Launch Shaft Plan (permanent condition)

Reception and Maintenance Shafts

Reception and maintenance shafts would have finished inside diameters ranging from 53 to 83 feet, depending on conveyance capacity. Tunnel reception and maintenance shaft sites would range in size depending on location and other facilities at the site (see tables of physical characteristics for each alternative [Tables 2-6 through 2-9]). Reception shaft sites would be larger than maintenance shaft sites because of the area needed to disassemble the TBM equipment prior to removal from the construction site. Construction activities at the maintenance and reception shaft sites would continue for approximately 2 years.

Dual Shafts for Tunnels on the Southern Complex

For Alternatives 1, 2b, 3, and 4b, in addition to the shafts required for the main tunnel, two launch shafts and two reception shafts would be required to bore dual tunnels that would convey water from the Southern Forebay Outlet Structure at the Southern Complex on Byron Tract to the South Delta Outlet and Control Structure at the Southern Complex west of Byron Highway. These facilities would be part of all alternatives except DWR's Preferred Alternative.

2.6.1.4 Reusable Tunnel Material

The removal and disposal of RTM is anticipated to result in the discharge of dredged or fill material into waters of the United States, which requires authorization from USACE under Section 10 of the RHA (33 USC § 403) and CWA Section 404 (33 USC § 1344). Storage and disposal of RTM would affect waters of the United States present at the locations of the shafts and RTM sites. Details on anticipated effects on wetlands and other waters are described in Chapter 3, *Affected Environment and Environmental Consequences*, Section 3.5, *Natural Communities, Special-Status Terrestrial Species, and Wetlands and Other Waters*, and are shown in Delta Conveyance Project Draft EIR Mapbooks 13-1 through 13-3[14] (California Department of Water Resources 2022).

RTM is the soil excavated by the TBM in boring tunnels, mixed with conditioners, and lifted to the ground surface through the launch shaft. "Wet excavated RTM" refers to the bulk material, including conditioners, resulting from tunnel excavation. After RTM is removed from the tunnel, it would be tested for hazardous materials, dried mechanically or allowed to dry naturally, then stockpiled and transported for reuse or permanently stored at tunnel launch shaft sites. Quantities of RTM generated would vary depending on tunnel diameter and length.

Disposal of Reusable Tunnel Material

The applicant would develop site-specific plans for the beneficial reuse of RTM to the greatest extent feasible for construction of the selected action alternative. Excavated RTM would be placed in temporary stockpile areas and tested (generally once or twice a day) in accordance with the requirements of the Central Valley Regional Water Quality Control Board and the Department of Toxic Substances Control for the presence of hazardous materials at concentrations above their regulatory threshold criteria.

[14] Mapbooks for the Delta Conveyance Project Draft EIR related to EIS Section 3.5, *Natural Communities, Special-Status Terrestrial Species, and Wetlands and Other Waters,* are available for public viewing at https://cadwr.box.com/s/vuxfqmjhycto2fzkekcdohmu40zl63ir.

Several stockpiles would be developed. Each temporary area would be generally sized to accommodate up to 1 week of RTM production to allow for testing the RTM before stockpiling on-site or transporting off-site. Stockpile areas would be lined with impermeable lining material. It is anticipated that the RTM stockpiles would consolidate and decrease in height over the long-term. Additional features of the long-term material storage areas will include berms and erosion protection measures to contain storm runoff as necessary and provisions to allow for truck traffic during construction.

A portion of the dried RTM would be used to refill the areas excavated at the launch site where soil was removed to construct tunnel shaft pads and levee modifications. RTM intended for reuse as structural fill would require drying. Both natural drying (evaporation) and mechanical drying were considered for the tunnel launch shaft sites. Mechanical drying is considered for Alternatives 1, 2b, 3, and 4b but not for DWR's Preferred Alternative because RTM generated by the TBM is not proposed for reuse during construction of DWR's Preferred Alternative. As RTM is required either on-site or at other locations, it would be removed by wheel loaders and conveyors onto trucks or rail cars for transport to the designated points of use. RTM not removed for reuse would be graded and planted with erosion-control seed mix to avoid a need for future handling and avoid dust generation.

For RTM not slated for reuse, wet RTM would be spread over a broad area in relatively thin lifts (e.g., 18 inches) and allowed to dry and drain naturally over a period of up to 1 year. Continuous spreading in thin lifts would allow RTM that is not mechanically dried to be dried naturally and compacted in place without excessive earthmoving requirements.

If portions of RTM were identified as hazardous, that material would be transported in trucks licensed to handle hazardous materials to a disposal location licensed to receive those constituents. It is expected that less than 1% of the total volume of excavated material would be deemed unsuitable for reuse. If RTM meets the criteria for reuse, the material would be moved by conveyor to a long-term on-site storage site or transported off-site for subsequent reuse.

Neither natural drying nor mechanical drying processes would be anticipated to create odors. Studies would be conducted during field investigations to evaluate materials for the presence of materials that could generate odors, such as organic or sulfide constituents. However, organic material would not be expected at tunnel depths. If sulfides were present, these constituents would probably be oxidized during the tunneling excavation and RTM soil-moving operations.

2.6.1.5 Southern Complex on Byron Tract

The Southern Complex would have facilities on Byron Tract east of Byron Highway and on a site west of Byron Highway (California Department of Water Resources 2022: Figure 2-8, Mapbook 3-1, Sheet 22).[15] These facilities would be constructed for all alternatives except DWR's Preferred Alternative, the Bethany Reservoir alignment.

The construction site for the Southern Complex on Byron Tract would occupy approximately 1,500 acres during construction and about 1,200 acres permanently. Facilities on Byron Tract east of Byron Highway would consist of the following.

[15] Mapbooks for the Delta Conveyance Project Draft EIR are available for public viewing at https://cadwr.app.box.com/s/36n8ugxlg2ntot31xvj92csan2ln41u5.

- Byron Tract working shaft.
- Main tunnel terminus at the Southern Forebay Inlet Structure and tunnel launch shaft.
- South Delta Pumping Plant.
- Southern Forebay.
- Emergency spillway.
- Electrical switchyard.
- Maintenance and ancillary buildings.
- Southern Forebay Outlet Structure dual launch shaft, upstream end of dual tunnels, and associated facilities to convey water in dual tunnels from the Southern Forebay to the South Delta Outlet and Control Structure (the Southern Forebay Outlet Structure is part of the "South Delta Conveyance Facilities" on Byron Tract).
- Emergency response facilities.
- RTM handling facilities (e.g., RTM testing, drying, temporary storage areas) for RTM generated at the three launch shafts at the Southern Complex; temporary and permanent storage of excess dried RTM generated at the Twin Cities Complex.
- Concrete batch plant.
- Fencing for the Southern Complex.
- Access roads, including truck overpass over Byron Highway.
- Rail-served materials depot along the Union Pacific Railroad (UPRR) Lathrop-Byron rail line parallel to Byron Highway to serve the Southern Complex tunnel launch shaft sites and to transport RTM from Twin Cities Complex to the Southern Complex and tunnel liner segments to the launch shaft site.
- Tunnel liner segment storage areas.

Portions of project land on Byron Tract would be reclaimed for habitat or agricultural use after construction. Other areas would be used for permanent stockpiles of topsoil and for storage of peat (covered with topsoil).

South Delta Pumping Plant

The South Delta Pumping Plant would be situated along the northern embankment of the Southern Forebay adjacent to the Southern Forebay Inlet Structure launch shaft on Byron Tract. The Southern Forebay Inlet Structure launch shaft would become the main tunnel terminus, the pumping plant inlet, and overflow structure (Figure 2-7). The pumping plant would be the primary feature for conveying water from the tunnel system into the Southern Forebay.

Most South Delta Pumping Plant facilities would be placed aboveground on a raised site pad along the Southern Forebay embankment to protect the facilities from the 200-year flood event with climate change–induced hydrology, sea level rise for year 2100, freeboard criteria, and wind fetch wave run-up as modeled by the applicant. The top of the pumping plant pad would be at an elevation of 28 to 29 feet.

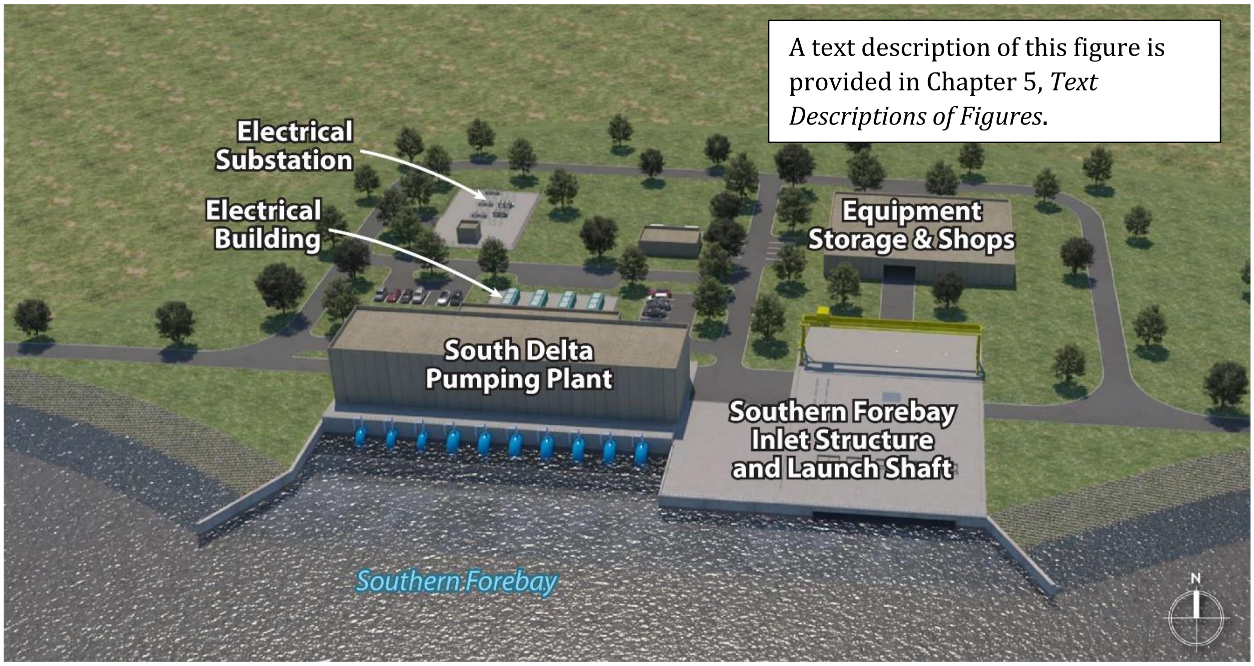
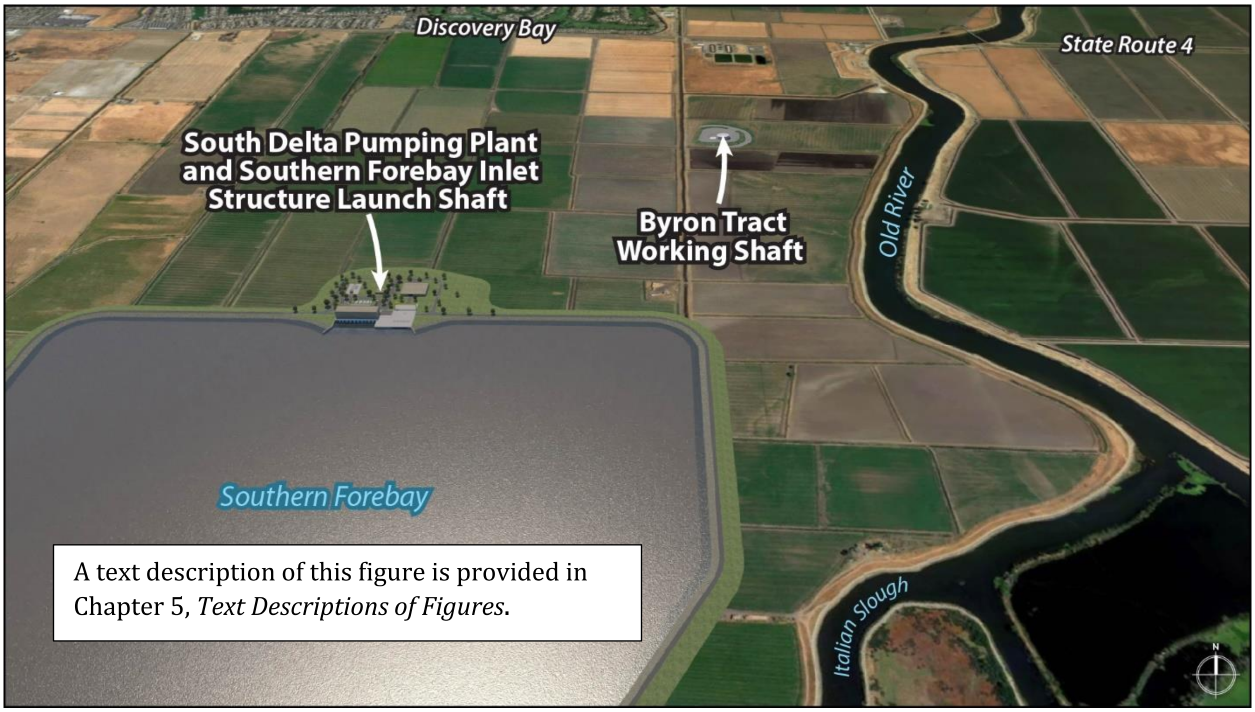


Figure 2-7. South Delta Pumping Plant Facilities

Southern Forebay

The Southern Forebay would be located on Byron Tract at the southern end of the main tunnel, northwest of Clifton Court Forebay and separated from it by Italian Slough (Figure 2-1 and Figure 2-8). The forebay would serve as a water balancing facility to equalize the difference between Delta Conveyance Project supply, existing Clifton Court Forebay south Delta supply, and SWP Banks Pumping Plant demand capacity. The Southern Forebay is one of the cornerstone facilities for the concept of dual conveyance for Alternatives 1, 2b, 4b, and 3, by allowing both supply systems to be used to the maximum benefit of the new and existing projects.



A text description of this figure is provided in Chapter 5, *Text Descriptions of Figures*.

Figure 2-8. Southern Complex on Byron Tract

Water in the forebay would flow south into a Southern Forebay Outlet Structure and be conveyed in two tunnels to the South Delta Outlet and Control Structure west of Byron Highway for release to the SWP Banks Pumping Plant approach channel (Figures 2-9 and 2-10). The Southern Forebay would have a perimeter length of approximately 4.7 miles and a footprint of approximately 1,000 acres including embankments and exterior-circumference access roads. The normal operating capacity of the Southern Forebay would be 9,000 acre-feet with a maximum surface area of approximately 750 acres. Because it would provide only temporary storage to balance flows, its size and capacity would be the same for Alternatives 1, 2b, 3, and 4b. The Southern Forebay would have an average water surface elevation of 11.5 feet, which would be approximately the mid-point within the normal operating range of elevations 5.5 to 17.5 feet. The forebay floor would slope from an elevation of 0 to −7 feet, so the average water depth would range from 11.5 to 18.5 feet at the average water surface elevation of 11.5 feet. A minimum water surface elevation of 5.5 feet would be required to provide gravity flow of up to 10,321 cfs to the SWP Banks Pumping Plant.

A text description of this figure is provided in Chapter 5, *Text Descriptions of Figures*.

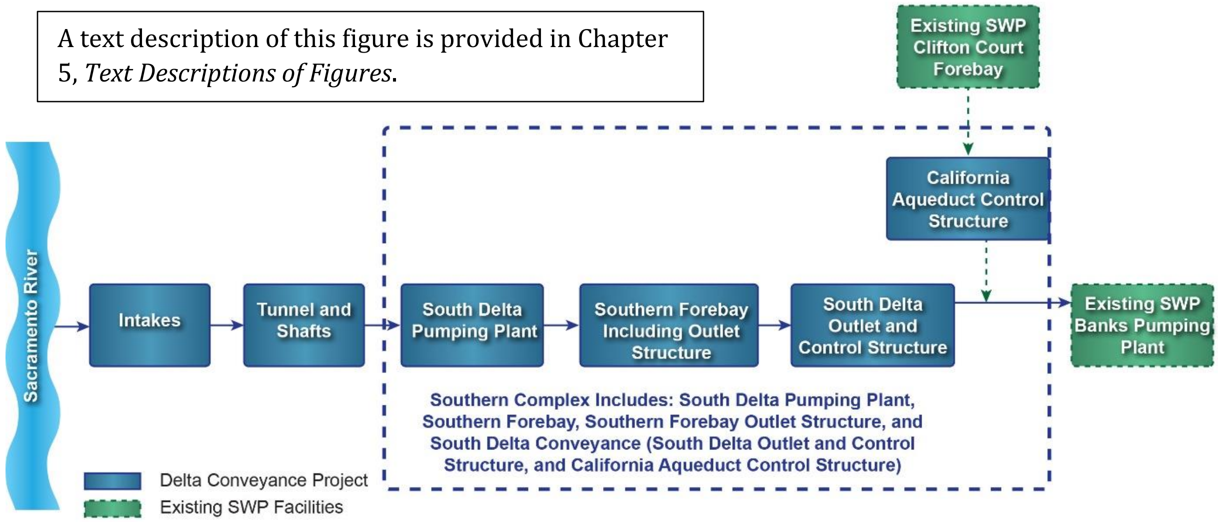


Figure 2-9. Schematic of Delta Conveyance Project Facilities under Alternatives 1, 2b, 3, and 4b

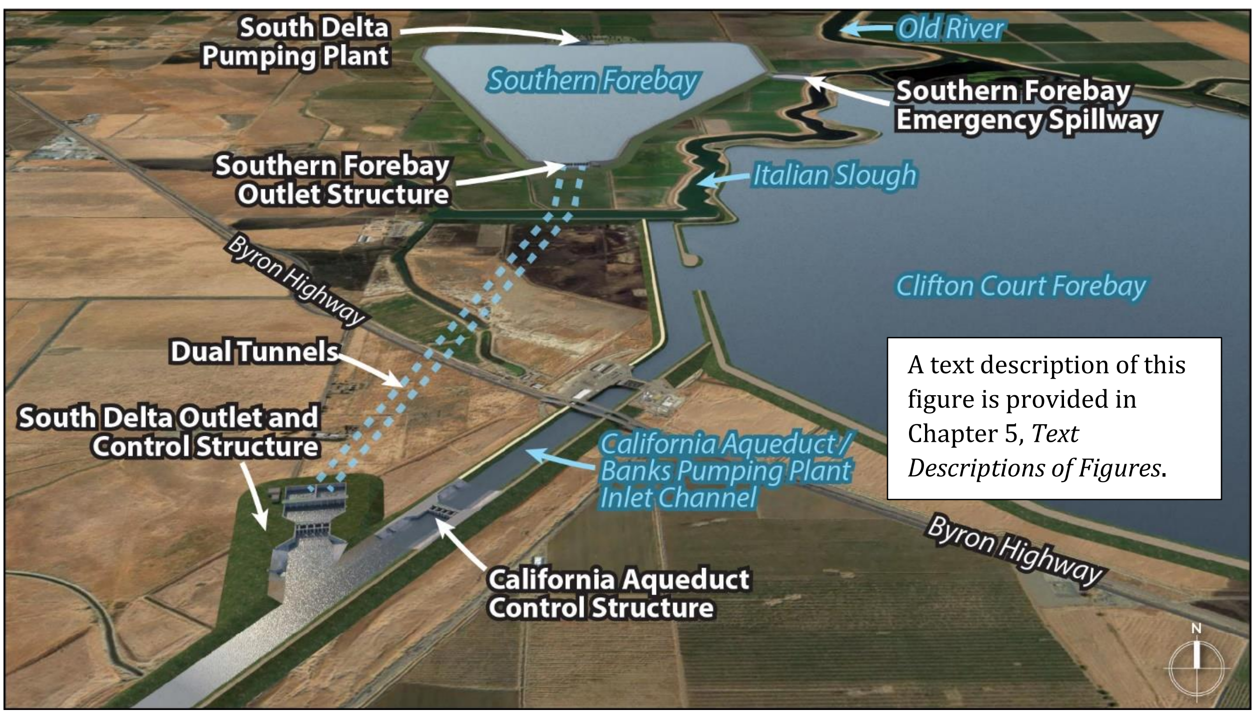


Figure 2-10. Southern Complex West of Byron Highway (Alternatives 1, 2b, 3, and 4b)

Hydraulic surge conditions could occur in the main tunnel if there was a simultaneous shutdown of the pumps at the South Delta Pumping Plant. The tunnel shafts would provide some volume to store water during surges. The South Delta Pumping Plant and the Pumping Plant Inlet and Overflow Structure would include emergency overflow weir-type openings to convey water into the Southern Forebay if transient surge conditions should occur in the tunnel.

The Southern Forebay would be designed in accordance with the DWR Division of Safety of Dams requirements for jurisdictional dams based on the anticipated maximum embankment height and storage volume. The Southern Forebay includes an overflow emergency spillway that would be used under the unlikely condition that the forebay water level continued to rise above the design maximum elevation. The emergency spillway would discharge flow from the Southern Forebay into Italian Slough, which flows into Old River.

The Southern Forebay embankments would be constructed above the existing ground surface using materials from on-site excavations and dried RTM to the maximum extent possible, and on-site soils from the Southern Complex to balance earthwork to the extent possible. Forebay design considerations would include flood management, soil stability and seismic considerations, embankment and foundation stability, and seepage cutoff wall placement. Embankment foundation improvements would be implemented where needed (i.e., cutoff walls for seepage, or ground improvement for embankment stability) because of potentially poorly consolidated or weak foundations and seismic conditions (Chapter 3, *Affected Environment and Environmental Consequences*, Section 3.10, *Geology, Soils, and Paleontological Resources*).

Riprap over filter material would be placed along the inside embankment slopes to protect against erosion and would also discourage vegetation establishment. Native grasses would be placed along the outside embankment slopes for erosion protection. During periods when diversions do not occur at the north Delta intakes, the Southern Forebay could either remain full or mostly empty; maintaining higher water elevations would reduce weed growth on the bottom of the forebay. Periodically reducing the surface water elevations could reduce vegetation on the inside slopes. Vegetation removal on the interior and exterior embankments of the Southern Forebay would be conducted quarterly and done mechanically. Landscaping and ground cover around the forebay and within the project boundary would be maintained so as to minimize attractants to wildlife.

Southern Forebay Outlet Structure

The Southern Forebay Outlet Structure would be in the embankment at the southern end of the Southern Forebay (Figure 2-10). Two launch shafts would be used to lower the TBM to bore each of two tunnels through which water would be conveyed 1.7 miles south to the South Delta Outlet and Control Structure at the SWP Banks Pumping Plant approach channel (also referred to as the California Aqueduct). These 115-foot inside-diameter shafts would remain to feed water from the Southern Forebay into the tunnels via gravity flow during operation. Each tunnel would have an inside diameter of 38 feet under Alternatives 1, 2b, 3, and 4b. The two tunnels together would be capable of delivering the full capacity of SWP Banks Pumping Plant when water does not flow from Clifton Court Forebay.

In accordance with DWR Division of Safety of Dams criteria, the Southern Forebay Outlet Structure would also function as the emergency outlet works capable of lowering the maximum storage depth by 10% within 7 to 10 days and fully draining the Southern Forebay within 90 or 120 days. As designed, the drawdown rate would exceed that required by the Division of Safety of Dams.

Drought-tolerant plants would be used as required in landscaping and no irrigation system would be installed. Landscape maintenance is assumed to consist of weed control only.

2.6.1.6 Southern Complex West of Byron Highway

West of Byron Highway, the Southern Complex would consist of the South Delta Conveyance Facilities that would connect the Southern Forebay to the SWP Banks Pumping Plant approach channel downstream of the John E. Skinner Fish Protective Facility (Figure 2-10; California

Department of Water Resources 2022: Mapbook 3-1, Sheet 23).[16] The upstream facilities—Southern Forebay Outlet Structure and upstream portions of the dual tunnels, plus associated facilities—would be located on Byron Tract, as described above. The dual tunnels from the Southern Forebay Outlet Structure would pass under Italian Slough and Byron Highway to the downstream South Delta Conveyance Facilities west of Byron Highway. These would consist of the South Delta Outlet and Control Structure and the California Aqueduct Control Structure. The portion of the Southern Complex west of Byron Highway would occupy 164 acres during construction and 112 acres postconstruction. None of these facilities would be present in DWR's Preferred Alternative (Bethany Reservoir alignment).

The South Delta Conveyance Facilities would operate in one of three modes.

- Single mode from the Delta Conveyance Project, with all flows to SWP Banks Pumping Plant coming from the Southern Forebay.
- Single mode from Clifton Court Forebay, with all flows to SWP Banks Pumping Plant coming from Clifton Court Forebay.
- Dual mode, in which flows would come from both the Southern Forebay and Clifton Court Forebay. Flows from Clifton Court Forebay would be regulated using gates at the California Aqueduct Control Structure and flows from the Southern Forebay would be regulated using gates at the South Delta Outlet and Control Structure.

The South Delta Outlet and Control Structure would be alongside the SWP Banks Pumping Plant approach channel approximately 1.4 miles upstream of the SWP Banks Pumping Plant. The structure would be 400 feet wide by 1,250 feet long and 45 feet deep and contain the downstream end of the dual tunnels from the Southern Forebay Outlet Structure. The dual tunnels would end at two 90-foot-diameter TBM reception shafts at the South Delta Outlet and Control Structure. A series of radial gates would control the rate of flow released into the existing SWP system. This outlet and control structure would also convey emergency releases from the Southern Forebay Outlet Structure when acting as an emergency outlet.

Other construction facilities at the South Delta Outlet and Control Structure include an electrical and control building, a bulkhead gate storage facility, a mobile crane, shops and offices for construction crews, parking, material laydown and erection areas, access roads, water treatment plant for runoff and dewatering flows, a septic system, and storage for topsoil.

The California Aqueduct Control Structure would be on the California Aqueduct, about 500 feet upstream of the confluence of the California Aqueduct and the South Delta Outlet and Control Structure. It would use a series of six large radial gates and one small gate to control flows from Clifton Court Forebay into the California Aqueduct or to balance them with flows from the Southern Forebay for conveyance into the SWP Banks Pumping Plant. The structure and surrounding grading heights would protect downstream facilities from the highest anticipated 200-year flood event plus sea level rise for year 2100 in the Clifton Court Forebay area.

[16] Mapbooks for the Delta Conveyance Project Draft EIR are available for public viewing at https://cadwr.app.box.com/s/36n8ugxlg2ntot31xvj92csan2ln41u5.

2.6.1.7 Access Roads

Constructing any of the alternatives would require substantial transportation facility improvements to serve the construction and material delivery processes and provide access to compensatory mitigation sites. Construction would require temporary relocation and realignment of SR 160 at the intakes, and new or improved access roads to intakes, tunnel shafts, the Southern Complex, and the Bethany Complex (Figures 2-13, 2-15, and 2-19). The access road activities would include widened and improved roads, new roads, and new and widened bridges. Roads used for material hauling, construction equipment access, and employee access would consist of existing state routes and two-lane roadways in the Delta, new gravel (with chip seal except on Mandeville and Bacon Islands), or paved roadways constructed from existing roads to construction sites, and new roads located within facility construction sites. Construction access roads would remain postconstruction for maintenance access to the facilities. Improvements to existing state routes and local roadways would also remain after construction.

Modifications to existing roadways and bridges would be completed in accordance with the plans and criteria of the California Department of Transportation (Caltrans) or county or local entity, depending upon the owner of the facility. Where road and bridge improvements are undertaken, wider shoulders would be considered to meet bicycle lane standards. Existing drainage facilities either within the construction sites or adjacent to them would be rerouted so as to not affect overland drainage flows or groundwater seepage flows prior to construction and after construction. Appendix C, *Description of the Proposed Project and Alternatives,* Section 3.4.7, *Access Roads,* provides details of the road modifications proposed for each alignment.

2.6.1.8 Rail-Served Materials Depots

Rail access to serve major construction sites would reduce truck use of local roads and highways. UPRR and the BNSF Railway serve the Delta Conveyance Project area. Rail-served materials depots with rail sidings would be constructed and used to transport certain large volume construction materials, such as tunnel liner segments, to tunnel launch shaft sites and sometimes to convey RTM from the tunnel launch shaft sites to the Southern Complex to form the Southern Forebay embankments. Central and eastern alignments would have rail-served material depots serving the Twin Cities Complex and the Southern Complex as listed below.

- Along the UPRR Sacramento-Lathrop rail line near Franklin Boulevard and Twin Cities Road to serve the Twin Cities Complex double launch shaft site.
- Along the UPRR Lathrop-Byron rail line parallel to the Byron Highway to serve the Southern Complex tunnel launch shaft sites and to transport RTM from the Twin Cities Complex to the Southern Complex.

At the Southern Complex, 30 miles of UPRR track would be rehabilitated and 14.4 miles of new track would be installed to reestablish operation on this line. New track would be installed on existing pilings of existing railroad bridge over the California Aqueduct to the east of Byron Highway.

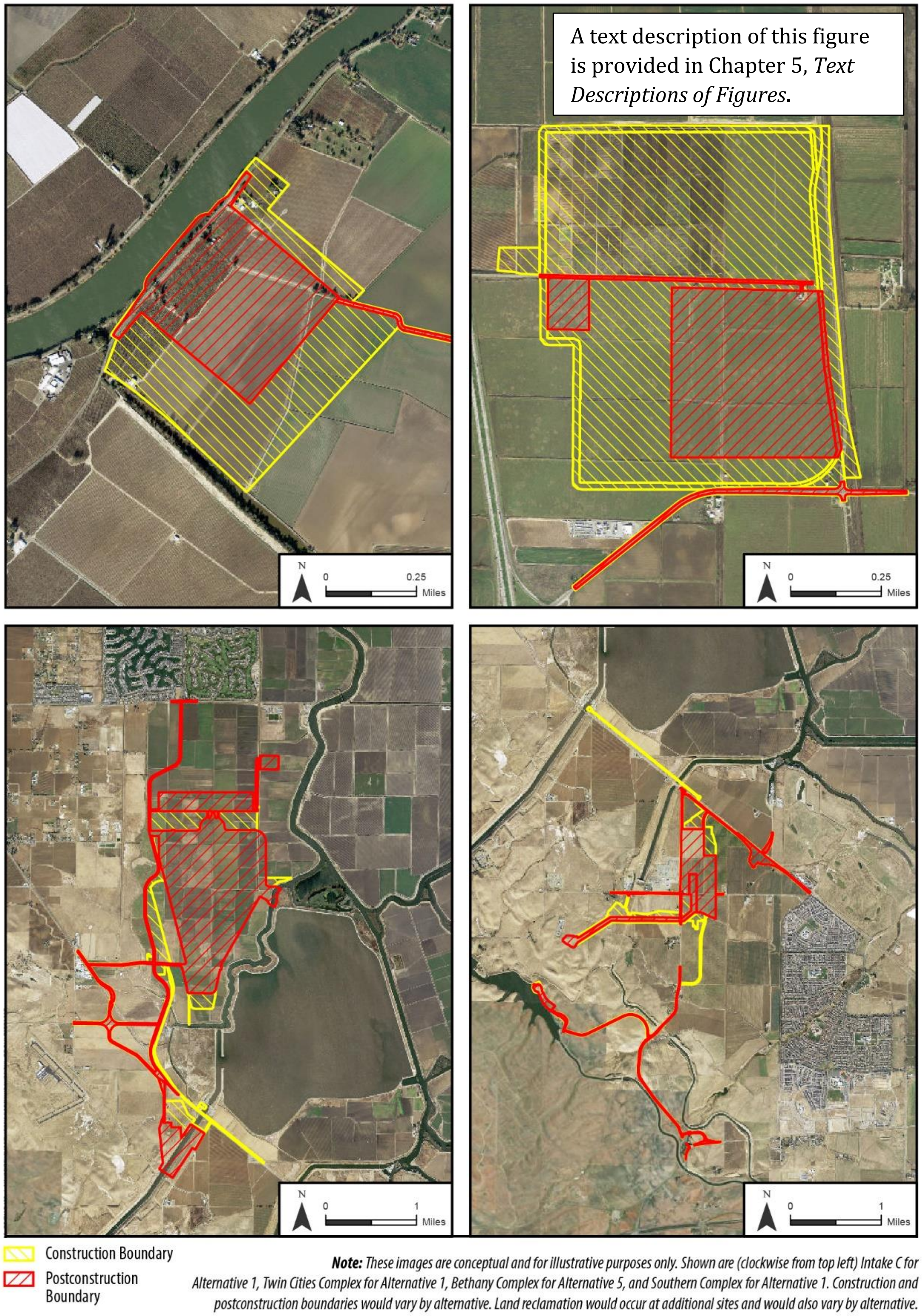
The eastern and Bethany Reservoir alignments would have a rail-served materials depot at Lower Roberts Island. Under the eastern and Bethany Reservoir alignments, rail access to Lower Roberts Island would be provided from existing UPRR and BNSF Railway tracks located on the Port of Stockton. Rail access would be extended over a new bridge over Burns Cut and continue to the launch shaft site and RTM storage area. Details on rail-served material depots for the central, eastern, and Bethany Reservoir alignments are shown on the engineering concept drawings in the EPRs.[17]

2.6.1.9 Land Reclamation

Construction activities, equipment, and material stockpiles could compact near-surface native soils or leave soils less suitable for agriculture or habitat. Lands to be reclaimed would be those areas at intakes, launch shafts, and Southern Complex or Bethany Complex that were used during construction for material/equipment laydown and staging, material stockpiles, slurry batch plant, parking areas, and facilities/trailers (Figure 2-11). The applicant would acquire the land for construction and would determine final reclamation methods and potential transfer of the lands to other parties.

The main goals of the land reclamation efforts would be to restore the soil health and condition in these construction areas to the extent practical. Cultivated lands that are used for borrow and RTM sites that cannot be reclaimed for cultivation following disturbance because of topographic alteration may be reclaimed as grasslands. Areas to be reclaimed to grassland would be seeded with a native grass and flowering forb mix, whereas areas to be reclaimed to agricultural use could be seeded with an erosion control seed mix. Permanent RTM stockpiles at some tunnel launch sites would be planted with native grasses for erosion control and habitat enhancement.

[17] EPRs are available for public review at https://www.dcdca.org/info-center/document-library/#Engineering-Project-Reports.



Note: *These images are conceptual and for illustrative purposes only. Shown are (clockwise from top left) Intake C for Alternative 1, Twin Cities Complex for Alternative 1, Bethany Complex for Alternative 5, and Southern Complex for Alternative 1. Construction and postconstruction boundaries would vary by alternative. Land reclamation would occur at additional sites and would also vary by alternative.*

Figure 2-11. Potential Land Reclamation Areas

2.6.1.10 Other Project Features and Facilities

Descriptions of construction support facilities (i.e., concrete batch plants, fuel stations, fuel storage, and emergency response facilities), power and supervisory control and data acquisition (SCADA), fencing and lighting, park-and-ride lots, construction techniques, and additional temporary and permanent project features can be found in Appendix C, *Description of the Proposed Project and Alternatives*, and in the C-E EPR[18] and Bethany EPR.[19] Any project features that would alter federal levees and cross under a federal navigation project would require permission from USACE under Section 408. In addition, any proposed work in navigable waters and discharge of dredged or fill material into waters of the United States would require authorization from USACE under Section 10 of the RHA (33 USC § 403) and Section 404 of the CWA (33 USC § 1344).

2.6.2 Alternative 1—Central Alignment, 6,000 cfs, Intakes B and C

Alternative 1 includes the major common features of the alternatives described in Section 2.6.1, *Common Features of the Action Alternatives*. Under Alternative 1, water would be diverted at new north Delta intakes and conveyed to the south Delta through a single main tunnel on a central alignment. Water would be diverted from the Sacramento River through new fish-screened Intakes B and C on the east riverbank, operated to provide diversions of up to a maximum total of 6,000 cfs (maximum of 3,000 cfs at each intake). Intake B would be just north of Hood and Intake C would be between Hood and Courtland (Figure 2-1a; California Department of Water Resources 2022: Mapbook 3-1, Sheets 3 and 5).[20]

The tunnel would extend from the intakes to the Twin Cities Complex (California Department of Water Resources 2022: Mapbook 3-1, Sheet 6)[21] and south on the central alignment to the Southern Forebay Inlet Structure shaft. The tunnels under Alternative 1 would have an inside diameter of 36 feet and an outside diameter of 39 feet and extend 39 miles from the intakes to the Southern Forebay.

Beyond the Twin Cities Complex double launch shaft, Alternative 1 would also have shafts along the main tunnel route at the following locations, as shown in Figure 2-12 and Delta Conveyance Project Draft EIR Chapter 3, *Description of the Proposed Project and Alternatives*, Mapbook 3-1, Sheets 7, 8, 11, 15, 16, 22, and 23 (California Department of Water Resources 2022).[22]

- New Hope Tract maintenance shaft (central)
- Staten Island maintenance shaft
- Bouldin Island reception and launch shaft

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[18] C-E EPR is available for public review at https://www.dcdca.org/info-center/document-library/#Engineering-Project-Reports.

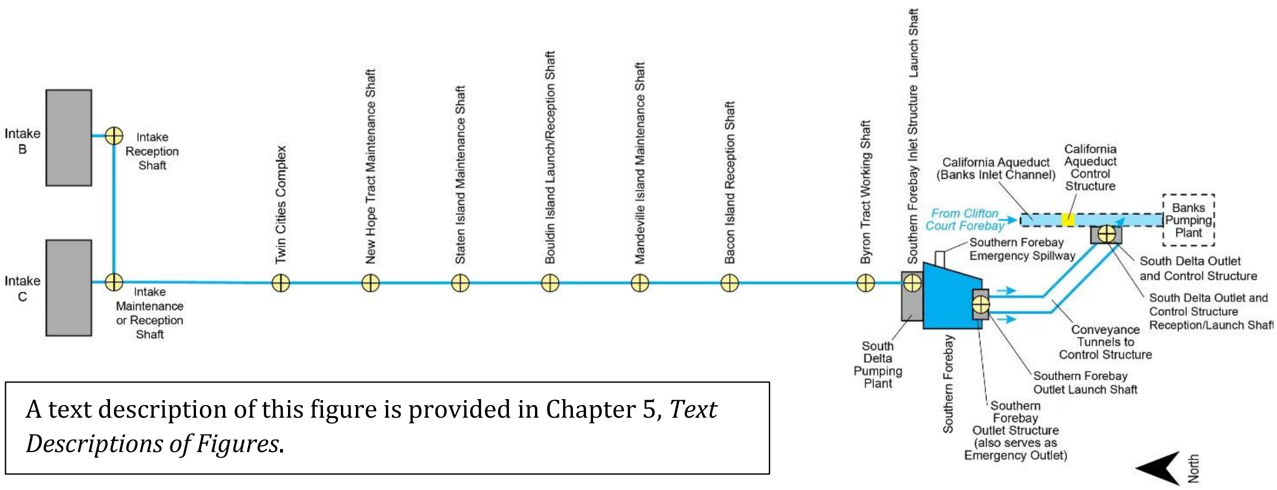
[19] Bethany EPR is available for public review at https://www.dcdca.org/info-center/document-library/#Engineering-Project-Reports.

[20] Mapbooks for the Delta Conveyance Project Draft EIR are available for public viewing at https://cadwr.app.box.com/s/36n8ugxlg2ntot31xvj92csan2ln41u5.

[21] See note 20 above.

[22] See note 20 above.

- Mandeville Island maintenance shaft
- Bacon Island reception shaft
- Byron Tract working shaft (launch shaft)
- Southern Forebay Inlet Structure (launch shaft)
- Dual launch shafts at the Southern Forebay Outlet Structure
- Dual reception shafts at the South Delta Outlet and Control Structure along SWP Banks Pumping Plant approach channel



A text description of this figure is provided in Chapter 5, *Text Descriptions of Figures*.

Figure 2-12. Project Schematic Alternatives 1 and 2b

Alternatives 1 and 2b would have a single reception and launch shaft on Bouldin Island between Twin Cities Complex and the Byron Tract working shaft. The tunnel launch shaft on Bouldin Island would launch the TBM south toward the tunnel reception shaft on Bacon Island. The same shaft would also be used to recover the TBM launched from Twin Cities Complex. The Bouldin Island tunnel launch/reception shaft site is potentially vulnerable to flooding because portions of the existing perimeter levee have insufficient freeboard or slopes that do not comply with the Public Law 84-99 Delta-specific levee design standard. Targeted repairs would primarily involve levee widening and crown raises to provide 1.5 feet of freeboard above the 100-year flood elevation, minimum 16-foot crest width, exterior slopes of 2H:1V, and interior slopes ranging between 3H:1V and 5H:1V depending on levee height and peat thickness. All of the modifications would occur on the land side of the levees. Levee modifications would occur at several areas for about 51,000 feet of levees. The total size of the construction site and postconstruction site for the Bouldin Island levee modifications would be approximately 251 acres, with an additional 90 acres for temporary levee modification access roads (California Department of Water Resources 2022: Mapbook 3-1, Sheet 11).[23] To account for ongoing work by levee maintenance agencies, the extent of levee repairs would be coordinated with the local levee maintenance agency.

Boring the tunnel 39 miles from the intakes to the Southern Forebay and dual tunnels 1.7 miles from the Southern Forebay Outlet Structure to the South Delta Outlet and Control Structure is expected to

[23] Mapbooks for the Delta Conveyance Project Draft EIR are available for public viewing at https://cadwr.app.box.com/s/36n8ugxlg2ntot31xvj92csan2ln41u5.

generate approximately 13.9 million wet excavated cubic yards of RTM.[24] Drying and compaction would reduce the final volumes of RTM for reuse and storage. RTM handling facilities would include RTM temporary wet storage; RTM mechanical dryers at Twin Cities Complex and Southern Complex; and RTM natural drying and long-term storage areas at Twin Cities Complex and Bouldin Island. Material would be tested for hazardous substances, stockpiled, and reused as much as possible. Excess suitable RTM remaining after project completion would be stockpiled at Twin Cities Complex. Stockpiles of RTM at Bouldin Island would only be used on-site, such as for restoring topography; it would not be transported for use at other construction sites.

The construction site for the Southern Complex on Byron Tract would occupy 1,457 acres and the permanent footprint would cover 1,189 acres. The Southern Complex would have two temporary RTM storage areas of 185 acres and 104 acres with stockpiles up to 6 feet high. It is not expected there would be any permanent long-term RTM stockpiles at the Southern Complex. Peat soils (51 acres) and topsoil and other soil materials (39 acres) would be stored in an area north of the Southern Forebay.

Table 2-5 summarizes the distinguishing water conveyance features and characteristics of Alternative 1 (e.g., dimensions and volumes). Delta Conveyance Project Draft EIR Chapter 3, *Description of the Proposed Project and Alternatives*, Mapbook 3-1 (California Department of Water Resources 2022)[25] depicts the locations of project facilities and major construction features for all central alignment alternatives. Additional construction and postconstruction details for the action alternatives with 6,000 cfs design capacity can be found in the C-E EPR[26] Appendix A, and C-E EPR engineering drawings provide site plans for facilities proposed under Alternative 1 (Delta Conveyance Design and Construction Authority 2022a).

Table 2-5. Summary of Physical Characteristics of Alternative 1

Characteristic	Description [a]
Alignment	Central
Conveyance capacity	6,000 cfs
Number of intakes	Two; Intakes B and C at 3,000 cfs each
Tunnel from Intakes to Southern Forebay	
Diameter	36 feet inside, 39 feet outside
Length	39 miles
Number of tunnel shafts [b]	10
Launch shaft diameter (including each shaft at double launch shafts and combined launch/reception shafts)	115 feet inside
Reception and maintenance shafts diameter	70 feet inside

[24] Excavated RTM would be in a less compact state than it is in the ground and, with the addition of water and conditioners during the tunneling process, could be expected to occupy a greater volume. After drying and compaction, the RTM's volume would be approximately 99% of the pre-excavated volume.

[25] Mapbooks for the Delta Conveyance Project Draft EIR are available for public viewing at https://cadwr.app.box.com/s/36n8ugxlg2ntot31xvj92csan2ln41u5

[26] C-E EPR is available for public review at https://www.dcdca.org/info-center/document-library/#Engineering-Project-Reports.

Characteristic	Description [a]
Twin Cities Complex	Construction acres: 479 Permanent acres: 141
Bouldin Island launch/reception shaft	Construction acres: 615 Permanent acres: 507
Southern Complex	
Byron Tract working shaft diameter	115 feet inside
Southern Forebay Inlet Structure launch shaft diameter	115 feet inside
Pumping plant building	378 feet by 99 feet (approximately 0.86 acre)
Pumps	7 pumps at 960 cfs each, including two standby pumps 3 pumps at 600 cfs each, including one standby pump 2 portable pumps to dewater tunnel
Southern Forebay Outlet Structure dual launch shafts diameter	115 feet inside, each
Dual tunnels to South Delta Outlet and Control Structure	38 feet inside 41 feet outside 1.7 miles long
Facilities on Byron Tract	Construction acres: 1,457 Permanent acres: 1,189
Facilities west of Byron Highway	Construction acres: 164 Permanent acres: 112
South Delta Outlet and Control Structure	400 feet wide by 1,250 feet long by 43 feet high
South Delta Outlet and Control Structure dual reception shafts diameter	90 feet inside
RTM Volumes [c] and Storage	
Twin Cities Complex long-term RTM storage (approximate)	130 acres by 15 feet high
Bouldin Island long-term RTM storage (approximate)	196 acres by 6 feet high
Southern Forebay long-term RTM storage	0
Total wet excavated RTM volume (for single main tunnel from intakes to Southern Forebay and dual South Delta Conveyance tunnels)	13.9 million cubic yards

cfs = cubic feet per second; RTM = reusable tunnel material.

[a] Acreage estimates represent the permanent surface footprints of selected facilities. Overall project acreage includes some facilities not listed, such as permanent access roads.

[b] Number of shafts for the main tunnel from intakes to Southern Forebay, counting the double shaft at Twin Cities Complex as one shaft.

[c] The long-term height of the RTM storage stockpiles would be lower as the RTM subsides into the ground.

Figure 2-13 shows proposed road modifications specific to the central alignment (Alternatives 1 and 2b). Appendix C, *Description of the Proposed Project and Alternatives,* Section 3.4.7, *Access Roads*, provides additional detail about access roads and road modifications.

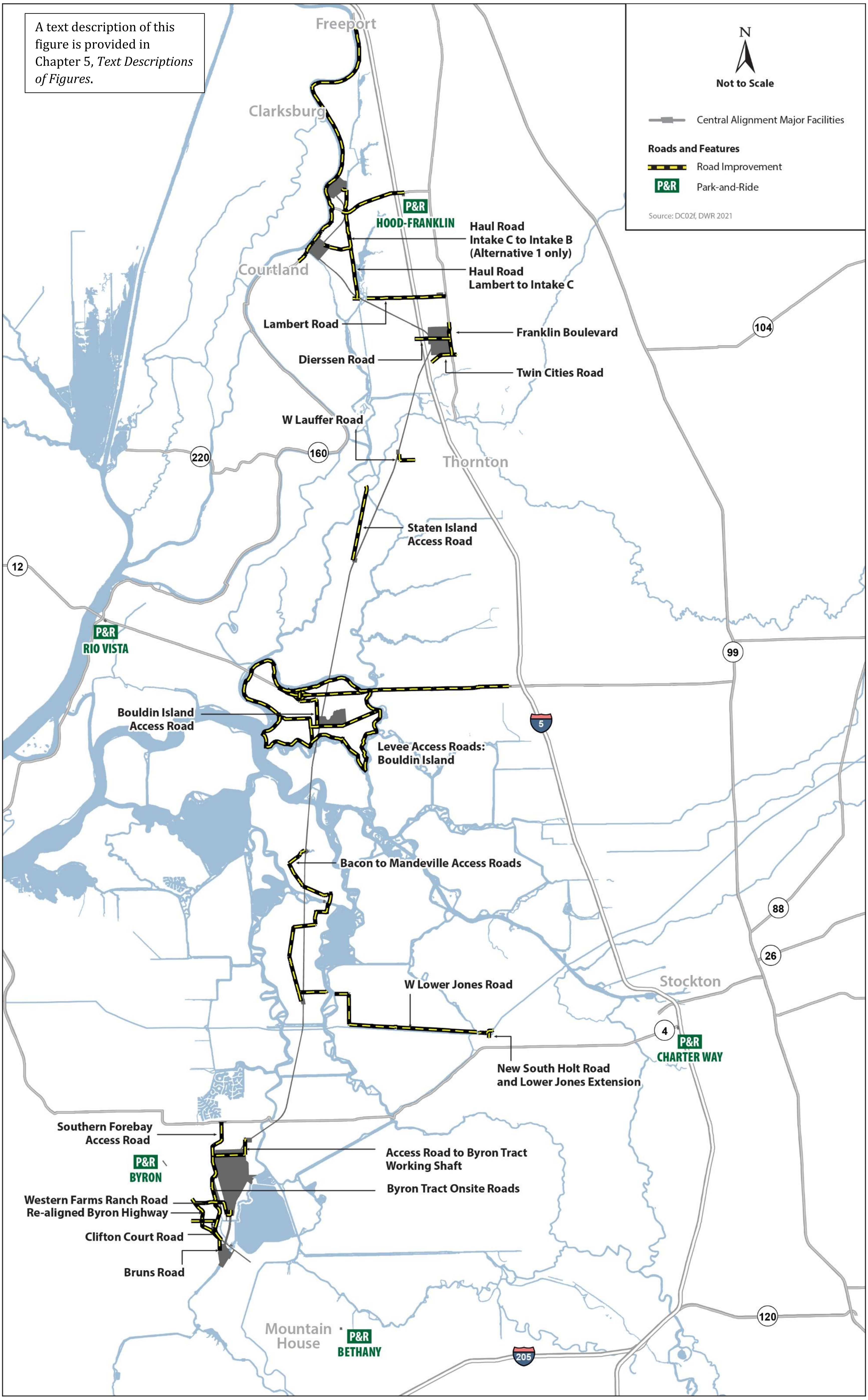


Figure 2-13. Road Modifications under Alternatives 1 and 2b

2.6.2.1 Construction Schedule

Construction of Alternative 1 would take approximately 12 years. Construction would not take place in all locations at the same time. Rather, it would proceed in stages, starting with site work at the intakes and Twin Cities Complex and power and SCADA facilities at maintenance shafts, and proceeding to equipment decommissioning, site reclamation, and road overlays in the final years. Most shafts would be completed in 2 to 3 years. Equipment decommissioning, site reclamation, and road overlays would occur in the final years.

2.6.3 Alternative 2b—Central Alignment, 3,000 cfs, Intake C

Under Alternative 2b, all conveyance facilities and operational components would be the same as described under Alternative 1, except that only Intake C would be constructed, and the maximum diversion capacity would be 3,000 cfs. With the smaller diversion capacity, the tunnel diameter would be 26 feet inside and about 28 feet outside, and its length from Intake C to the Southern Forebay would be 37 miles.

The Intake C tunnel shaft would have an inside diameter of 83 feet and would also serve as the TBM reception shaft. Intake C would also include the emergency response facilities and the wastewater facilities that would instead be located at Intake B under Alternative 1.

Tunnel shaft locations would be the same as under Alternative 1. Launch shafts for the main tunnel would have inside diameters of 110 feet and reception and maintenance shafts would have an inside diameter of 53 feet. Launch shaft sites would be somewhat smaller than under Alternative 1 because the smaller tunnel and shorter length would generate less RTM.

All facilities at the Southern Complex would be the same as described for Alternative 1, except with a reduced diversion capacity, the South Delta Pumping Plant would have a maximum capacity of 3,000 cfs, fewer pumps, and the pumping plant building and electrical building would be smaller (Table 2-6). The Southern Complex would have two temporary RTM storage areas of 140 acres and 159 acres with stockpiles up to 4 feet high. It is not expected that Alternative 2b would require permanent stockpiles of surplus RTM at the Southern Complex. However, peat soils and topsoil and other soil materials would be stored at an area north of the Southern Forebay.

Access roads and road modifications would be the same as for Alternative 1, shown on Figure 2-13, except that Alternative 2b would not require the access road between Intake C and Intake B, which is not included in Alternative 2b.

Table 2-6 summarizes the distinguishing water conveyance features and characteristics of Alternative 2b (e.g., dimensions and volumes). Figure 2-12 under Alternative 1 is a schematic of all central alignment features; note that Alternative 2b would not include Intake B. Additional construction and postconstruction details for the action alternatives with 3,000 cfs design capacity can be found in the C-E EPR, Appendix C.

Table 2-6. Summary of Physical Characteristics of Alternative 2b

Characteristic	Description [a]
Alignment	Central
Conveyance capacity	3,000 cfs
Number of Intakes	One; Intake C at 3,000 cfs
Tunnel from Intakes to Southern Forebay	
Diameter	26 feet inside, 28 feet, 4 inches outside
Length	37 miles
Number of tunnel shafts	9
Launch shafts diameter	110 feet inside
Reception and maintenance shafts diameter	53 feet inside
Twin Cities Complex	Construction acres: 322 Permanent acres: 26
Bouldin Island Launch/Reception Shaft	Construction acres: 540 Permanent acres: 436
Southern Complex	
Byron Tract working shaft diameter	110 feet inside
Southern Forebay Inlet Structure launch shaft diameter	110 feet inside
Pumping plant building	345 feet by 99 feet (approximately 0.78 acre)
Pumps	5 pumps at 960 cfs each, including 2 standby pumps 3 pumps at 600 cfs each, including 1 standby pump 2 portable pumps to dewater tunnel
Southern Forebay Outlet Structure dual launch shafts diameter	115 feet inside, each
Facilities on Byron Tract	Construction acres: 1,457 Permanent acres: 1,189
Facilities west of Byron Highway	Same as Alternative 1
RTM Volumes [b] and Storage	
Twin Cities Complex long-term RTM storage (approximate)	15 acres by 15 feet high
Bouldin Island long-term RTM storage (approximate)	129 acres by 5 feet high
Southern Forebay long-term RTM storage	0
Total wet excavated RTM volume (for single main tunnel from intakes to Southern Forebay and dual South Delta Conveyance tunnels)	7.5 million cubic yards

cfs = cubic feet per second; RTM = reusable tunnel material.

[a] Acreage estimates represent the permanent surface footprints of selected facilities. Overall project acreage includes some facilities not listed, such as permanent access roads.

[b] The long-term height of the RTM storage stockpiles would be lower as the RTM subsides into the ground.

2.6.3.1 Construction Schedule

Construction of Alternative 2b would take approximately 12 years. Construction would not take place in all locations at the same time. Rather, it would proceed in stages, starting with site work at the intake and Twin Cities Complex and power and SCADA at maintenance shafts, and proceeding to equipment decommissioning, site reclamation, and road overlays in the final years.

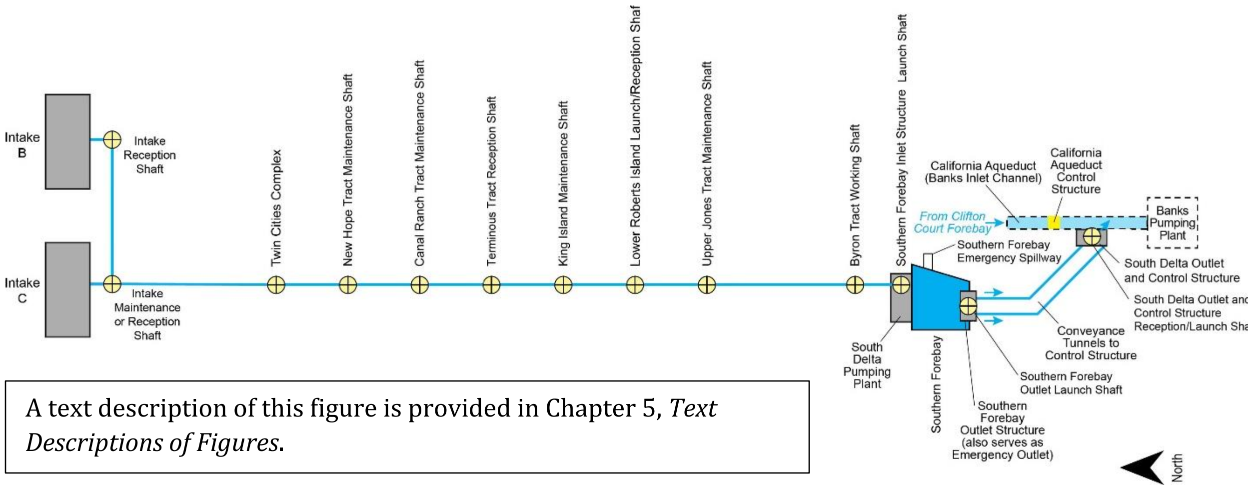
2.6.4 Alternative 3—Eastern Alignment, 6,000 cfs, Intakes B and C

Alternative 3 includes the major common features of the alternatives described in Section 2.6.1, *Common Features of the Action Alternatives*. Alternative 3 would have the same new diversion facilities and 6,000 cfs capacity as Alternative 1, but the main tunnel would follow the eastern alignment from the Twin Cities Complex to the Southern Forebay (Figure 2-1b). The tunnel diameter would be 36 feet inside and 39 feet outside, same as Alternative 1, but would extend 42 miles from the north Delta intakes to the new pumping plant at the Southern Forebay. Figure 2-14 is a schematic diagram of the conveyance facilities associated with the eastern alignment.

Beyond the Twin Cities Complex double launch shaft (California Department of Water Resources 2022: Mapbook 3-2, Sheet 5)[27], Alternative 3 would have shafts along the main tunnel route at the following locations (California Department of Water Resources 2022: Mapbook 3-2, Sheets 6, 7, 8, 12, 15, 17, and 19).[28]

- New Hope Tract maintenance shaft (eastern)
- Canal Ranch Tract maintenance shaft
- Terminous Tract reception shaft
- King Island maintenance shaft
- Lower Roberts Island reception/launch shaft
- Upper Jones Tract maintenance shaft
- Byron Tract Working Shaft (launch shaft)
- Southern Forebay Inlet Structure launch shaft
- Southern Forebay Outlet Structure dual launch shafts
- Dual launch shafts at the Southern Forebay Outlet Structure
- Dual reception shafts at the South Delta Outlet and Control Structure along SWP Banks Pumping Plant approach channel

[27] Mapbooks for the Delta Conveyance Project Draft EIR are available for public viewing at https://cadwr.app.box.com/s/36n8ugxlg2ntot31xvj92csan2ln41u5.
[28] See note 27 above.



A text description of this figure is provided in Chapter 5, *Text Descriptions of Figures*.

Figure 2-14. Project Schematic Alternatives 3 and 4b

Reception shafts under Alternative 3 would be located at Intake B, Terminous Tract, and Lower Roberts Island. The Lower Roberts Island single reception shaft would also serve as a launch shaft, as described below. The reception shaft on Terminous Tract would receive the TBM launched from Lower Roberts Island and the TBM launched from Twin Cities Complex.

The double launch shaft at the Twin Cities Complex that would allow the TBM to tunnel north toward the intakes and south toward the Southern Forebay would be the same as under Alternative 1. Under Alternative 3, however, the TBM would tunnel south on the eastern alignment. The total size of the permanent Twin Cities Complex site under Alternative 3 would be 170 acres due to a larger permanent RTM storage area necessitated by the longer tunnel length, which would generate more RTM.

Under Alternative 3, the tunnel launch site on Lower Roberts Island would launch the TBM north toward Terminous Tract. The launch shaft would also serve as a reception shaft for recovery of the TBM launched from Byron Tract.

Under Alternative 3, RTM would be handled at Lower Roberts Island (instead of Bouldin Island) in addition to the Twin Cities Complex and the Southern Complex. A conveyor would move RTM from the shaft site approximately 2 miles along the access road to a separate RTM handling and storage area (California Department of Water Resources 2022: Mapbook 3-2, Sheet 13).[29] RTM generated at Lower Roberts Island would be used to backfill borrow areas on-site. Approximately 71 acres of the site would be used for permanent RTM stockpiles up to 15 feet high that could be used for future, as yet unidentified projects.

Portions of the existing perimeter levee on the Lower Roberts Island site do not comply with the Public Law 84-99 Delta-specific levee design standard because of insufficient freeboard or slopes. To address flood risk, the action alternatives would involve targeted repairs to existing levees to address geometry and historic performance issues that could recur during a potential high-water event. Following this standard, the Lower Roberts Island levee would be designed with 1.5 feet of freeboard above the 100-year flood elevation, minimum 16-foot crest width, exterior slopes of

[29] Mapbooks for the Delta Conveyance Project Draft EIR are available for public viewing at https://cadwr.app.box.com/s/36n8ugxlg2ntot31xvj92csan2ln41u5.

2H:1V, and interior slopes ranging from 3H:1V to 5H:1V depending on levee height and peat thickness. Levee modifications would occur along the Turner Cut eastern levee adjacent to West Neugebauer Road (California Department of Water Resources 2022: Mapbook 3-2, Sheets 11 and 12).[30] All of the modifications would occur on the land side of the levees. Temporary levee modification access roads would be constructed along the landside toe of the existing levee at current grade level. The construction and postconstruction site for levee modifications would occupy approximately 30 acres, plus an additional 37 acres for temporary levee modification access roads.

Under Alternative 3, the construction site for the Southern Complex on Byron Tract would occupy 1,488 acres, and the permanent footprint would cover 1,220 acres (California Department of Water Resources 2022: Mapbook 3-2, Sheet 17).[31] The project facilities of the Southern Complex would be the same as described under Alternative 1 except for RTM, peat, and topsoil storage areas. Excess RTM from tunneling at the Southern Complex would be moved to a storage area north of the Southern Forebay on the Southern Complex; the RTM stockpile there would occupy about 30 acres and be 15 feet high. Peat soils (51 acres) and topsoil and other soil materials (41 acres) would also be stored in that area. Table 2-7 summarizes the major features and characteristics of Alternative 3. Delta Conveyance Project Draft EIR Chapter 3, *Description of the Proposed Project and Alternatives*, Mapbook 3-2 (California Department of Water Resources 2022)[32] depicts the locations of project facilities and major construction features for the eastern alignment alternatives. Additional construction and postconstruction details for the action alternatives with 6,000 cfs design capacity can be found in the C-E EPR Appendix A and C-E EPR engineering drawings provide site plans for facilities proposed under Alternative 3 (Delta Conveyance Design and Construction Authority 2022a).

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[30] Mapbooks for the Delta Conveyance Project Draft EIR are available for public viewing at https://cadwr.app.box.com/s/36n8ugxlg2ntot31xvj92csan2ln41u5.

[31] See note 30 above.

[32] See note 30 above.

Table 2-7. Summary of Physical Characteristics of Alternative 3

Characteristic	Description [a]
Alignment	Eastern
Conveyance capacity	6,000 cfs
Number of Intakes	Two; Intakes B and C at 3,000 cfs each
Tunnel from Intakes to Southern Forebay	
Diameter	36 feet inside, 39 feet outside
Length	42 miles
Number of tunnel shafts [b]	11
Launch shaft diameter (including each shaft at double launch shafts and combined launch/reception shafts)	115 feet inside
Reception and maintenance shafts diameter	70 feet inside
Twin Cities Complex	Construction acres: 479 Permanent acres: 170
Lower Roberts Island launch/reception shaft	Construction acres: 407 Permanent acres: 176
Southern Complex	**Same as Alternative 1 except for facilities on Byron Tract**
Facilities on Byron Tract	Construction acres: 1,488 Permanent acres: 1,220
Facilities west of Byron Highway	Construction acres: 164 Permanent acres: 112
RTM Volumes [c] and Storage	
Twin Cities Complex long-term RTM storage (approximate)	159 acres by 15 feet high
Lower Roberts Island long-term RTM storage (approximate)	71 acres by 15 feet high
Southern Forebay long-term RTM storage (approximate)	30 acres by 15 feet high
Total wet excavated RTM volume (for single main tunnel from intakes to Southern Forebay and dual South Delta Conveyance tunnels)	14.8 million cubic yards

cfs = cubic feet per second; RTM = reusable tunnel material.

[a] Acreage estimates represent the permanent surface footprints of selected facilities. Overall project acreage includes some facilities not listed, such as permanent access roads.

[b] Number of shafts for the main tunnel from intakes to Southern Forebay, counting the double shaft at Twin Cities Complex as one shaft.

[c] The height of the RTM storage stockpiles would decrease as the RTM subsides into the ground over time.

Access roads to Intakes B and C, relocation of SR 160, and new or modified access roads for the Twin Cities Complex and Southern Complex would be the same as under Alternative 1. Separate access roads would be constructed for reception and maintenance shaft sites on the eastern alignment. All eastern alignment alternatives would involve constructing an overpass over the East Bay Municipal Utility District (EBMUD) Mokelumne Aqueducts. Figure 2-15 shows the road modifications proposed for Alternative 3.

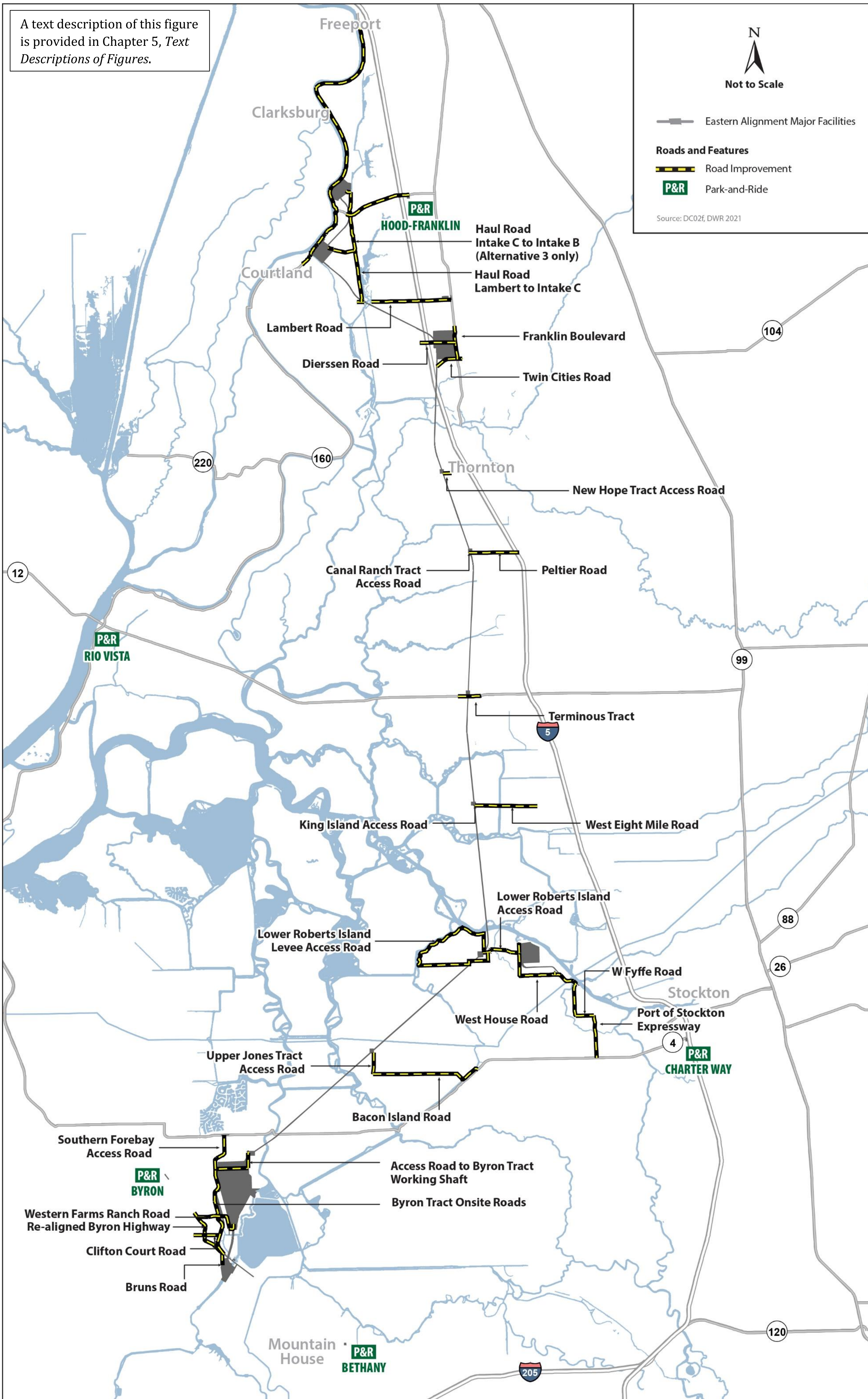


Figure 2-15. Road Modifications under Alternatives 3 and 4b

2.6.4.1 Construction Schedule

Construction of Alternative 3 would take approximately 13 years. Construction would not take place in all locations at the same time. Rather, it would proceed in stages, starting with site work at the intakes and Twin Cities Complex and power and SCADA at maintenance shafts, and proceeding to equipment decommissioning, site reclamation, and road overlays in the final years.

2.6.5 Alternative 4b—Eastern Alignment, 3,000 cfs, Intake C

Under Alternative 4b, all conveyance facilities and operational components would be the same as under Alternative 2b, except that the main tunnel would follow the eastern alignment from the Twin Cities Complex to the Southern Forebay, as described under Alternative 3. Only Intake C would be constructed, and the maximum diversion capacity would be 3,000 cfs. The tunnel diameter would be 26 feet inside, 28 feet outside, and 40 miles long on this alignment. TBM launch shaft sites would be the same as under Alternative 3 but would be correspondingly smaller than under other alternatives because less area would be needed for RTM storage. Other shaft sites would be the same as under Alternative 3.

Under Alternative 4b, the construction site for the Southern Complex on Byron Tract would occupy 1,457 acres and the permanent footprint would cover 1,189 acres. Otherwise, the Southern Complex would be the same as described for Alternative 2b. No surplus RTM would be stockpiled at the Southern Complex.

Table 2-8 summarizes the distinguishing water conveyance features and characteristics of Alternative 4b (e.g., dimensions and volumes). Figure 2-14 is a schematic diagram associated with the eastern alignment; note that Alternative 4b would not include Intake B. Appendix C, *Description of the Proposed Project and Alternatives,* and Delta Conveyance Project Draft EIR Chapter 3, *Description of the Proposed Project and Alternatives*, Mapbook 3-2 (California Department of Water Resources 2022)[33] show the major project facilities and construction features associated with the eastern alignment. Road modifications would be the same as shown on Figure 2-15 for Alternative 3, except that Alternative 4b would not require the access road between Intake C and Intake B, which is not included in Alternative 4b.

[33] Mapbooks for the Delta Conveyance Project Draft EIR are available for public viewing at https://cadwr.app.box.com/s/36n8ugxlg2ntot31xvj92csan2ln41u5.

Table 2-8. Summary of Physical Characteristics of Alternative 4b

Characteristic	Description [a]
Alignment	Eastern
Conveyance capacity	3,000 cfs
Number of Intakes	One; Intake C at 3,000 cfs
Tunnel from Intakes to Southern Forebay	
Diameter	26 feet inside, 28 feet outside
Length	40 miles
Number of tunnel shafts [b]	10
Launch shafts diameter	110 feet inside
Reception and maintenance shafts diameter	53 feet inside
Twin Cities Complex	Construction acres: 322 Permanent acres: 26
Lower Roberts Island launch/reception shaft	Construction acres: 327 Permanent acres: 136
Southern Complex	**Same as Alternative 2b**
Permanent RTM Volumes [c] and Storage	
Twin Cities Complex long-term RTM storage (approximate)	15 acres by 15 feet high
Lower Roberts Island long-term RTM storage (approximate)	33 acres by 15 feet high
Southern Forebay long-term RTM storage (approximate)	0
Total wet excavated RTM volume (for single main tunnel from intakes to Southern Forebay and dual South Delta Conveyance tunnels)	7.9 million cubic yards

cfs = cubic feet per second; RTM = reusable tunnel material.

[a] Acreage estimates represent the permanent surface footprints of selected facilities. Overall project acreage includes some facilities not listed, such as permanent access roads.

[b] Number of shafts for the main tunnel from intakes to Southern Forebay, counting the double shaft at Twin Cities Complex as one shaft.

[c] The height of the RTM storage stockpiles would decrease as the RTM subsides into the ground over time.

2.6.5.1 Construction Schedule

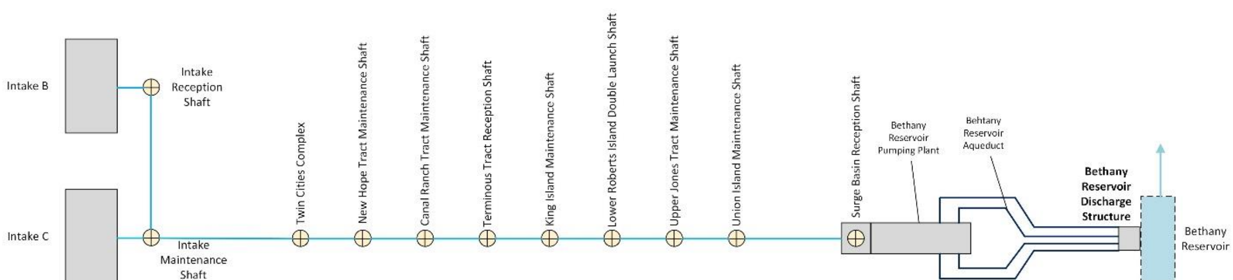
Construction of Alternative 4b would take approximately 13 years. Construction would not take place in all locations at the same time. Rather, it would proceed in stages, starting with site work at the intake and Twin Cities Complex and power and SCADA at maintenance shafts, and proceeding to equipment decommissioning, site reclamation, and road overlays in the final years.

2.6.6 DWR's Preferred Alternative—Bethany Reservoir Alignment, 6,000 cfs, Intakes B and C

DWR's Preferred Alternative includes most of the major common features of the alternatives described in Section 2.6.1, *Common Features of the Action Alternatives*, except for the Southern Complex. This alternative would use new Intakes B and C in the north Delta to divert and convey up to 6,000 cfs water in a single tunnel along the eastern alignment as far as the launch shaft at Lower

Roberts Island as described under Alternative 3. However, from Lower Roberts Island, the tunnel would follow a different route to a location south of Clifton Court Forebay and terminate at the Bethany Complex. This tunnel alignment is referred to as the Bethany Reservoir alignment (Figure 2-1c). The tunnel diameter would be 36 feet inside and 39 feet outside, and the alignment would be 45 miles long from the intakes to the surge basin at the Bethany Complex. Figure 2-16 is a schematic diagram depicting the conveyance facilities associated with DWR’s Preferred Alternative. Tunnel shafts would be located at the following sites (California Department of Water Resources 2022: Mapbook 3-3, Sheets 2, 3, 6, 7, 8, 11, 12, 15, 16, and 20).[34]

- Intake B
- Intake C
- Twin Cities Complex double launch shaft
- New Hope Tract maintenance shaft (eastern)
- Canal Ranch maintenance shaft
- Terminous Tract reception shaft
- King Island maintenance shaft
- Lower Roberts Island double launch shaft
- Upper Jones Tract maintenance shaft (Bethany)
- Union Island maintenance shaft
- Surge Basin reception shaft (at Bethany Complex)



A text description of this figure is provided in Chapter 5, *Text Descriptions of Figures*.

Figure 2-16. Project Schematic DWR’s Preferred Alternative, Bethany Reservoir Alignment

Instead of having the Southern Complex facilities described for Alternatives 1, 2b, 3, and 4b, this alternative would include a new Bethany Reservoir Pumping Plant and Surge Basin (Figure 2-17; California Department of Water Resources 2022: Mapbook 3-3, Sheet 18)[35], and a new Bethany Reservoir Aqueduct that would convey flows from the pumping plant to a new Bethany Reservoir Discharge Structure on the shore of Bethany Reservoir (Figure 2-18; California Department of Water

[34] Mapbooks for the Delta Conveyance Project Draft EIR are available for public viewing at https://cadwr.app.box.com/s/36n8ugxlg2ntot31xvj92csan2ln41u5.

[35] See note 34 above.

Resources 2022: Mapbook 3-3, Sheet 20).[36] Collectively, these facilities are called the *Bethany Complex*.

DWR's Preferred Alternative would have the same tunnel shafts as described under Alternative 3 from the north Delta to Lower Roberts Island. Lower Roberts Island would have a double launch shaft, similar to that at the Twin Cities Complex (Figure 2-6), which would allow one TBM to bore north to the Terminous Tract reception shaft and one to bore south toward the final reception shaft at the Bethany Reservoir Surge Basin via maintenance shafts on Upper Jones Tract (at a different location than under Alternative 3) and on Union Island (Figure 2-1c). The Union Island maintenance shaft would be unique to DWR's Preferred Alternative. The shaft pads at Upper Jones Tract and Union Island tunnel maintenance shafts would be constructed of soil excavated from Lower Roberts Island.

The Twin Cities Complex under the Bethany Reservoir alignment would be similar to Alternative 3, but larger because RTM that would be used or stored at the Southern Complex under other alternatives would not be transported to that site and would need to be stored on-site instead (California Department of Water Resources 2022: Mapbook 3-3, Sheet 6).[37] Tunnel segments, TBM machinery, other soil materials, and equipment would be delivered to the Twin Cities Complex by road; there would be no rail-served materials depot at the Twin Cities Complex under DWR's Preferred Alternative. Access road modifications, RTM storage, and facility layouts would change accordingly. RTM handling at the Twin Cities Complex and Lower Roberts Island TBM launch shafts would be the same as described for other eastern alignment alternatives, except that mechanical dryers would not be used at Lower Roberts Island and no RTM would be transported for forebay construction.

The double launch shaft at Lower Roberts Island would require a larger shaft site than under Alternative 3, constructed in a figure eight configuration to accommodate two TBMs, a larger RTM storage area, and corresponding adjustments to access roads and railroad alignments (California Department of Water Resources 2022: Mapbook 3-3, Sheets 12 and 13).[38] Material excavated on-site would be used to construct the shaft pad. The site would also house a rail-served materials depot similar to the facility described under Alternative 3. Rail access to Lower Roberts Island would be provided from existing UPRR and/or BNSF Railway tracks located on the Port of Stockton. Rail lines could be extended from one of the existing rail facilities at the Port of Stockton. Rail access would be extended over a new bridge over Burns Cut and continue to the launch shaft site and RTM storage area.

Portions of existing perimeter levee on the Lower Roberts Island site do not comply with the Public Law 84-99 Delta-specific levee design standard because of insufficient freeboard or slopes. Levee modifications for this alternative would be made as described for Alternative 3 (California Department of Water Resources 2022: Mapbook 3-3, Sheet 12).[39]

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[36] See note 34 above.

[37] Mapbooks for the Delta Conveyance Project Draft EIR are available for public viewing at https://cadwr.app.box.com/s/36n8ugxlg2ntot31xvj92csan2ln41u5.

[38] See note 37 above.

[39] See note 37 above.

2.6.6.1 Bethany Complex

The Bethany Complex would be constructed southeast of Clifton Court Forebay and would be located on ground above the flood elevations for the 200-year flood event with sea level rise and climate change hydrology for year 2100. The Bethany Reservoir Pumping Plant and Surge Basin would be located along Mountain House Road approximately 0.5 mile south of the intersection with Byron Highway (Figures 2-17 and 2-18; California Department of Water Resources 2022: Mapbook 3-3, Sheet 20).[40] The aqueduct would extend approximately 2.5 miles from the pumping plant to the new discharge structure at the Bethany Reservoir. The aqueduct would consist of four pipelines including tunneled segments under the existing CVP Jones Pumping Plant discharge pipelines and existing conservation easements adjacent to Bethany Reservoir (Figure 2-18).

As under Alternative 3, RTM generated at the Twin Cities Complex and Lower Roberts Island launch shafts sites would be processed and reused at the launch shaft sites to backfill borrow areas and excess RTM would be stockpiled on-site. Excavation for the Bethany Reservoir Pumping Plant, Aqueduct, and Discharge Structure would not require the use of a TBM and would not generate the same type of RTM. Excess excavated soil from construction of the surge basin, pumping plant, and aqueduct would be used on-site for grading as much as possible. Excess topsoil and excavation material would be stockpiled at four locations at the Bethany Complex. A permanent 33-foot-high stockpile of excavated material from the Bethany Reservoir Pumping Plant and Surge Basin would occupy about 59 acres; topsoil from those features would cover about 7 acres up to 22 feet high for about 7 years. Temporary topsoil stockpiles from the aqueduct and discharge structure would cover 4.5 and 0.5 acres up to 22 feet high for 4 and 5 years, respectively. Each stockpile area would be cleared, grubbed, and stripped of topsoil before stockpiling. Topsoil from these locations and excess topsoil from other portions of the Bethany Complex would be spread over the completed stockpiles and hydroseeded. Land reclamation would proceed as described in Section 2.6.1.9, *Land Reclamation*, and shown on Figure 2-11.

Table 2-9 summarizes the distinguishing water conveyance features and characteristics of DWR's Preferred Alternative (e.g., dimensions and volumes). A detailed depiction is provided in the Delta Conveyance Project Draft EIR Chapter 3, *Description of the Proposed Project and Alternatives*, Mapbook 3-3 (California Department of Water Resources 2022).[41] DWR's Preferred Alternative is described in Appendix C, *Description of the Proposed Project and Alternatives,* Section 3.14, *Alternative 5—Bethany Reservoir Alignment, 6000 cfs, Intakes B and C (Proposed Project).* Further details of the facilities proposed for the Bethany Reservoir alignment can be found in the Bethany EPR, technical memoranda, and engineering drawings (Delta Conveyance Design and Construction Authority 2022b).

Table 2-9. Summary of Physical Characteristics under DWR's Preferred Alternative

Characteristics	Description [a]
Alignment	Bethany Reservoir
Conveyance capacity	6,000 cfs
Number of Intakes	Two; Intakes B and C at 3,000 cfs each

[40] See note 37 above.

[41] Mapbooks for the Delta Conveyance Project Draft EIR are available for public viewing at https://cadwr.app.box.com/s/36n8ugxlg2ntot31xvj92csan2ln41u5.

Characteristics	Description [a]
Tunnel from Intakes to Bethany Reservoir Pumping Plant	
Diameter	36 feet inside, 39 feet outside
Length	45 miles
Number of tunnel shafts	11 [b]
Launch shafts diameter	115 feet inside
Reception and maintenance shafts diameter	70 feet inside
Surge Basin reception shaft diameter	120 feet inside
Twin Cities Complex	Construction acres: 586 Permanent acres: 222
Lower Roberts Island double launch shaft site	Construction acres: 610 Permanent acres: 300
Upper Jones Tract maintenance shaft [c]	Construction acres: 11 Permanent acres: 11
Union Island maintenance shaft [c]	Construction acres: 14 Permanent acres: 14
Bethany Complex	
Bethany Reservoir Pumping Plant and Surge Basin site size	Construction acres: 228 Permanent acres: 175
Bethany Reservoir Pumping Plant pad site	1,166 feet wide x 1,260 feet long (approximately 34 acres)
Surge basin	815 feet wide x 815 feet long x 35 feet deep, approximately 15 acres
Bethany Reservoir Aqueduct	Four 15-foot-diameter parallel below-ground pipelines 13,000 linear feet each Construction acres: 138 acres Permanent acres: 63
Aqueduct tunnels	Four 20-foot-diameter parallel tunnels, two reaches
Bethany Reservoir Discharge Structure	Construction acres: 15 Permanent acres: 13
RTM Volumes [d] and Storage	
Twin Cities Complex long-term RTM storage (approximate)	214 acres x 15 feet high
Lower Roberts Island long-term RTM storage (approximate)	189 acres by 15 feet high
Bethany Complex	No TBM RTM generated or stored
Total wet excavated (bulked) RTM volume	14.4 million cubic yards

cfs = cubic feet per second; RTM = reusable tunnel material; TBM = tunnel boring machine.

[a] Acreage estimates represent the permanent surface footprints of selected facilities. Overall project acreage includes some facilities not listed, such as permanent access roads.

[b] Number of shafts for the main tunnel from intakes to Bethany Reservoir Surge Basin shaft, counting the double shaft at Twin Cities Complex and the double shaft at Lower Roberts Island each as one shaft.

[c] These maintenance shafts are included in this table because they are distinctive to the Bethany Reservoir alignment. Upper Jones Tract maintenance shaft is in a different location than in other eastern alignment alternatives and Union Island maintenance shaft is unique to this alternative.

[d] The height of the RTM storage stockpiles would decrease as the RTM subsides into the ground over time.

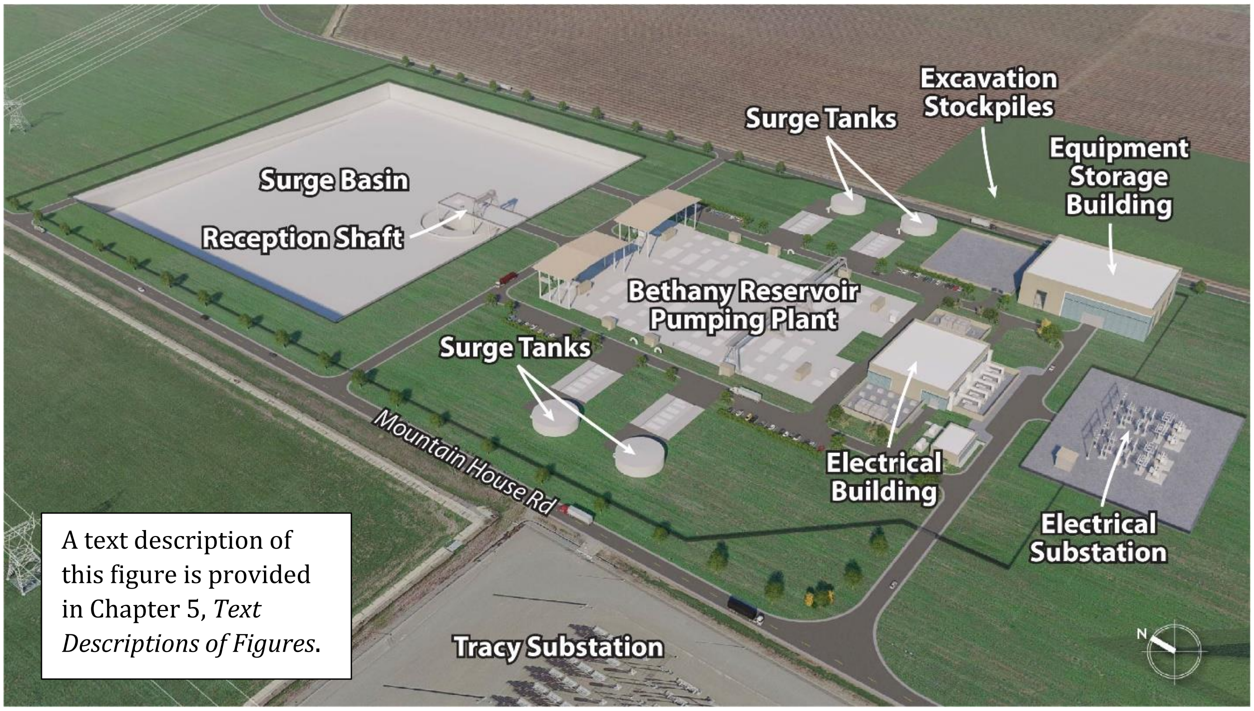


Figure 2-17. Bethany Reservoir Pumping Plant and Surge Basin

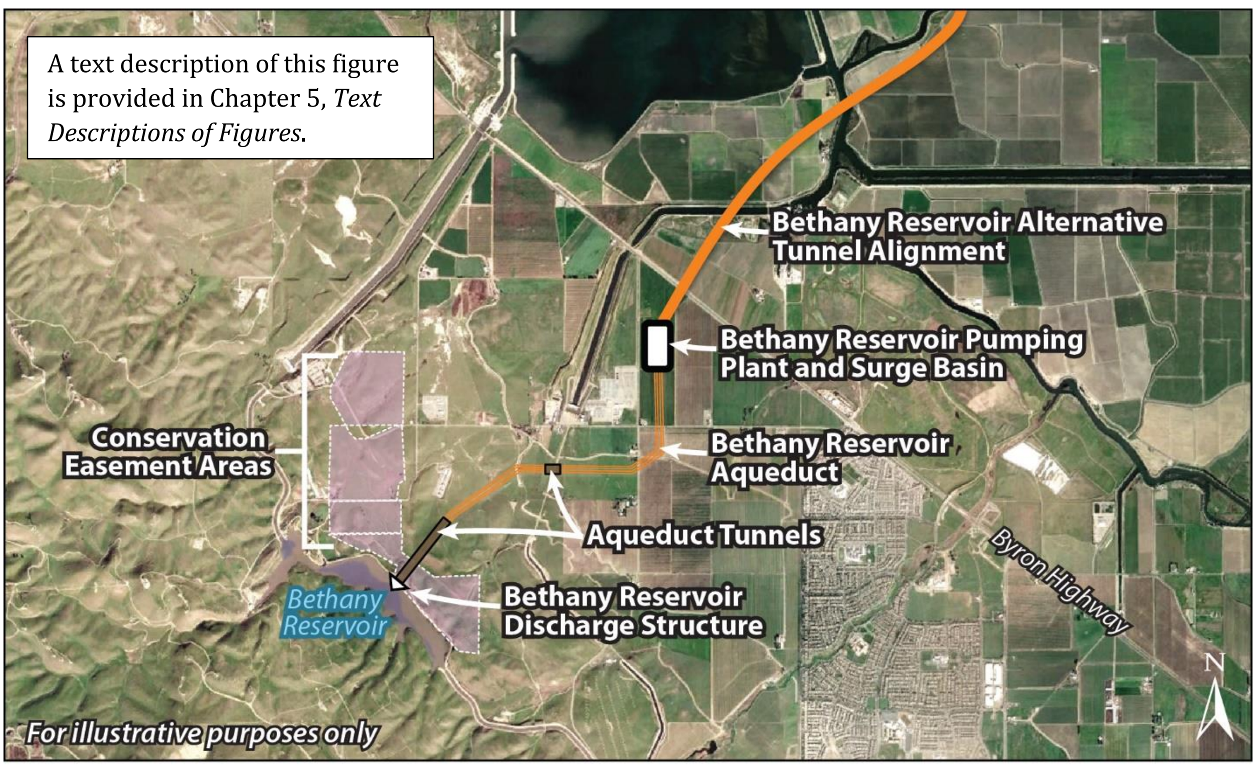


Figure 2-18. Bethany Reservoir Aqueduct Route with Tunnel Reaches

Access roads to the intakes, New Hope Tract tunnel maintenance shaft, Canal Ranch Tract tunnel maintenance shaft, Terminous Tract tunnel reception shaft, King Island tunnel maintenance shaft, and Lower Roberts Island double launch shaft site would be the same under DWR's Preferred Alternative as under Alternative 3. Road improvements for the Twin Cities Complex would be slightly different than under Alternative 3. The maintenance shaft site on Upper Jones Tract would require a different access road than under Alternative 3 because it is in a different location. Construction access to Union Island (unique to DWR's Preferred Alternative) would be via Clifton Court Road and Bonetti Road. Road modifications proposed for DWR's Preferred Alternative are shown on Figure 2-19 and are described in more detail in Appendix C, *Description of the Proposed Project and Alternatives,* Section 3.14.2, *Access Roads*.

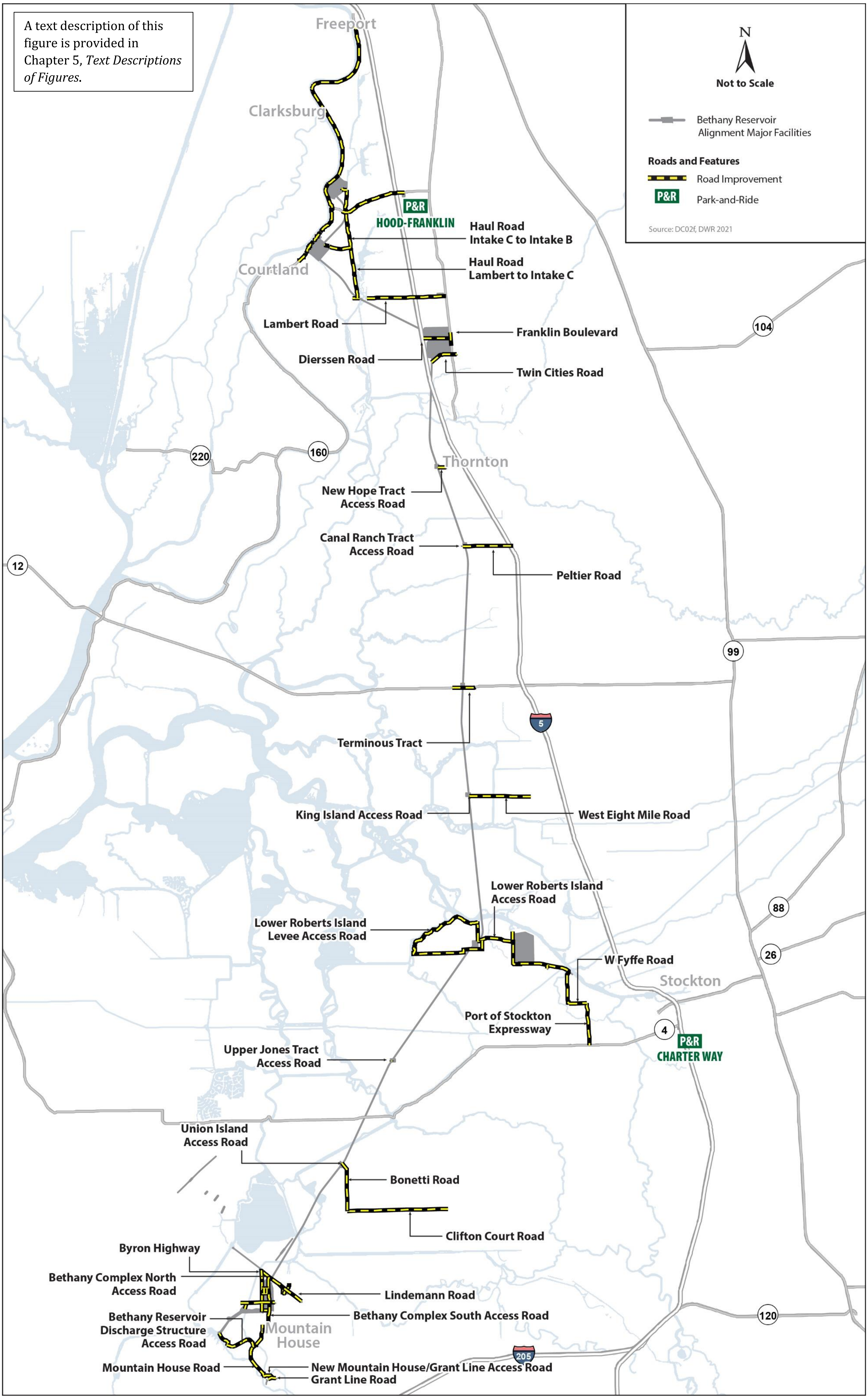


Figure 2-19. Road Modifications under DWR's Preferred Alternative

2.6.6.2 Construction Schedule

Construction of DWR's Preferred Alternative would take approximately 13 years. Construction would not take place in all locations at the same time. Rather, it would proceed in stages, starting with access roads and site work at the intakes and Twin Cities Complex and power and SCADA at maintenance shafts, and proceeding to equipment decommissioning, site reclamation, and road overlays in the final years.

2.7 Field Investigations

After completion of the NEPA process (and assuming the proposed action or an action alternative moves forward), identification of an approved project footprint, and acquisition of all required permits, additional field investigations would be conducted to more specifically identify appropriate construction methods in the final design documents. These investigations would also address the establishment of geological and groundwater monitoring programs that could extend during the design and construction phases of the project. Field investigations would involve ground-disturbing activities on project levees and within waters of the United States. The effects of field investigations are included in the analysis of effects in Chapter 3, *Affected Environment and Environmental Consequences*.

Field investigations would be conducted to support the formal Section 408 request to USACE to address intake construction and the tunneled crossing of the Stockton Deep Water Ship Channel in the San Joaquin River (Figure 3.14-1). Additional field investigations would be conducted to support development of final design documents for the following project facilities.

- Intakes
- Tunnel shafts
- Tunnel alignments
- Power lines
- Access roads and bridges
- The Southern Complex on Byron Tract
- The Southern Complex west of Byron Highway
- Bethany Reservoir Pumping Plant and Surge Basin
- Bethany Reservoir Aqueduct
- Bethany Reservoir Discharge Structure

Geotechnical investigations to support Section 408 permitting would begin after issuance of the ROD and before the start of 65% level of design. Soil borings and cone penetration tests would be conducted within the construction boundaries at the intakes and within the Stockton Deep Water Ship Channel in the San Joaquin River and adjacent non-project levees at the location of the proposed tunnel undercrossing (Figure 3.14-1). For groundwater testing and monitoring at each intake, it is assumed that one 12-inch-diameter steel-cased test well would be installed in a 24-inch-diameter borehole to conduct pumping tests. It is also assumed that vibrating wire piezometers would be installed in several levee borings, and 4-inch groundwater monitoring wells would be installed in several site borings at each intake to permit measurements of groundwater head, monitoring of groundwater elevations during the pumping tests, and the collection of water quality samples at the intake locations. A surface water gage would be installed at each intake to track the elevation of the adjacent river for use in analysis of the results.

These field investigations to support the Section 408 permitting process would require their own, separate, Section 408 permits from USACE, and Section 10 and Section 404 permit approvals prior to implementation. Investigations are expected to be completed within approximately 2 years following completion of all required permits, depending on availability of access to the project sites. Groundwater and other monitoring activities would be performed prior to, during, and after intake construction is completed.

Separately from investigations to support Section 408 permitting, additional preconstruction geotechnical investigations or installation of monitoring equipment would be completed within approximately 2 years following completion of all required permits. Soil borings, overwater soil borings, and cone penetration tests would be conducted within the construction boundaries of the intakes, tunnel shafts, tunnel alignments, access roads and bridges, and levees for all action alternatives. For Alternatives 1, 2b, 3, and 4b, these geotechnical investigations would also be conducted within the Southern Complex on Byron Tract and west of Byron Highway. If DWR's Preferred Alternative is selected, these geotechnical investigations would also be conducted at the Bethany Reservoir Pumping Plant and Surge Basin, Bethany Reservoir Aqueduct, and the Bethany Reservoir Discharge Structure. Preconstruction soil boring and cone penetration tests would be the same as described for Section 408 permitting above and in Appendix C, *Description of the Proposed Project and Alternatives,* Section 3.15.1, *Investigations to Support Section 408 Permitting*.

The groundwater monitoring program would be implemented to determine the seasonal variations in groundwater elevations, the constituents of the groundwater (including the nature and presence of dissolved gas), and the interrelation between groundwater and surface water levels for several years before construction. Preconstruction groundwater testing and monitoring would be conducted with the same methods described to support Section 408 permitting. It is assumed that a test well for pump tests would be installed at each tunnel shaft and at each intake, plus two at the Southern Complex under Alternatives 1, 2b, 3, or 4b. If DWR' Preferred Alternative is selected, two test wells would be installed at the Bethany Reservoir Pumping Plant and Surge Basin, and at each of the two planned tunnel sections of the Bethany Reservoir Aqueduct (under the Jones Pumping Plant discharge pipelines and the conservation easement adjacent to the Bethany Reservoir).

Additional preconstruction field investigations are described in Appendix C, *Description of the Proposed Project and Alternatives,* Section 3.15.2, *Investigations Prior to Construction Phase,* and would include the following studies.

- Pilot studies to test the geotechnical response to placement of fill at tunnel shaft sites.
- Testing and validating ground improvement methods, especially in areas with substantial deposits of peat and loose or soft soils.
- Testing pile installation methods and possible acoustic mitigation measures at one intake site along the Sacramento River.
- Vibratory testing to validate peat soil response during earthquakes.

- Excavation of up to six test trenches (up to approximately 1,000 feet long, 3 feet wide, and 20 feet deep) along a line running from the southeast of Byron to the southeast of the forebay to further investigate the nature and location of the West Tracy Fault.
- A study of the Bethany Fault using electrical resistivity tomography to characterize subsurface soil characteristics above the Bethany Reservoir Aqueduct tunnels.
- Testing of compacted soil rehabilitation methods and treatments for establishing agricultural crop or native grass species.
- Subsurface explorations to confirm locations of existing utilities.

Further investigations would be conducted after the start of construction if the proposed action or an action alternative is approved. Soil boring and cone penetration tests would continue within the first 2 years of the construction period or longer in the same locations established for preconstruction investigations or adjacent locations if necessary. Ground movement during construction would be monitored with inclinometers and extensometers. Previously installed groundwater monitoring would continue to be used during and after construction, and additional wells would be installed if necessary. Locations of buried groundwater and natural gas and oil wells to be abandoned would be determined before and during construction. Appendix C, *Description of the Proposed Project and Alternatives,* Section 3.15.3, *Investigations during Construction Phase*, provides further details.

2.8 Additional Project Components of All Action Alternatives

When USACE reviews a proposed action that would require Department of the Army authorization, its evaluation typically includes a determination of whether the applicant has taken sufficient measures to mitigate the proposed action’s likely adverse effect on the aquatic ecosystem. The CEQ has defined mitigation in its regulations at 40 CFR Section 1508.20 to include avoiding impacts, minimizing impacts, rectifying impacts, reducing impacts over time, and compensating for impacts. USACE regulation 33 CFR Section 332.1(c) defines the sequencing for mitigation which, compliant with applicable provisions of 40 CFR Part 230, must avoid and minimize adverse impacts on waters of the United States to the extent practicable and that compensatory mitigation for unavoidable effects may be required. USACE regulation 33 CFR Section 332.2 defines compensatory mitigation as “the restoration (re-establishment or rehabilitation), establishment (creation), enhancement, and/or in certain circumstances preservation of aquatic resources for the purposes of offsetting unavoidable adverse impacts which remain after all appropriate and practicable avoidance and minimization has been achieved.” For the purposes of USACE’s effects analysis under NEPA, these mitigation measures and compensatory mitigation measures are considered components of the Delta Conveyance Project and their effects are analyzed as such.

2.8.1 Mitigation Measures

Mitigation measures have been identified to avoid and minimize the effects of construction and implementation of the action alternatives. These measures are described in detail in Appendix C2, *Mitigation Measures*, and are identified within each resource area section, where the benefits of their application are also described.

2.8.2 Compensatory Mitigation

The action alternatives would include constructing adequate habitat acreage to provide compensatory mitigation for habitat and species effects as a result of construction and operation as it relates to the continued function of the Sacramento River Flood Control Project.

A proposed Compensatory Mitigation Plan is under development and is subject to change during the permitting process. Construction effects due to the implementation of the Compensatory Mitigation Plan are included in the Draft EIS as project effects. Descriptions of the compensatory mitigation actions that are anticipated to be undertaken and which are used as a basis for evaluation of construction effects under each resource area are described in detail in Appendix C3, *Compensatory Mitigation Plan for Special-Status Species and Aquatic Resource*s.

2.9 Additional Elements of the Delta Conveyance Project Outside of USACE Authority

As discussed in Chapter 1, *Introduction and Purpose and Need*, operation of the proposed facilities is not a covered action under USACE authority. A brief discussion of operations and its effects are included in this Draft EIS. However, as the operations-related elements of the project are not within USACE authority, readers should refer to the Delta Conveyance Project Draft EIR (California Department of Water Resources 2022) for complete details of operations-related elements, such as the intake operations and maintenance, contract amendments, real-time operational decision-making, adaptive management and monitoring, and the associated impacts of these operations on the natural environment. Detailed descriptions of these operations-related elements are also provided in Appendix C, *Description of the Proposed Project and Alternatives,* for informational purposes.

Chapter 3
Affected Environment and Environmental Consequences

Introduction

This chapter presents an analysis of the effects of the action alternatives on the existing human environment in accordance with National Environmental Policy Act (NEPA) regulations (40 Code of Federal Regulations [CFR] § 1502.16). Where noted, this EIS incorporates by reference portions of the *Delta Conveyance Project Draft Environmental Impact Report* (Delta Conveyance Project Draft EIR) IR (Draft EIR) (California Department of Water Resources 2022).[1]

Scope of the Environmental Impact Statement

NEPA and its implementing regulations require an environmental impact statement (EIS) to evaluate a reasonable range of feasible alternatives, as well as a No Action Alternative. In compliance with requirements set forth in NEPA, the U.S. Army Corps of Engineers (USACE) Sacramento District prepared a Notice of Intent (NOI) describing the intent to prepare an EIS under the authority of Section 14 of the Rivers and Harbors Act of 1899 (RHA) (33 United States Code [USC] § 10); and Section 404 of the Clean Water Act (CWA). The NOI was posted in the *Federal Register* on August 20, 2020. All public comments were reviewed and carefully considered in the preparation of this Draft EIS, especially when applicable to the scope of the action alternatives, and where comments raise significant environmental issues. Appendix H, *Public Scoping Report*, describes the public scoping process and the comments received.

Engineer Circular 1165-2-220, *Policy and Procedural Guidance for Processing Requests to Alter U.S. Army Corps of Engineers Civil Works Projects Pursuant to 33 USC 408* (U.S. Army Corps of Engineers 2018) provides policy and procedural guidance for processing requests to make alterations to civil works projects or temporarily or permanently occupy or use such projects, including USACE federally authorized civil works projects pursuant to CWA Section 408. Under Engineer Circular 1165-2-220:

> if a proposed alteration is part of a larger project (and/or its associated features) that extends beyond the USACE project boundaries, the district should determine what portions or features of the larger project USACE has sufficient control and responsibility over to warrant their inclusion in the USACE environmental review. The scope of analysis for the NEPA and environmental compliance evaluations for the Section 408 review should be limited to the area of the alteration and those adjacent areas that are directly or indirectly affected by the alteration.

As described in Chapter 1, *Introduction and Purpose and Need,* and Chapter 2*, Project Description and Alternatives*, the large-scale operation of the State Water Project (SWP), including the facilities

[1] The Delta Conveyance Project Draft EIR is available for viewing online at https://www.deltaconveyanceproject.com/read-the-document. A "Change Sheet" identifying changes that will be made in the Final EIR is available on DWR's project website: https://cadwr.app.box.com/s/gyecr8xrc4gogrprmdnf2mxdipw4hnvg.

proposed in this project, is outside USACE authority under Section 408, Section 10, and Section 404. Therefore, the Draft EIS focuses only on those actions requiring USACE authorization or approval: Section 408 authority covers alterations to the Sacramento River Flood Control Project; Section 10 applies to work in navigable waters of the United States; Section 404 applies to the discharge of dredged or fill material into Waters of the United States; and a real estate outgrant is required to cross under the Stockton Deep Water Ship Channel pursuant to Army Regulation (AR) 405-80 *Management of Title and Granting Use of Real Property*.

While project operations and maintenance are discussed briefly and qualitatively throughout the EIS, readers should refer to the Delta Conveyance Project Draft EIR (California Department of Water Resources 2022) for a more in-depth analysis of project operations and maintenance and associated effects on the environment.

Section Contents

- **Environmental Consequences.** Describes the direct/indirect and cumulative environmental effects associated with a particular environmental resource that would result from construction, operation, and maintenance of the action alternatives.
    - <u>Methods for Analysis.</u> Describes the resource-specific methodology used to identify and assess the potential environmental effects that may result from implementation of the action alternatives.
    - <u>Effects and Mitigation.</u> Describes direct and reasonably foreseeable indirect effects associated with the No Action Alternative and action alternatives and identifies mitigation measures that could be used to reduce or avoid potentially adverse effects. Specific measures are proposed when necessary to avoid, reduce, minimize, or compensate for significant environmental effects of the action alternatives.
- **Cumulative Analysis.** Discusses whether there is a cumulative effect considering past, present, and reasonably foreseeable probable future projects and determining if the action alternatives cause potential effects.

There are resource sections included in the EIS that adopt a slightly different structure or approach to the effects analysis for various reasons. In a number of cases, the resource section describes potential effects on the resource as a result of operations. These effects are included to present a clear picture of the known potential effects of the action alternatives but are outside the authority of USACE and are included for informational purposes only.

Many environmental resource areas refer to environmental commitments, best management practices, mitigation measures, and compensatory mitigation. Complete descriptions of these practices and measures can be found in Appendix C1, *Environmental Commitments and Best Management Practices*, Appendix C2, *Mitigation Measures,* and Appendix C3, *Compensatory Mitigation Plan for Special-Status Species and Aquatic Resources*.

Regulatory Framework/Applicable Laws, Regulations, Plans and Policies

Appendix G, *Regulatory Setting,* provides tables of all applicable federal, state, local, and regional laws, regulations, and policies that may be applicable to the action alternatives regarding a resource or relevant for assessing effects.

Topics with Little or No Effects

Topics with little or no effect as a result of implementation of the action alternatives need not be discussed in detail in this Draft EIS and are, therefore, included here. These resource areas are not evaluated further in the Draft EIS.

Mineral Resources

Mineral resources were evaluated and determined to have little to no effect as a result of the action alternatives. No active wells would be displaced by the construction footprint of any of the action alternatives. Because no producing wells within the construction footprints would be permanently abandoned, construction of any action alternative would not result in reduced natural gas production and would not affect any locally important natural gas wells. While the action alternatives cross over natural gas fields, the acreage affected is very small compared to the large size of the underlying natural gas fields; accordingly, the variation by alternative is small.

The alternatives have different routes and footprint acreages; however, they do not intersect any existing mines and there are no identified mineral resource zones within the footprints. While the action alternatives would require large amounts of aggregate for construction of the water-conveyance and support facilities, construction, maintenance, and implementation of the compensatory mitigation program for any of the action alternatives would use minimal amounts of the regional aggregate available to meet the regional 50-year demand. For additional information on the analysis of mineral resources please see Delta Conveyance Project Draft EIR Chapter 27, *Mineral Resources* (California Department of Water Resources 2022).

3.1 Aesthetics and Visual Resources

This section describes the affected environment for aesthetics and visual resources and analyzes effects that could occur in the study area from construction, operation, and maintenance of the action alternatives, as well as the No Action Alternative. Mitigation and minimization measures that would avoid, minimize, rectify, reduce, or compensate potentially adverse effects are included as part of each action alternative. Additional information on the affected environment, methods, and the anticipated effects of the action alternatives can be found in the Delta Conveyance Project Draft EIR Chapter 18, *Aesthetics and Visual Resources* (California Department of Water Resources 2022).

3.1.1 Affected Environment

The visual resources study area (i.e., the area in which effects may occur), consists of the statutory borders of the Sacramento–San Joaquin River Delta (Delta), upstream rivers and reservoirs, and the Areas of Additional Analysis (Delta Conveyance Project Draft EIR Chapter 1, *Introduction*) (California Department of Water Resources 2022). The area of visual effect (AVE) for visual resources comprises smaller sites throughout the landscape and larger visual resources study area where aboveground changes associated with the action alternatives would occur, which combine to create the larger study area. Therefore, the study area hosts a variety of land cover and vegetative communities, such as open water, riparian forest, wetlands and aquatic vegetation, agriculture, grasslands, and rural development, which are evaluated in more detail at the AVE level.

Delta Conveyance Project Draft EIR Chapter 18, *Aesthetics and Visual Resources*, Section 18.1, *Environmental Setting*, presents a detailed description of the visual character of the study area and upstream of the Delta, as well as the viewers in the study area that may be affected by the action alternatives (California Department of Water Resources 2022).

3.1.2 Environmental Consequences

This section describes the assessment methods used to analyze potential environmental effects and identifies the direct, indirect, and cumulative effects associated with aesthetics and visual resources that would result from construction, operation, and maintenance of the action alternatives. The No Action Alternative is also defined here.

3.1.2.1 Methods for Analysis

The research and analysis methods used to determine effects are described in detail in Delta Conveyance Project Draft EIR Appendix 18A, *Expanded Methodology and Setting* (California Department of Water Resources 2022), and are based on the Federal Highway Administration (FHWA) *Guidelines for the Visual Impact Assessment of Highway Projects* (FHWA Guidelines) (Federal Highway Administration 2015). The FHWA Guidelines' approach addresses analysis of the natural environments and cultural environments (i.e., human-altered/built environments). These guidelines include a phased approach to analyzing existing visual resources and the future condition with the action alternative using changes in visual quality and the sensitivity of viewers (i.e., receptors) to determine aesthetics and visual effects. The analysis determines potential effects of the action alternatives during both the construction and operational phases.

The focus of this visual analysis is on the action alternatives' potential to adversely affect views from publicly accessible locations. Publicly accessible locations in the communities from which residents would view the study area are, therefore, considered to be of primary importance in this analysis. The effects assessment methodology for aesthetic and visual resources includes the following components.

- Establish the study area for aesthetics resources.
- Inventory and describe the affected environment, affected viewers, and existing visual quality.
- Identify candidate key observation points (cKOPs), key observation points (KOPs) for use in the visual assessment in this chapter, and KOPs for rendering or rendered KOPs (RKOPs). As described in Delta Conveyance Project Draft EIR Appendix 18A, cKOPs were selected and designated as KOPs to be used as the basis to describe the effects of the various features of the action alternatives within this analysis; cKOPs are shown in Delta Conveyance Project Draft EIR Appendix 18A, Figures 18A-2 through 18A-5 (California Department of Water Resources 2022). The KOPs used in this chapter are identified by their previous cKOP designations; 10 KOPs were selected for representative photographs. Then, 10 RKOPs were selected for their ability to illustrate effects from the action alternatives. All KOPs and RKOPs are shown in Delta Conveyance Project Draft EIR Chapter 18, Figure 18-1. Photographs taken from these representative KOPs are presented in Delta Conveyance Project Draft EIR, Chapter 18, *Aesthetics and Visual Resources,* Figures 18-2 through 18-6 (California Department of Water Resources 2022).
- Assess visual compatibility and viewer sensitivity and analyze visual effects with the aid of RKOPs. RKOPs are presented in Delta Conveyance Project Draft EIR Chapter 18, *Aesthetics and Visual Resources,* Figures 18-10 through 18-19 (California Department of Water Resources 2022).
- Consider the regional visual context and the effect construction and facilities would have on the study area visual landscape.
- Provide methods to mitigate adverse visual effects.

The methods for evaluating aesthetic effects include the use of existing data collection methods and sources provided for the analysis, an inventory of regional and local conditions, evaluation of the Delta analytical context, and qualitative analysis techniques to determine how activities from the action alternatives and physical changes associated with the study area could cause effects. The context and intensity of the effects are also considered.

No Action Alternative

The No Action Alternative takes into account projects, plans, and programs that would be reasonably expected to occur in the foreseeable future if none of the action alternatives were approved and the proposed action's purpose and need were not met.

Construction and operation of water supply–reliability projects have the potential to affect the aesthetic resources in the four regions: northern coastal, northern inland, southern coastal, and southern inland. Table 3.1-1 provides examples of how surface aesthetics could be affected.

Table 3.1-1. Examples of Effects on Aesthetics from Construction and Operation of Projects in Lieu of the Action Alternatives

Project Type	Potential Aesthetics Effects	Region(s) in Which Effect Would Likely Occur [a]
Desalination, groundwater management, groundwater recovery, and water recycling	Potential to convert existing land uses to industrial-looking water supply facilities by locating the facilities on undeveloped sites or by redeveloping sites currently occupied by non-industrial development. Would require grading and excavation at the project sites to construct foundations and buildings, trenching would occur for the installation of water delivery pipelines and utilities, aboveground utilities would be installed to power the facilities, roadways would be needed to provide site access, fencing would be needed for security purposes, and lighting would be needed for operations and security purposes. In addition to these features, groundwater management projects would also construct recharge basins, siphons, conveyance canals, and pump stations.	Northern coastal, northern inland, southern coastal, southern inland
Water use efficiency measures	Wide variety of project types. These activities would occur within already developed areas, where there would be minimal and temporary visual resource effects.	Northern coastal, northern inland, southern coastal, southern inland

[a] See Chapter 2, *Project Description and Alternatives*, Section 2.5, *No Action Alternative*, for a complete definition of the geographic regions.

3.1.2.2 Effects and Mitigation

Impact AES-1: Substantially Degrade the Existing Visual Character or Quality of Public Views (from Publicly Accessible Vantage Points) of the Construction Sites and Visible Permanent Facilities and Their Surroundings in Nonurbanized Areas

No Action Alternative

Changes to land use have the greatest potential to affect visual resources and viewer groups under continuation of existing policies and programs in the absence of the proposed action or alternatives. The No Action Alternative analysis considered the range of programs and projects in the study area and adjacent areas that might have effects on aesthetics and visual resources independent of the proposed action or alternatives (Table 3.12-1).

Under the No Action Alternative, state and federal programs to preserve open space and agricultural lands would continue to be implemented, as described in Delta Conveyance Project Draft EIR Chapter 14, *Land Use*. The land uses in the Delta would be similar to those of today because only limited types of development are allowed in the Primary Zone of the Delta. However, some changes in the study area could occur as a result of localized population growth, continued land subsidence on Delta islands, levee instability and potential flood risk, sea level rise, and restoration activities. These changes could result in the conversion of additional agricultural land uses and would consequently affect the visual landscape.

Localized population growth would convert agricultural lands on the outskirts of towns and cities in the Delta but would not entail new suburban developments in undeveloped areas because of the limits associated with the Primary Zone of the Delta.[2] In addition, conservation easements would limit the conversion of agricultural lands by restricting development on protected lands. This would limit the amount of agricultural land conversion to rural and suburban development perceived by viewers in the area but could result in site-specific adverse effects through temporary construction activities and the alteration of the existing visual character. The severity of such effects would depend on the density and appearance of new development. In addition, new rural and suburban development would increase the amount of light and glare present in these areas.

The 2019 Biological Opinions issued by the National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS) facilitate Delta habitat restoration. Conversion of agricultural lands to restoration sites would typically involve some topographic grading, exposure of bare soil, and change in vegetation that could be visually detrimental. However, the construction effects on the visual landscape would be temporary. The visual changes associated with constructing a restoration site would be similar to the visual character seen in much of the Delta with the ongoing agricultural and restoration operations that are already occurring. Agricultural activities include ground-clearing (disking and tilling) and planting activities. Restoration projects may enhance wildlife viewing, nonmotorized boating, and other passive recreation opportunities and visual access within the Delta by increasing wildlife habitat and public access. These areas may increase glare for a short period of time until vegetation becomes established, or if restoration projects include built facilities that produce glare or require lighting.

As described in Delta Conveyance Project Draft EIR Chapter 16, *Recreation*, ongoing projects and programs such as operation of the Delta Cross Channel, the South Delta Temporary Barriers Program, and the Georgiana Slough Nonphysical Fish Screen would also affect water-dependent recreation by hindering boat passage and access to portions of the Delta's waterways when in place (California Department of Water Resources 2022). Other ongoing resource management plans such as controlling nonnative aquatic vegetation, Delta levee protection and repair programs, hatchery and stocking programs, maintenance of channels and sloughs, and other similar projects and programs help maintain access to Delta waterways, keep levees in working order, and keep lands protected. All these ongoing activities are a part of the existing visual environment and would not have detrimental effects on the existing visual landscape.

In addition to the No Action Alternative projects described above, water supply projects have the potential to affect the visual landscape if the Delta Conveyance Project would not move forward. Water agencies participating in the Delta Conveyance Project have been broken out into four regions: northern coastal, northern inland, southern coastal, and southern inland. Each region would likely pursue a specific suite of water supply projects in a No Action Alternative scenario. Water conservation programs aimed at water reduction would not result in changes to the visual landscape. In addition, water efficiency projects would include a wide variety of project types, such as flow measurement or automation in a local water delivery system, lining of canals, use of buried perforated pipes to water fields, and detection and repair of leaking pipes. These activities would occur within already developed areas, where there would be minimal temporary visual effects to no visual effects. However, changes to land use through the construction and operation of other water supply projects under the No Action Alternative, which would occur in the absence of the proposed action or alternatives, have the greatest potential to affect visual resources and viewer groups.

[2] Land Use Policy P-4 states "Direct new non-agriculturally oriented non-farmworker residential development within the existing unincorporated towns (Walnut Grove, Clarksburg, Courtland, Hood, Locke, and Ryde)" (Delta Protection Commission 2010:9).

These projects are likely to include water recycling projects, groundwater recovery, seawater desalination, and groundwater management projects. Regardless of the region or the type of project, all of these projects have the potential to convert existing land uses to industrial-looking water supply facilities by locating the facilities on undeveloped sites or by redeveloping sites currently occupied by nonindustrial development. Water recycling projects, groundwater recovery, seawater desalination, and groundwater management projects would all require grading and excavation at the project sites to construct foundations and buildings, trenching would occur for the installation of water delivery pipelines and utilities, aboveground utilities would be installed to power the facilities, roadways would be needed to provide site access, fencing would be needed for security purposes, and lighting would be needed for operations and security purposes. In addition to these features, groundwater management projects would also construct recharge basins, siphons, conveyance canals, and pump stations.

If the facilities would be built in an area that is already industrial in nature, the project would have less potential to result in adverse visual effects because there is a higher likelihood that the facility would blend with the surrounding visual landscape and not negatively affect views or viewers. However, it is anticipated that many of these facilities would be located on sites or in areas that are undeveloped, such as along the coast or on agricultural lands. This would alter the existing visual character in the affected areas and could result in effects on views and nearby viewer groups through the removal of vegetation, terrain changes, the introduction of large-scale, industrial-looking facilities and supporting infrastructure (i.e., roadways and utilities), and increases in light and glare. Projects constructed in coastal areas would have the potential to result in greater effects because coastal areas have protections in place due to the scenic nature of views associated with coastal areas. In addition, federal, state, and local scenic byways are more likely to occur in coastal areas. However, projects in inland regions also have the potential to affect scenic state and local roadways. Further, all projects have the potential to result in increases in light and glare.

Desalination projects would most likely be pursued in the northern and southern coastal regions. The southern coastal regions would likely require larger and more desalination projects than the northern coastal region in order to replace the water yield that otherwise would have been received through Delta Conveyance. Groundwater recovery (brackish water desalination) could occur across the northern inland, southern coastal, southern inland regions and in both coastal and inland areas, such as the San Joaquin Valley. The northern and southern coastal regions are also most likely to explore constructing groundwater management projects. The southern coastal region would require more projects than the northern coastal region under the No Action Alternative. Water recycling projects could be pursued in all four regions. The northern inland region would require the fewest number of wastewater treatment/water reclamation plants, followed by the northern coastal region, followed by the southern coastal region. The southern inland region would require the greatest number of water recycling projects to replace the anticipated water yield that it would receive through Delta Conveyance. Overall, the southern coastal region would experience the greatest visual change from the construction and operation of water supply projects under the No Action Alternative, followed by the southern inland region. The northern coastal and northern inland regions would be affected to a lesser degree.

Water supply project types across all regions would involve relatively typical construction techniques (i.e., no large-scale tunnels) and many of the ongoing programs include development of future projects that would be required to conform with the requirements of NEPA and/or federal, state, and local regulations protecting aesthetic and visual resources. In addition, mitigation measures would be developed to protect these resources, such as requiring the implementation of landscaping to screen facilities or replace removed vegetation, the use of aesthetic treatments to make buildings and structures blend with the landscape, or applying minimum lighting standards to reduce the effects associated with nighttime lighting. Overall, the No Action Alternative would result in an array of effects on existing visual quality and character in the Delta and the four geographic regions affected by the need to implement water supply projects in lieu of any of the action alternatives moving forward. Effects would occur at isolated sites that would be spread out over large geographic areas and would not involve one large-scale project that focuses on one specific region or a large area of one region (e.g., the Delta).

All Action Alternatives

The primary features that would affect the existing visual quality and character under all action alternatives, once the facility has been constructed, would be Intakes B and/or C, the Twin Cities Complex, shaft sites, RTM areas, Southern Complex, Southern Complex west of Byron Highway, Bethany Complex and Bethany Reservoir discharge structure, resulting landscape effects left behind from RTM areas, constructed bridges, introduction of tall lattice steel transmission towers, and park-and-ride lots in agricultural areas. These changes would be most evident in the northern portion of the study area, which would undergo extensive changes from the permanent establishment of large industrial facilities and the supporting infrastructure along and surrounding the segment of the Sacramento River from Clarksburg to north of Courtland where the intakes would be situated. The construction of one intake would have an effect on views in this area, and the construction of one or two additional intakes would have even more of an effect on views. Under all action alternatives, the visual landscape in this area of the Delta would be greatly altered.

Overall, construction would take 12 to 14 years, depending on the alternative, and would change the existing visual character in the vicinity of action alternative elements from those of agricultural, rural residential, or riparian and riverine settings to areas involving heavy construction equipment, temporary construction structures, work crews, other support vehicles and other activities that would modify and disrupt short- and long-range views. Construction of the intakes and the accompanying intake structure and sedimentation basins, shaft sites, tunnel work areas, and RTM areas would introduce visually dominant and discordant features in the foreground and middleground views, and these elements would be very noticeable to all viewer groups, even with perimeter landscaping at conveyance facilities. The intakes, Twin Cities Complex, shaft sites, RTM areas, transmission lines, rail access, Southern Complex, Southern Complex west of Byron Highway, and Bethany Complex would be visible from county-designated scenic routes and these features would detract from the visual quality of views from these routes.

Because of the overall viewer sensitivity and visual dominance of these features, these changes would result in reduced scenic quality throughout the study area. Thus, all action alternatives would result in effects on the existing visual quality and character in the study area.

After construction, areas surrounding the intakes, Twin Cities Complex, shaft sites, RTM areas, Southern Complex, Southern Complex west of Byron Highway, Bethany Complex, and Bethany Reservoir discharge structure may be void of vegetation for a short period of time until the landscaping plans designed under the Environmental Commitments (Appendix C1, *Environmental Commitments and Best Management Practices*) are implemented. Landscaping implemented as a result of the Environmental Commitments described in Appendix C1 would improve the aesthetics of the action alternatives to a degree. However, the sites would be in a transitional state, and over a period of a few years, plant species would mature and vegetation would recolonize the sites. These changes would happen in an area known for its open space, agricultural landscapes, and rural characteristics and would segment the visual landscape of the study area, reduce the amount of open space lands available to viewers, and eliminate valued visual resources. The effects of permanent access roads on visual resources would not markedly degrade existing visual character. To reduce effects, the action alternatives would include measures such as installation of visual barriers, aesthetic design treatments and best management practices for building design and maintenance, and implementation of landscaping plans.

Future field investigations would take a short period of time; test holes would be backfilled, and large-scale excavations would be seeded so that disturbed areas would be restored to pre-construction conditions. Therefore, visual effects on the existing visual character and visual quality would be temporary and there would be no permanent effects.

Implementation of Mitigation Measures AES-1a: *Install Visual Barriers between Construction Work Areas and Sensitive Receptors*, AES-1b: *Apply Aesthetic Design Treatments to Project Structures*, and AES-1c: *Implement Best Management Practices to Implement Project Landscaping Plan* would reduce effects by installing visual barriers between construction work areas and sensitive receptors, applying aesthetic design treatments to all structures to the extent feasible, and using best management practices to implement a landscaping plan. In addition, compensatory mitigation would aid in improving views associated with restored lands. However, overall, even though environmental commitments, mitigation measures, and compensatory mitigation would reduce some aspects of the effect on visual quality and character, these measures would not return the visual character of the area to pre-construction views and the action alternatives would continue to have an effect on the visual quality and character of the study area. In addition, the size of the study area and the nature of changes introduced by all action alternatives would result in permanent changes to the regional landscape such that there would be noticeable to very noticeable changes that do not blend or are not in keeping with the existing visual environment based on the viewer's location in the landscape relative to the seen change.

Maintenance and operation of the facilities, once constructed, would not result in further substantial changes to the existing natural viewshed or terrain, alter existing visual quality of the region or eliminate visual resources, or obstruct or permanently reduce visually important features.

Based on the information presented above, even with implementation of proposed mitigation measures and environmental commitments, the effect all action alternatives would have on aesthetics and visual resources may be significant.

Impact AES-2: Substantially Damage Scenic Resources including, but Not Limited to, Trees, Rock Outcropping, and Historic Buildings Visible from a State Scenic Highway

State Route (SR) 160 within Sacramento County is the only designated state scenic highway in the study area.

No Action Alternative

Scenic resources visible from SR 160 could be affected by the projects occurring under the No Action Alternative provided in Table 3.1-1 and located in Sacramento County proximate to the Sacramento River. Changes to scenic highways would occur when the existing visual character and quality of views seen from the scenic highway are altered by a program, plan, or project. The potential changes to the existing visual character and quality of views that could occur under the No Action Alternative are described under Impact AES-1.

All Action Alternatives

Features of the action alternatives that have the potential to affect views associated with SR 160 include construction and operation of the intakes and aboveground supervisory control and data acquisition (SCADA) lines. Effects on state scenic highways result when there are changes to the existing visual character and quality of views associated with these resources. Impact AES-1 discusses effects on visual character and quality and, although the effect mechanism is the same, Impact AES-2 summarizes how these effects would affect state scenic highways.

Visual elements associated with all action alternatives would conflict with the existing forms, patterns, colors, and textures along SR 160; would dominate riverfront views available from SR 160; and would alter broad views and the general nature of the visual experience presently available from SR 160 (thereby permanently damaging the scenic resources along a state scenic highway). Mitigation Measures AES-1b: *Apply Aesthetic Design Treatments to Project Structures*, and AES-1c: *Implement Best Management Practices to Implement Project Landscaping Plan* would help reduce these effects through the application of aesthetic design treatments to all structures, to the extent feasible. However, damage to scenic resources that may be viewed from a state scenic highway remain. The nature of changes introduced by all action alternatives would result in permanent changes to the regional landscape. There would be noticeable to very noticeable changes to the visual character of a scenic highway viewshed that do not blend or are not in keeping with the existing visual environment based upon the viewer's location in the landscape relative to the seen change. These changes have the potential to affect SR 160's designation as a state scenic highway.

Future field investigations would take a short period of time and test sites would be backfilled and seeded so that disturbed areas would be restored to pre-construction conditions. Therefore, visual effects on scenic highways as a result of field investigations would be temporary and there would be no permanent effects.

Several environmental commitments (Appendix C1, *Environmental Commitments and Best Management Practices*) have been identified to reduce emissions of construction-related criteria pollutants, including basic and enhanced fugitive dust control measures and measures for entrained road dust (e.g., irrigation piping with spray nozzles, water trucks, covered truck loads, and truck tire washes) that would greatly reduce the creation of dust clouds that would negatively affect views (Environmental Commitment EC-11: *Fugitive Dust Control*). However, dust clouds are a common part of the agricultural landscape because many of the vineyards and pear and cherry orchards are interspersed with annual row crops that require plowing, which creates dust. As described in Appendix C1, revegetation of disturbed areas would occur as a part of the action alternatives to aid in erosion and sediment control and site reclamation.

Maintenance and operation of all action alternatives, once constructed, would not result in further substantial changes to the existing natural viewshed or terrain, alter existing visual quality of the region or eliminate visual resources, or obstruct or permanently reduce visually important features.

Based on the information presented above, even with implementation of proposed mitigation measures and environmental commitments, the effect all action alternatives would have on scenic resources visible from a state scenic highway may be significant.

Impact AES-3: Have Substantial Effects on Scenic Vistas

A scenic vista is a view of natural environmental, historic, and/or architectural features that has visual and aesthetic qualities of high value to a community. Scenic vistas generally encompass a wide area with long-range views of surrounding elements in the landscape. Effects on scenic vistas result when there are changes to the existing visual character and quality of views associated with these resources.

For the Delta Conveyance Project, the analysis of effects on scenic vistas is based on vista views identified in local and county jurisdictional planning documents, such as open space, circulation, and/or natural resource elements of general plans. The review of planning documentation revealed there are no scenic vista views designated or otherwise identified in the study area.

Given the level topography of the study area, long-range views, such as those observed from scenic vista viewing locations, would be similar to middle- to background views observed from viewing points identified and analyzed under Impact AES-1. With the absence of designated vista viewing points and the similarity of long-range views considered in Impact AES-1, the No Action and action alternatives' effects on scenic vistas would be the same as the visual effects presented in Impact AES-1.

Based on the information presented in Impact AES-1, even with implementation of proposed mitigation measures and environmental commitments, the effect the action alternatives would have on aesthetics and visual resources may be significant.

Impact AES-4: Create New Sources of Substantial Light That Would Adversely Affect Daytime or Nighttime Views of the Construction Areas or Permanent Facilities

No Action Alternative

As described under Impact AES-1, localized population growth would convert agricultural lands on the outskirts of towns and cities in the Delta, but limits associated with the Primary Zone of the Delta and conservation easements would limit the conversion of agricultural lands to new suburban developments by restricting development on protected lands. This would limit the amount of agricultural land conversion to rural and suburban development perceived by viewers in the area. New rural and suburban development would increase the amount of light and glare present in these areas. The severity of such effects would depend on the density and appearance of new development. Restoration projects may increase glare for a short period of time until vegetation becomes established or if restoration projects include built facilities that produce glare or require lighting. Water recycling projects, groundwater recovery, seawater desalination, and groundwater management projects would include built features (e.g., buildings and windows) that could increase glare. In addition, lighting would be needed for operations and security purposes that would increase nighttime light and glare. If the facilities would be built in areas that are already developed and well-lit, the projects would have less potential to result in effects because projects would only result in incremental changes in light and glare that would not negatively affect views or viewers. However, there is a higher likelihood that the project would result in effects if they were to be located on sites or in areas that are undeveloped, such as along the coast or on agricultural lands. Such projects have the potential to result in increases in light and glare by introducing new sources of nighttime light and glare to areas that are unlit or lowly lit, which would negatively affect nighttime views of the dark sky and could negatively affect nearby viewers.

All Action Alternatives

Construction of the water-conveyance facilities would occur over a period of 12 to 14 years. Specific activities would vary over time, depending on the activities and equipment needed at any given time. The majority of activities required to construct water-conveyance facilities are assumed to occur 5 days a week for up to an average of 10 hours per day, from sunrise to sunset, during the entire construction period. This would limit the need for construction lighting and equipment use during nighttime hours. However, there would be limited exceptions for specific construction activities needed at certain facilities, which would require nighttime construction lighting and equipment use.

Continuous concrete pours would occur 24 hours per day for construction of Intakes B and/or C and would require nighttime lighting. Like the intakes, for a short period of time all shaft sites would require continuous concrete pours 24 hours per day, which would require nighttime lighting (the majority of shaft sites, except for Twin Cities Complex, Lower Roberts Island Launch and Reception Shaft and RTM Storage, Southern Complex, and Bethany Complexes, are located far enough from sensitive receptors that lighting effects would not be generated). To accommodate the continuous pours needed for construction of the intakes and tunnels, the Lambert Road Concrete Batch Plant would operate periodically for 24 hours per day during construction. Hours of operation of the batch plant would be contingent on the activity occurring at a given time (e.g., intakes, tunnels). Further, RTM excavation, testing, drying, and movement from the tunnel launch shaft sites would occur 20 hours per day, Monday through Friday. The nighttime security lighting proposed for the Bethany Road Park-and-Ride lot would create a noticeable new source of light. During construction, glare would be created by the reflection of headlights or sunlight off of windshields of parked employee vehicles or construction equipment, but these instances would be limited to a fleeting moment as roadway travelers pass by a park-and-ride lot or an active construction site and would not vary greatly from the intermittent glare created under existing conditions due to reflections of agricultural equipment or passing vehicles.

There is a potential for effects associated with construction light and glare under all action alternatives because there would be new sources of light at the water-conveyance facilities, including in and around the waterways, intake structures, and Southern and Bethany Complexes. Construction of water-conveyance facilities would increase the amount of nighttime lighting, although limited to the facility sites in the Delta. As the study area currently experiences low levels of light because there are fewer existing sources of light and glare than what is typical in urban areas, the light and glare potentially attributable to the water-conveyance facilities would be notable. Mitigation Measures AES-1b: *Apply Aesthetic Design Treatments to Project Structures,* and AES-1c: *Implement Best Management Practices to Implement Project Landscaping Plan*, would reduce these potential effects by ensuring that reflective surfaces are minimized and that vegetative screening is planted to filter nighttime lighting seen by sensitive receptors. Mitigation Measures AES-4a: *Limit Construction Outside of Daylight Hours within 0.25 Mile of Residents at the Intakes*, AES-4b: *Minimize Fugitive Light from Portable Sources Used for Construction*, and AES-4c: *Install Visual Barriers along Access Routes, Where Necessary, to Prevent Light Spill from Truck Headlights towards Residences*, would reduce construction lighting effects by limiting construction to daylight hours within 0.25 mile of residents; minimizing light trespass from portable sources used for construction; and installing visual barriers along access routes, where necessary, to prevent light spill from truck headlights toward residences.

Future field investigations would take place during the day and would not require the use of bright, nighttime lighting or result in a change in glare.

Operations and maintenance of the action alternatives would introduce new sources of light at the permanent locations. Although the lighting would be designed to be shielded and oriented in such a manner so as not to subject the immediate surroundings to extremes in the levels of light, these types of light generate an ambient nighttime luminescence that is visible from a distance. This glow contrasts with the existing immediate rural, dark character of the surrounding landscape. Lighting effects would be minimized by the use of motion-activated switches and with the design features described above. While these new sources of light would be visible to nearby residences and vehicles passing by, they would only be used when necessary and not for extended periods of time.

The main potential sources of glare from operations would occur at the intakes and the Southern Complex forebay. Intakes B and C and their associated large sediment basins, sediment drying lagoons, and support structures would create glare due to created water surfaces and their potential to be made of materials or be colored in a manner that easily reflects light. The intake screens and panels above them would be made of stainless steel with a matte finish that would reduce the reflection of light. Glare on the sedimentation basins would be minimal because the only sources of light at the site would be motion-sensor lighting and moonlight. The basins would be surrounded by a levee that would impede views from surrounding lands but would remain visible from SR 160. It is not anticipated that sunlight reflecting off of the water surfaces of the Southern Complex forebay would create new sources of nuisance glare because the water surface would not be visible from ground-level views. While glare would be an issue for air travelers using Byron Airport, this issue is already managed with the presence of the Clifton Court Forebay. Although there is currently no decision or direction to use non-specular (non-glare) conductors, the addition of transmission lines would not add a large number of lines relative to the number of lines already present in the area. Due to the minimal amount of glare that would be created during the operation of water-conveyance facilities, and the existing glare effects from the Sacramento River where glare-inducing features of the action alternatives would be visible, operations would not markedly change the amount or intensity of glare effects in the vicinity.

Based on the information presented above, and considering the proposed mitigation measures and environmental commitments, the effect on daytime or nighttime views from new sources of light under all action alternatives does not appear to be significant.

3.1.2.3 Cumulative Analysis

This cumulative effect analysis considers projects that could affect the same resources and, where relevant, in the same time frame as the action alternatives, resulting in a cumulative effect. The visual environment is expected to change as a result of past, present, and reasonably foreseeable future projects related to changes in land use. It is expected that changes to the existing visual environment would take place, even though reasonably foreseeable future projects likely would include typical design and construction practices to avoid or minimize potential effects.

Cumulative projects include those within and in proximity to the study area (e.g., within the Lower Sacramento Valley, Delta, Bay Area, and Upper San Joaquin Basin). Projects that lie outside of the study area (e.g., projects occurring in the Upper Sacramento Valley, Lower San Joaquin Basin, and further south) are not included. Only projects that would result in visible changes to the landscape are included in the cumulative analysis. Projects that would not result in visible changes to the landscape include such plans or programs that monitor or implement existing regulations and programs (e.g., implementing stormwater regulations, Fish Screen and Passage Program), plans or programs that are currently in operation and are a part of the existing visual environment (e.g., invasive species control programs), and programs that would manage water flows for identified species because variable flows are already a naturally occurring climatic condition.

The programs, plans, and projects included in the cumulative analysis are summarized in Table 3.1-2, along with their anticipated effects on aesthetics and visual resources.

Table 3.1-2. Plans, Policies, and Programs Included in the Cumulative Analysis

Program/ Project	Agency	Status	Description of Program/Project	Effects on Aesthetic and Visual Resources
Fremont Landing Conservation Bank	CDFW	Ongoing	The project would preserve and enhance 40 acres of existing riparian and wetland habitat and restore/create 60 acres of riparian woodland and wetland sloughs within the floodplain of the Sacramento River at Fremont Landing Conservation Bank site for the federally and state listed fish species. Three borrow pits would be connected to the Sacramento River to reduce or eliminate fish stranding.	The project would result in the conversion of existing land uses to restored habitat and the enhancement of marginal habitats to increase habitat value. This project would result in beneficial effects through the reintroduction of habitats that had been lost through the original conversion of natural lands to agriculture and could increase biodiversity that would result in benefits to wildlife and scenery viewing. This would not be an incremental contribution to aesthetic effects in the study area.
Staten Island Wildlife-Friendly Farming Demonstration	CDFW	Ongoing	This project involves the acquisition and restoration of Staten Island (9,269 acres) by The Nature Conservancy to protect critical agricultural wetlands used by waterfowl and Sandhill cranes. The project practices increased habitat availability by flooding 2,500–5,000 acres of corn for a longer duration than previously possible.	The farming demonstration would increase length of times flooding is seen on the island. Beneficial visual effects could result where restoration and enhancement activities improve existing visual conditions and increase visual diversity. Would increase sandhill crane viewing opportunities. This would not be an incremental contribution to aesthetic effects in the study area.
Central Valley Flood Protection Plan (CVFPP)	DWR	Ongoing	CVFPP will be a sustainable, integrated flood management plan describing the existing flood risk in the Central Valley and recommending actions to reduce the probability and consequences of flooding. Produced in partnership with federal, tribal, local, and regional partners and other interested parties, CVFPP will	CVFPP would result in site-specific repairs or levee upgrades over areas of varying sizes. Some projects would repair levees in a way that would appear visually similar to adjacent levees. However, there would be larger levee rehabilitation projects that would raise levees to protect public and

Program/ Project	Agency	Status	Description of Program/Project	Effects on Aesthetic and Visual Resources
			also identify the mutual goals, objectives, and constraints important in the planning process; distinguish plan elements that address mutual flood risks; and recommend improvements to the state-federal flood protection system.	private lands that would result in visual effects through vegetation removal and increased levee heights. This would be an incremental contribution to aesthetic effects in the study area.
Delta Levees Flood Protection Program	DWR	Ongoing	This grants program works with more than 60 reclamation districts in the Delta and Suisun Marsh to maintain and improve the flood control system and provide protection to public and private investments in the Delta by maintaining, planning, and completing levee rehabilitation projects. The program presently focuses on flood control projects and related habitat projects for eight western Delta Islands (Bethel, Bradford, Holland, Hotchkiss, Jersey, Sherman, Twitchell and Webb Islands) and for the towns of Thornton and Walnut Grove.	This program would result in site-specific repairs or levee upgrades over areas of varying sizes. Some projects would repair levees in a way that would appear visually similar to adjacent levees. However, there would be larger levee rehabilitation projects that would raise levees to protect public and private lands that would result in visual effects through vegetation removal and increased levee heights. This would be an incremental contribution to aesthetic effects in the study area.
Delta Risk Management Strategy (DRMS)	DWR	Completed	The first phase of DRMS analyzes the risks and consequences of levee failure in the Delta region. The analysis considers current and future risks of levee failures from earthquakes, high water conditions, climate change, subsidence, and dry-weather events. The analysis also estimates the consequences of levee failures to the local and state economy, public health and safety, and the environment. The DRMS Phase 1 report findings will be used to develop a set of strategies to manage levee failure risks in the Delta and to improve the management of state funding for levee maintenance and improvement.	Projects that would evolve from DRMS findings would result in site-specific repairs or levee upgrades over areas of varying sizes. Some projects would repair levees in a way that would appear visually similar to adjacent levees. However, there would be larger levee rehabilitation projects that would raise levees to protect public and private lands that would result in visual effects through vegetation removal and increased levee heights. This would be an incremental contribution to aesthetic effects in the study area.
FloodSAFE California	DWR	Ongoing	FloodSAFE promotes public safety through integrated flood management while protecting environmental resources and emphasizes action in the Delta. This program is very broad, but	Projects that would evolve from FloodSAFE findings would result in site-specific repairs or levee upgrades over areas of varying sizes. Some projects would repair levees

Program/ Project	Agency	Status	Description of Program/Project	Effects on Aesthetic and Visual Resources
			it is designed to improve flood safety throughout the state while encouraging sound conservation actions that benefit California's native fish and wildlife and promote wildlife-friendly agricultural practices.	in a way that would appear visually similar to adjacent levees. However, there would be larger levee rehabilitation projects that would raise levees to protect public and private lands that would result in visual effects through vegetation removal and increased levee heights. Beneficial indirect effects would come from reducing the potential for catastrophic flooding. This would be an incremental contribution to aesthetic effects in the study area.
Levee Repairs Program	DWR	Ongoing	This is a program to repair state and federal project levees. To date, hundreds of levee repair sites have been identified. The most critical sites have already been improved. Repairs to other sites are either in progress or scheduled to be completed in the near future, and still more repair sites are in the process of being identified, planned, and prioritized.	This program would result in site-specific repairs or levee upgrades over areas of varying sizes. Some projects would repair levees in a way that would appear visually similar to adjacent levees. However, there would be larger levee rehabilitation projects that would raise levees to protect public and private lands that would result in visual effects through vegetation removal and increased levee heights. This would be an incremental contribution to aesthetic effects in the study area.
Lower Yolo Restoration Project	State and Federal Contractors Water Agency, DWR and MOA Partners	Completed	The project, located in the lower Yolo Bypass, is a tidal and seasonal salmon habitat project restoring tidal flux to about 1,100 acres of existing pasture land. The goal of this project is to provide important new sources of food and shelter for a variety of native fish species in strategic locations in addition to ensuring continued or enhanced flood protection. The project is part of an adaptive management approach in the Delta to learn the relative benefits of different fish habitats, quantify the production and transport of food, and understand how fish	The project would result in the conversion of existing land uses to restored habitat and the enhancement of marginal habitats to increase habitat value. This project would result in beneficial effects through the reintroduction of habitats that had been lost through the original conversion of natural lands to agriculture and could increase biodiversity that would result in benefits to wildlife and scenery viewing. This would not be an incremental contribution to aesthetic effects in the study area.

Program/ Project	Agency	Status	Description of Program/Project	Effects on Aesthetic and Visual Resources
			species take advantage of new habitat.	
Mayberry Farms Subsidence Reversal and Carbon Sequestration Project	DWR	Completed	The project would restore approximately 192 acres of emergent wetlands and enhance approximately 115 acres of seasonally flooded wetlands. It was conceived as a demonstration project that would provide subsidence reversal benefits and develop knowledge that could be used by operators of private wetlands (including duck clubs) that manage lands for waterfowl-based recreation.	The project would result in the conversion of existing land uses to restored habitat and the enhancement of marginal habitats to increase habitat value while also providing subsidence reversal. This project would result in beneficial effects through the reintroduction of habitats that had been lost through the original conversion of natural lands to agriculture and could increase biodiversity that would result in benefits to wildlife and scenery viewing. This would not be an incremental contribution to aesthetic effects in the study area.
North Delta Flood Control and Ecosystem Restoration Project	DWR	Ongoing	The project is intended to improve flood management and provide ecosystem benefits in the North Delta area through actions such as construction of setback levees and configuration of flood bypass areas to create quality habitat for species of concern. The purpose of the project is to implement flood control improvements in a manner that benefits aquatic and terrestrial habitats, species, and ecological processes. Flood control improvements are needed to reduce damage to land uses, infrastructure, and the Bay-Delta ecosystem resulting from overflows caused by insufficient channel capacities and catastrophic levee failures in the project study area.	The project would result in conversion of existing land uses to restored habitat and enhancement of marginal habitats to increase habitat value. This project would result in beneficial effects through reintroduction of habitats that had been lost through the original conversion of natural lands to agriculture and could increase biodiversity that would result in benefits to wildlife and scenery viewing. Flood control improvements may result in visual effects where new or taller levees are introduced or rock slope protection replaces vegetation on levee slopes. This would be an incremental contribution to aesthetic effects in the study area.
Cache Slough Area Restoration	DWR and CDFW	Ongoing	Restoration efforts would support native fish species by creating or enhancing natural habitats and improving the food web that fish require. Surrounding lands that are at elevations that would function as floodplain or marsh if not separated by levees could also be included in the Cache Slough	Project would give rise to projects that would affect the visual landscape. Beneficial visual effects could result where restoration and enhancement activities improve existing visual conditions and increase visual diversity. Visual effects could result where restoration,

Program/ Project	Agency	Status	Description of Program/Project	Effects on Aesthetic and Visual Resources
			Area. This broader area includes roughly 45,000 acres of existing and potential open water, marsh, floodplain, and riparian habitat.	enhancement, and management measures require built elements that detract from, instead of compliment or improve, the visual landscape. This would be an incremental contribution to aesthetic effects in the study area.
Dutch Slough Tidal Marsh Restoration Project	DWR and California State Coastal Conservancy	Ongoing	The project would restore wetland and uplands and provide public access to the 1,166-acre Dutch Slough property. The project would provide ecosystem benefits, including habitat for sensitive aquatic species. Two neighboring projects proposed by other agencies that are related to the Dutch Slough Restoration Project collectively contribute to meeting project objectives: the City of Oakley's proposed Community Park and Public Access Conceptual Master Plan for 55 acres adjacent to the wetland restoration project and 4 miles of levee trails, and the Ironhouse Sanitary District's West Marsh Creek Delta Restoration Project, a restoration of a portion of the Marsh Creek delta on an adjacent 100-acre parcel.	The project would result in the conversion of existing land uses to restored habitat and the enhancement of marginal habitats to increase habitat value. This project would result in beneficial effects through the reintroduction of habitats that had been lost through the original conversion of natural lands to agriculture and could increase biodiversity that would result in benefits to wildlife and scenery viewing. This would not be an incremental contribution to aesthetic effects in the study area.
Franks Tract Futures	DWR and Reclamation	Planning phase	Under the project, state and federal agencies would evaluate and implement a strategy to reduce salinity levels in the south Delta and at the water export facilities. The project would improve water supply reliability by reconfiguring levees and/or Delta circulation patterns around Franks Tract while accommodating recreational interests.	This would introduce considerable industrial-looking structures on waterways where none presently exists. This would alter the existing visual character at this location and result in effects on nearby viewer groups through construction and operation. This would be an incremental contribution to aesthetic effects in the study area.
Sacramento-San Joaquin Delta Estuary TMDL for Methylmercury	Central Valley Regional Water Quality Control Board	Ongoing	The Central Valley Regional Water Quality Control Board's draft Basin Plan amendment would require proponents of new wetland and wetland restoration projects scheduled for construction after 2011 to	These projects would result in measures to improve water quality that could result in visual changes to the landscape such as from erosion and sediment control features or mine reclamations

Program/ Project	Agency	Status	Description of Program/Project	Effects on Aesthetic and Visual Resources
			either participate in a comprehensive study plan or implement a site-specific study plan, evaluate practices to minimize methylmercury discharges, and implement newly developed management practices as feasible. Projects would be required to include monitoring to demonstrate effectiveness of management practices. Activities, including changes to water management and storage in and upstream of the Delta, changes to salinity objectives, dredging and dredge materials disposal and reuse, and changes to flood conveyance flows, would be subject to the open water methylmercury allocations.	that alter the existing visual character. These measures could result in visual effects if they introduce discordant visual features into the landscape or they could result in beneficial effects if they restore the visual environment by recontouring the topography and revegetating the landscape, thereby reducing the amount of scarring upon the landscape and restoring natural plant communities to soften the visual appearance of such landscapes and improving aesthetics. This would be an incremental contribution to aesthetic effects in the study area.
Liberty Island Conservation Bank	Reclamation District 2093	Ongoing	This project would create a conservation bank on the northern tip of Liberty Island that would preserve, create, restore, and enhance habitat for native Delta fish species. The project consists of creating tidal channels, perennial marsh, riparian habitat, and occasionally flooded uplands on the site. The project also includes the breaching of the northernmost east–west levee, and preservation and restoration of shaded riverine aquatic habitat along the levee shorelines of the tidal sloughs.	The project would result in the conversion of existing land uses to restored habitat and the enhancement of marginal habitats to increase habitat value. This project would result in beneficial effects through the reintroduction of habitats that had been lost through the original conversion of natural lands to agriculture and could increase biodiversity that would result in benefits to wildlife and scenery viewing. This would not be an incremental contribution to aesthetic effects in the study area.
Flood Management Program	SAFCA, CVFPB, and USACE	Ongoing	The program provides flood control improvements. Projects include the South Sacramento Streams Project and the Sacramento River Bank Protection Project. The South Sacramento Streams Project consists of levee, floodwall, and channel improvements along the Sacramento River to protect the City of Sacramento from flooding. The Sacramento River Bank Protection Project addresses long-term erosion protection along the	This program would result in site-specific repairs or levee upgrades over areas of varying sizes. Some projects would repair levees in a way that would appear visually similar to adjacent levees. However, there would be larger levee rehabilitation projects that would raise levees to protect public and private lands that would result in visual effects through vegetation removal and increased levee heights. This

Program/ Project	Agency	Status	Description of Program/Project	Effects on Aesthetic and Visual Resources
			Sacramento River and its tributaries. Bank protection measures typically consist of large angular rock placed to protect the bank, with a layer of soil/rock material to allow bank revegetation.	would be an incremental contribution to aesthetic effects in the study area.
SRWTP Facility Upgrade Project (EchoWater)	Sacramento Regional County Sanitation District	Ongoing	This project would upgrade existing secondary treatment facilities to advanced unit processes including improved nitrification/ denitrification and filtration at the Sacramento Regional Wastewater Plant.	This would upgrade facilities that likely result in minor visual changes to pre-existing treatment facilities. This would not be an incremental contribution to aesthetic effects in the study area.
Delta Water Supply Project	Stockton	Completed	The project would develop a new supplemental water supply for the Stockton metropolitan area by diverting water from the Delta and conveying it through a pipeline to a surface water treatment plant. Initially, the project would have the capacity to meet approximately one-third of Stockton's water needs.	This would introduce industrial-looking facilities on the river where none presently exists and would expand existing water-conveyance facilities. This would alter the existing visual character at this location and could result in effects on nearby viewer groups through construction and operation. This would be an incremental contribution to aesthetic effects in the study area.
Sacramento River Bank Protection Project	U.S. Army Corps of Engineers	Planning phase	The project is a long-term flood risk management project designed to enhance public safety and help protect property along the Sacramento River and its tributaries. While the original authorization approved the rehabilitation of 430,000 linear feet of levee, the 1974 Water Resources Development Act added 405,000 linear feet to the authorization and a 2007 bill authorized another 80,000 linear feet for a total of 915,000 linear feet of project.	The project would result in site-specific repairs or levee upgrades over areas of varying sizes. Some projects would repair levees in a way that would appear visually similar to adjacent levees. However, there would be larger levee rehabilitation projects that would raise levees to protect public and private lands that would result in effects through vegetation removal and increased levee heights. This would be an incremental contribution to aesthetic effects in the study area.
San Francisco Bay to Stockton Deep Water Ship Channel Project	U.S. Army Corps of Engineers, Port of Stockton, and Contra Costa County	Planning phase	A joint EIS/EIR will evaluate the action of navigational improvements to the Stockton Deep Water Ship Channel. A General Reevaluation Report is being prepared to determine the feasibility of modifying the current dimensions of the West	Dredging operations require construction activities to perform the actions, but they are short-term in nature. Dredging may alter the visual landscape by removing areas of sediment accumulation where vegetation has

Program/ Project	Agency	Status	Description of Program/Project	Effects on Aesthetic and Visual Resources
	Water Agency		Richmond, Pinole Shoal, Suisun Bay, and Stockton Ship Channels, which are currently maintained to 35 feet and provide access to oil terminals, industry in Pittsburg, and the Port of Stockton. The proposed project consists of altering the depth of the deep draft navigation route.	established, and removal of such features could result in visual effects. Dredge material placement also poses the potential to affect the visual landscape if measures are not taken to blend such elements into the landscape or to use design measures to improve the landscape within which they are disposed. Dredge material placement could result in beneficial effects is used for restoration purposes. This would be an incremental contribution to aesthetic effects in the study area.
Sacramento Deep Water Ship Channel Project	USACE and Port of Sacramento	Ongoing	The proposed project would complete the deepening and widening of the navigation channel to its authorized depth of 35 feet. Deepening of the existing ship channel is anticipated to allow for movement of cargo via larger, deeper draft vessels. Widening portions of the channel would increase navigational safety by increasing maneuverability. The 46.5-mile-long ship channel lies within Contra Costa, Solano, Sacramento, and Yolo Counties and serves the marine terminal facilities at the Port of Sacramento. The Sacramento Deep Water Ship Channel joins the existing 35-foot-deep channel at New York Slough, thereby affording the Port of Sacramento access to San Francisco Bay Area harbors and the Pacific Ocean.	Dredging operations require construction activities to perform the actions, but they are short-term in nature. Dredging may alter the visual landscape by removing areas of sediment accumulation where vegetation has established, and removal of such features could result in visual effects. Dredge material placement also poses the potential to affect the visual landscape if measures are not taken to blend such elements into the landscape or to use design measures to improve the landscape within which they are disposed. Dredge material placement could result in beneficial effects is used for restoration purposes. This would be an incremental contribution to aesthetic effects in the study area.
Anadromous Fish Screen Program (AFSP)	Reclamation and USFWS	Completed	AFSP will help prevent entrainment of fish at priority diversions throughout the Central Valley.	This project would result in incremental additions to the amount of infrastructure seen on waterbodies and waterways in the study area. This could result in effects on nearby viewer groups through construction and operation. This would be an incremental contribution to aesthetic effects in the study area.
Delta Fish Species	USFWS, Reclamation,	Planning phase	The Interim Federal Action Plan includes the development of a	The project would repurpose the Rio Vista Army base and

Program/ Project	Agency	Status	Description of Program/Project	Effects on Aesthetic and Visual Resources
Conservation Hatchery	DWR, and CDFW		permanent fish restoration facility in Rio Vista. In addition, upgrades to the existing Delta Smelt Research and Culture Facility at Banks Pumping Plant would be made.	improve the existing visual character at the project location, which is currently blighted. This would not be an incremental contribution to aesthetic effects in the study area.
West Sacramento Levee Improvements Program	WSAFCA and USACE	Planning phase	The program would construct improvements to the levees protecting West Sacramento to meet local and federal flood protection criteria. The program area includes the entire WSAFCA boundaries which encompasses portions of the Sacramento River, the Yolo Bypass, the Sacramento Bypass, and the Sacramento Deep Water Ship Channel. The system associated with these waterways includes over 50 miles of levees.	This program would result in site-specific repairs or levee upgrades over areas of varying sizes. Some projects would repair levees in a way that would appear visually similar to adjacent levees. However, there would be larger levee rehabilitation projects that would raise levees to protect public and private lands that would result in visual effects through vegetation removal and increased levee heights. This would be an incremental contribution to aesthetic effects in the study area.
Franklin Bulk Substation	Sacramento Municipal Utility District	Planning phase	This project will construct a new distribution substation, the Rancho Seco-Pocket 230 kV No. 1 Line will be looped into the substation, and 2-16.2 MVAr of capacitor banks will be installed.	This project would introduce project facilities on open space lands where none presently exist and would increase the presence of utility infrastructure in the area. This would alter the existing visual character in the affected area and could result in effects on nearby viewer groups through construction and operation. This would be an incremental contribution to aesthetic effects in the study area.
Twitchell Island Levee Habitat Restoration Project	CDFW	Planning phase	This project has been identified as one of the projects that will be implemented under California EcoRestore.	Beneficial visual effects could result where restoration and enhancement activities improve existing visual conditions and increase visual diversity. Visual effects could result where restoration, enhancement, and management measures require built elements that detract from, instead of compliment or improve, the visual landscape. This would be an incremental contribution to aesthetic effects in the study area.

Program/ Project	Agency	Status	Description of Program/Project	Effects on Aesthetic and Visual Resources
Grizzly Slough Floodplain Project	DWR	Planning phase	The project will reduce flooding and provide contiguous aquatic and floodplain habitat along the downstream portion of the Cosumnes Preserve by modifying levees on Grizzly Slough. Benefits to ecosystem processes, fish and wildlife, will be achieved by recreating floodplain seasonal wetlands and riparian habitat on the Grizzly Slough proper.	Beneficial visual effects could result where restoration and enhancement activities improve existing visual conditions and increase visual diversity. Visual effects could result where restoration, enhancement, and management measures require built elements that detract from, instead of compliment or improve, the visual landscape. This would be an incremental contribution to aesthetic effects in the study area.
Lower Putah Creek Realignment	CDFW	Completed	The project will restore 300–700 acres of tidal freshwater wetlands, creating 5 miles of a new fish channel, improving anadromous fish access to 25 miles of stream, and restoring at least 5,000 square feet of salmon spawning habitat.	Beneficial visual effects could result where restoration and enhancement activities improve existing visual conditions and increase visual diversity. Visual effects could result where restoration, enhancement, and management measures require built elements that detract from, instead of compliment or improve, the visual landscape. This would be an incremental contribution to aesthetic effects in the study area.
Wallace Weir Improvements and Tule Canal Agricultural Crossings	Reclamation District 108 and DWR	Planning phase	The project replaced the seasonal earthen dam at Wallace Weir with a permanent, operable structure that would provide year-round operational control. The project also included a fish rescue facility that returns fish back to the Sacramento River.	Beneficial visual effects could result where restoration and enhancement activities improve existing visual conditions and increase visual diversity. Visual effects could result where restoration, enhancement, and management measures require built elements that detract from, instead of compliment or improve, the visual landscape. This would be an incremental contribution to aesthetic effects in the study area.
Prospect Island Tidal Habitat Restoration Project	DWR and CDFW	Planning phase	The intent of the project is to restore freshwater tidal marshes and associated aquatic habitat. However, funding for the wildlife refuge and the restoration project was never authorized. This project has	Beneficial visual effects could result where restoration and enhancement activities improve existing visual conditions and increase visual diversity. Visual effects could result where restoration,

Program/ Project	Agency	Status	Description of Program/Project	Effects on Aesthetic and Visual Resources
			been identified as one of the projects that will be implemented under California EcoRestore. The Final EIR was certified in 2019.	enhancement, and management measures require built elements that detract from, instead of compliment or improve, the visual landscape. This would be an incremental contribution to aesthetic effects in the study area.
Southport Early Implementation Project	WSAFCA	Planning phase	The WSAFCA is proposing the flood risk–reduction measures that will be implemented along 6 miles of the levee that runs along the west bank of the Sacramento River from the Barge Canal to the South Cross Levee.	Beneficial visual effects could result where restoration and enhancement activities improve existing visual conditions and increase visual diversity. Visual effects could result where restoration, enhancement, and management measures require built elements that detract from, instead of compliment or improve, the visual landscape. This would be an incremental contribution to aesthetic effects in the study area.
McCormack-Williamson Tract Flood Control and Ecosystem Restoration Project	DWR	Planning phase	This project is a part of the North Delta Flood Control and Ecosystem Restoration Project and will implement flood control improvements principally on and around McCormack-Williamson Tract in a manner that benefits aquatic and terrestrial habitats, species, and ecological processes. Flood control improvements are needed to reduce damage to land uses, infrastructure, and the Bay-Delta ecosystem caused by catastrophic levee failures in the project study area.	Beneficial visual effects could result where restoration and enhancement activities improve existing visual conditions and increase visual diversity. Visual effects could result where restoration, enhancement, and management measures require built elements that detract from, instead of compliment or improve, the visual landscape. This would be an incremental contribution to aesthetic effects in the study area.
Hill Slough Restoration Project	CDFW	Planning phase	The purpose of the project is to restore brackish tidal marsh and associated upland ecotone at the northern Suisun Marsh near the corner of Highway 12 and Grizzly Island Road to benefit endangered as well as migratory and resident species.	Beneficial visual effects could result where restoration and enhancement activities improve existing visual conditions and increase visual diversity. Visual effects could result where restoration, enhancement, and management measures require built elements that detract from, instead of compliment or improve, the visual landscape. This would

Program/ Project	Agency	Status	Description of Program/Project	Effects on Aesthetic and Visual Resources
				be an incremental contribution to aesthetic effects in the study area.
Goat Island at Rush Ranch Tidal Marsh Restoration	Solano Land Trust	Planning phase	This project aims to restore tidal marsh habitat by reconnecting and reestablishing tidal marsh hydrology and related physical and ecological processes within and around Goat Island Marsh. This project will be implemented in conjunction with construction of an Interpretive Nature Trail to Goat Island Marsh to offset public access effects resulting from closure of the levee trail.	Beneficial visual effects could result where restoration and enhancement activities improve existing visual conditions and increase visual diversity. Visual effects could result where restoration, enhancement, and management measures require built elements that detract from, instead of compliment or improve, the visual landscape. This would be an incremental contribution to aesthetic effects in the study area.
Knights Landing Outfall Gates Fish Barrier Project	California Natural Resources Agency	Completed	The project will rehabilitate the outfall gates by repairing known structural deficiencies (including scouring found at the inlet and outlet gates), replacing worn out appurtenances, construct a trash barrier system to protect the gates and ease debris collection, and upgrading the electrical and communication system to include backup capability to meet current USACE operations and maintenance standards	Visual effects are likely to be minimal because changes would be consistent with existing visual conditions. This would not be an incremental contribution to aesthetic effects in the study area.

EACCS = East Alameda County Conservation Strategy; CDFW = California Department of Fish and Wildlife; USFWS = U.S. Fish and Wildlife Service; DWR = California Department of Water Resources: LSIWA = Lower Sherman Island Wildlife Area; LMP Land Management Plan; BLM = U.S. Bureau of Land Management; CALFED = California Federal Bank; CVFPP = Central Valley Flood Protection Plan; DRMS = Delta Risk Management Strategy; I- = Interstate; MOA = Memorandum of Agreement; Reclamation = U.S. Bureau of Reclamation; RHJV = Riparian Habitat Joint Venture; CVJV = Central Valley Joint Venture; TMDL = Total Maximum Daily Load; HCP = Habitat Conservation Plan; NCCP = Natural Community Conservation Plan; EIR = environmental impact report; CVP = Centra Valley Project; SR= State Route; SWP = State Water Project; CCWD = Contra Costa Water District; Management Plan = Land Use and Resource Management Plan; BDCP = Bay Delta Conservation Plan; TCD = Temperature Control Device; NMFS = National Marine Fisheries Service; NSJCGBA = Northeastern San Joaquin County Groundwater Banking Authority; USACE = U.S. Army Corps of Engineers; SRWRS = Sacramento River Water Reliability Study; SAFCA = Sacramento Area Flood Control Agency; SRWTP = Sacramento Regional Water Treatment Plant; BCDC = Bay Conservation and Development Commission; SFPUC = San Francisco Public Utilities Commission; EIS = environmental impact statement; DMC = Delta Mendota Canal; AFSP = Anadromous Fish Screen Program; RPA = Reasonable and Prudent Alternative; WSAFCA = West Sacramento Area Flood Control Agency.

Some of the cumulative effects described include localized effects that would occur in direct combination with the action alternative in the vicinity of alternative conveyance facilities and restoration actions. Other cumulative effects described consider more indirect additive effects on aesthetics and visual resources in the region, including outside of the Delta study area.

Implementation of Mitigation Measures AES-1a: *Install Visual Barriers between Construction Work Areas and Sensitive Receptors*, AES-1b: *Apply Aesthetic Design Treatments to Project Structures*, and AES-1c: *Implement Best Management Practices to Implement Project Landscaping Plan*, would partially reduce effects by installing visual barriers between construction work areas and sensitive receptors, applying aesthetic design treatments to all structures to the extent feasible, and using best management practices to implement a landscaping plan. In addition, compensatory mitigation would aid in improving views associated with restored lands. However, even though environmental commitments, mitigation measures, and compensatory mitigation would reduce some aspects of the effect on visual quality and character and scenic highways, the effects would remain. While the size of the study area and the nature of changes introduced by all action alternatives would result in permanent changes to the landscape at the water-conveyance facilities, the changes would not be noticeable because they would visually blend with other structures throughout the Delta landscape (i.e., agricultural facilities). Thus, the contribution to the substantial alteration of the existing visual quality and character and the state scenic highway in the study area would be visually dispersed.

In addition, all of the cumulative projects also have the potential to contribute to a cumulative increase of light and glare in the study area due to increased rural and suburban development, lighting of facilities and buildings, removal of vegetation, and increased water surfaces. However, the restoration and enhancement projects have the potential to reduce glare by introducing trees and shrubs into a landscape that was in agricultural production and lacking mature vegetative cover that would absorb light and reduce the potential for glare. While this would be beneficial, the amount of new artificial sources of light and glare through development and introduction of anthropogenic features would continue to have an effect on nearby receptors. Mitigation Measures AES-1b: *Apply Aesthetic Design Treatments to Project Structures*, and AES-1c: *Implement Best Management Practices to Implement Project Landscaping Plan*, would help reduce these effects by ensuring that reflective surfaces are minimized and that vegetative screening is planted to filter nighttime lighting seen by sensitive receptors. Mitigation Measure AES-4a: *Limit Construction Outside of Daylight Hours within 0.25 Mile of Residents at the Intakes*, AES-4b: *Minimize Fugitive Light from Portable Sources Used for Construction,* and AES-4c: *Install Visual Barriers along Access Routes, Where Necessary, to Prevent Light Spill from Truck Headlights toward Residences,* would help reduce these effects by limiting construction to daylight hours within 0.25 mile of residents; minimizing fugitive light from portable sources used for construction; installing visual barriers along access routes, where necessary, to prevent light spill from truck headlights toward residences. However, in some case, these mitigation measures would not reduce effects. Given the broad expanse of the of the study area and the nature of changes introduced by the water-conveyance facilities, there would be permanent changes to the regional landscape, but they would not be noticeable changes to the visual character that do not blend or are not in keeping with the existing visual environment. Thus, the contribution to the alteration of daytime and nighttime light and glare in the study area would be visually dispersed.

3.2 Agricultural Resources

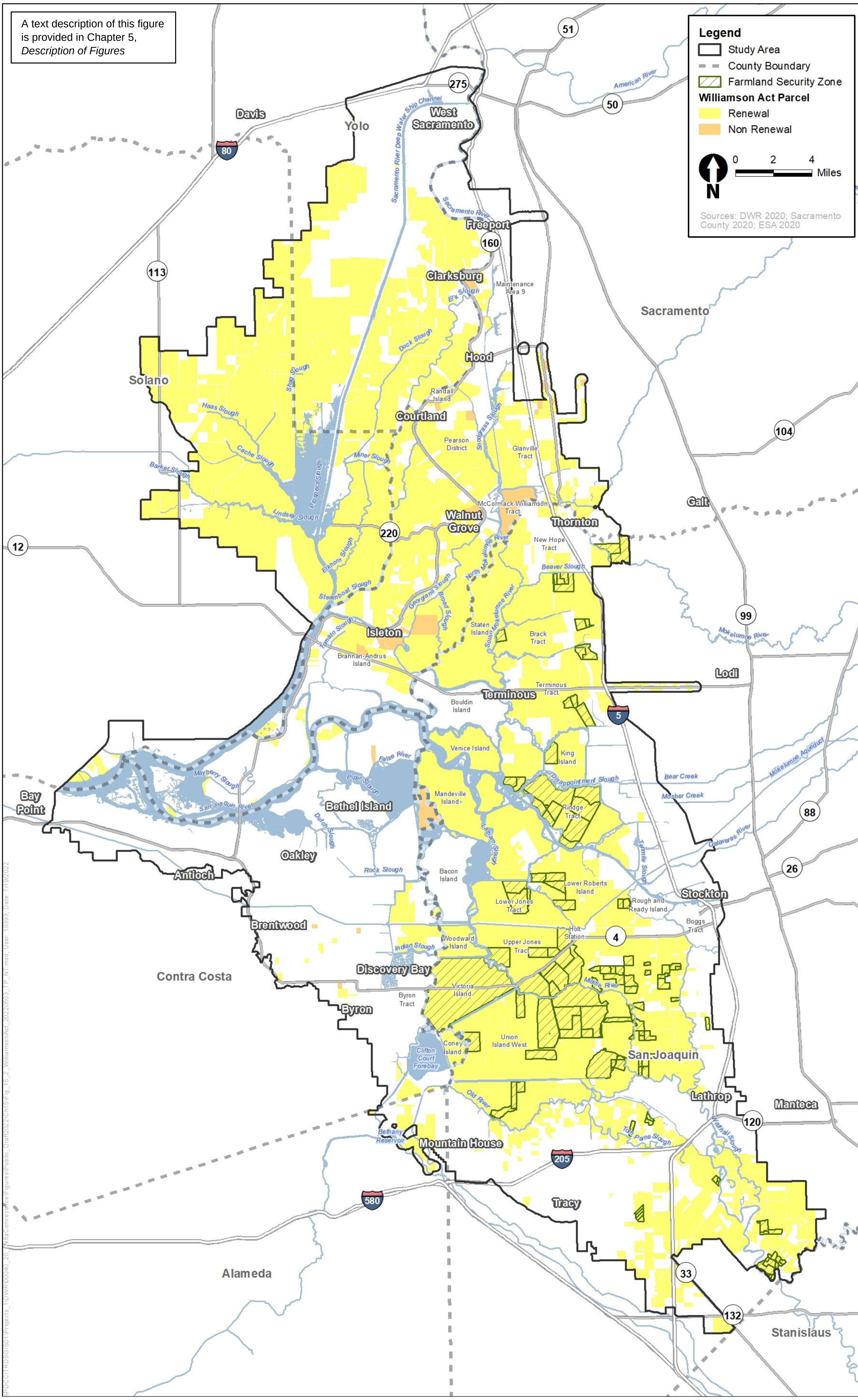
This section describes the affected environment for agricultural resources and analyzes effects that could occur in the study area from construction, operation, and maintenance of the action alternatives, as well as the No Action Alternative. Mitigation and minimization measures that would avoid, minimize, rectify, reduce, or compensate potentially adverse effects are included as part of each action alternative. Additional information on the affected environment, methods, and the anticipated effects of the action alternatives can be found in Delta Conveyance Project Draft EIR Chapter 15, *Agricultural Resources* (California Department of Water Resources 2022).

3.2.1 Affected Environment

The study area for the analysis of agricultural resources includes the Sacramento–San Joaquin River Delta (Delta), which encompasses roughly 744,000 acres within Alameda (6,471 acres), Contra Costa (112,562 acres), Sacramento (121,857 acres), San Joaquin (318,882 acres), and Yolo (92,011 acres) Counties and limited adjacent areas just outside the Delta, mainly around the Bethany Reservoir. Lands used for agricultural purposes according to Farmland Mapping and Monitoring Program (FMMP) classifications comprise more than 585,000 acres of the study area and are an important economic factor within the region (California Department of Conservation 2016–2018).

Lands within and surrounding the Delta contain soil types that, along with the regional climate, allow the region to grow a wide variety of crops. Over 30 types of crops are grown in the study area's agricultural land. The top five Delta crops in terms of acreage are corn, alfalfa, miscellaneous grain/hay, wine grapes, and wheat (Land IQ 2018). Mixed pasture is the single largest agricultural land use in the Delta (Land IQ 2018). While corn and alfalfa cover the widest acreage in the Delta, the Delta Protection Commission's *The State of Delta Agriculture: Economic Impact, Conservation and Trends* (2020:1) identified tomatoes and wine grapes as those crops that create the most economic value through their sales and in their linkages to manufacturing in the area. Almonds have been gaining more prominence in the Delta, with the acreage in almond orchard increasing 401% from 2009 to 2016, however almonds remained less prevalent in the Delta than in the Central Valley (Delta Protection Commission 2020:9).

The Delta includes a large area of land uses designated for agricultural or specified compatible open-space uses under the provisions of the California Land Conservation Act of 1965, more commonly known as the Williamson Act. The Delta contains about 391,000 acres of agricultural land subject to active Williamson Act contract, with an additional 10,000 acres of land under Williamson Act contract but currently in a nonrenewal process (California Department of Conservation 2016–2018). Figure 3.2-1 shows the extent of lands under Williamson Act contract within the study area.



1

2 **Figure 3.2-1. Williamson Act Parcels in the Study Area**

A large portion of agricultural land in the study area is designated Important Farmland in the FMMP. Under this program, lands are divided into one of eight categories. In the Delta, there are approximately 432,000 acres of Important Farmland, including approximately 375,000 acres of Prime Farmland, 32,000 acres of Farmland of Statewide Importance, 25,000 acres of Unique Farmland, and 52,000 acres of Farmland of Local Importance. Additionally, there are about 65,000 acres of Grazing Land, Semi-Agricultural and Rural Commercial Land, and Farmland of Local Potential, categories that are not included in estimates of Important Farmland (California Department of Conservation 2020). Figure 3.2-2 shows the FMMP mapping, including the distribution of Important Farmland in the Delta.

The Delta Conveyance Project Draft EIR Chapter 15, *Agricultural Resources*, Section 15.1, *Environmental Setting* (California Department of Water Resources 2022), presents a detailed description of agricultural resource and practices in the study area.

3.2.2 Environmental Consequences

This section describes the assessment methods used to analyze potential environmental effects and identifies the direct, indirect, and cumulative effects associated with agricultural resources during construction, operation, and maintenance of the action alternatives.

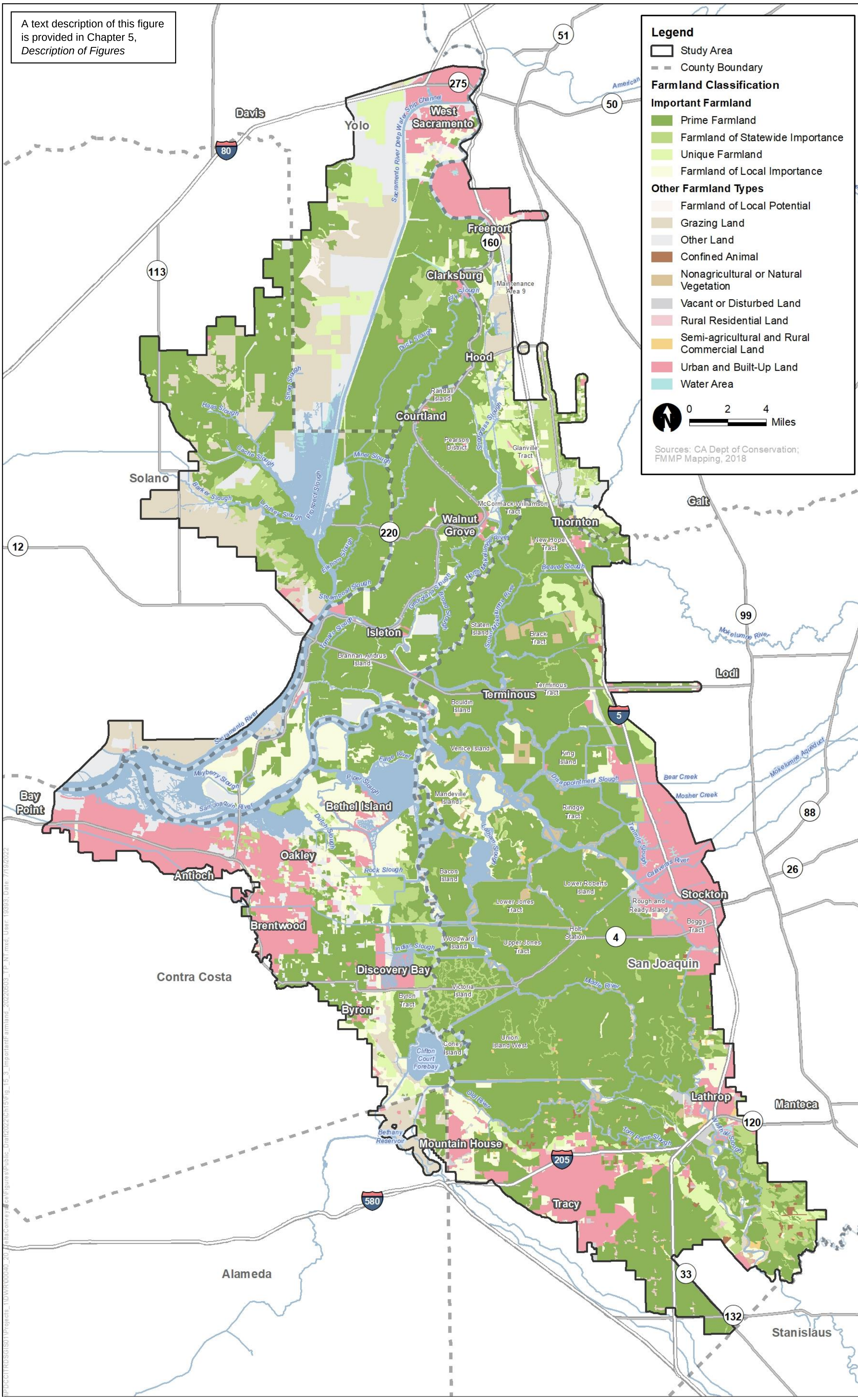


Figure 3.2-2. Farmland Classification in the Study Area

3.2.2.1 Methods for Analysis

The analysis used a range of methodological approaches to evaluate effects that would result from the action alternatives. First, geospatial data were used to quantify the number of acres that would be affected by the physical footprint of all associated water-conveyance facilities. Additionally, the extent of Important Farmland, land contracted under Williamson Act, and land under contract within a Farmland Security Zone that would be affected by the footprint was determined using data from the FMMP and from county assessors' offices.

A remnant farmland area analysis was developed to identify portions of Important Farmland parcels that are bisected by the construction footprint; while these remaining portions of the Important Farmland parcel outside the construction footprint area would not be directly converted due to construction, these remnant areas could nonetheless be indirectly converted if they are too small in size to effectively support ongoing agricultural operations. Information presented in the Sacramento County (County of Sacramento 2019:13), San Joaquin County (County of San Joaquin 2017:57), and Contra Costa County (County of Contra Costa 2005:3-37) general plans was used as the basis for determining that 20 contiguous acres under the same property ownership was the minimum agricultural property size to adequately support general commercial agriculture. A geographic information system (GIS) analysis identified all areas where the construction footprint for the project would fragment or sever larger farmland areas (i.e., more than 20 contiguous acres of Important Farmland) into smaller remnant farmland areas of Important Farmland that were less than 20 contiguous acres.

- **Permanent effects.** Permanent effects include those resulting from the physical footprint of water-conveyance facilities—land that cannot be returned to farmland because it now contains, for example, a pump station, intake, forebay, or sedimentation basin, or farmland has been permanently modified in a manner that makes it unsuitable for growing crops (e.g., topsoil was entirely removed). In addition, some traditionally "temporary" effects are designated as permanent agricultural effects if there is uncertainty whether the farmland will be returned to productive farmland following completion of construction activities (e.g., due to it being subject to an amount of soil compaction that may hinder its crop productivity or the area is potentially too small to be farmed economically). These include areas that are in the construction footprint where no permanent physical structures are planned (e.g., areas with temporary structures, staging areas, and access roads).
- **Temporary effects.** Temporary effects are those that would be largely limited to the duration of construction activities at a given site but could be returned to active farmland after cessation of construction activities. Some areas that are considered temporarily affected would be returned to a condition suitable for farming immediately after work activities are finished and are associated with areas temporarily trenched for utility line connections or geotechnical sampling.

The extent of agricultural land that would be disturbed by construction activities determines the severity of each effect.

Compensatory mitigation for the action alternatives would involve actions such as habitat restoration activities within the Delta to mitigate potentially adverse effects resulting from the action alternatives. Although certain mitigation actions that are available to address special-status species effects are compatible with long-term preservation of agricultural land (e.g., placement of conservation easements to ensure lands remain in alfalfa or pasture to benefit Swainson's hawk

[*Buteo swainsonii*] foraging habitat), other actions such as restoration of farmland to seasonal wetland would result in the permanent conversion of agricultural land. Mitigation sites have been identified which are located on lands owned by the California Department of Water Resources (DWR) or another public agency; these sites include Interstate (I)-5 Ponds 6, 7, and 8 and Bouldin Island. The planned mitigation concepts at these sites allows the establishment of created and enhanced habitats ahead of effects associated with construction buildout and operation of the action alternatives. The compensatory mitigation plan (CMP) is described in more detail in Delta Conveyance Project Draft EIR Appendix 3F, *Compensatory Mitigation Plan for Special-Status Species and Aquatic Resources* (California Department of Water Resources 2022).

Delta Conveyance Project Draft EIR Chapter 15, *Agricultural Resources*, Section 15.3.1, *Methods for Analysis* (California Department of Water Resources 2022), provides additional details on the methods used to analyze potential environmental effects associated with agricultural resources during construction, operation, and maintenance of the action alternatives.

No Action Alternative

The No Action Alternative considers projects, plans, and programs that would be reasonably expected to occur in the foreseeable future if the action alternatives were not approved and the purpose and need were not met.

Water agencies participating in the Delta Conveyance Project have been grouped into four geographic regions. The water agencies within each geographic region would likely pursue a similar suite of water supply projects under the No Action Alternative. Construction of water supply projects under the No Action Alternative would result in construction of new or expanded facilities (e.g., desalination plants, water recycling facilities, groundwater recharge and recovery systems, etc.) that could result in conversion of Important Farmland, most likely in areas outside the Delta. The extent of the potential Important Farmland conversion would vary widely depending on the footprint and geographic location of these new or expanded water supply facilities, and the distribution of agricultural land.

Construction and operation of water supply–reliability projects have the potential to affect the agricultural resources in the four regions. Table 3.2-1 provides examples of how agricultural resources could be affected.

Table 3.2-1. Examples of Effects on Agricultural Resources from Construction and Operation of Projects in Lieu of the Project

Project Type	Potential Agricultural Effects	Region(s) in Which Effects Would Likely Occur [a]
Desalination	Most likely to be sited near the coast where the highest quality farmland is less likely to be present. Southern coastal regions would likely require larger and more desalination projects and therefore more land than northern coastal.	Northern coastal, southern coastal
Groundwater management	Southern coastal would require more projects than northern coastal. Construction activities could require excavation and connection of water-conveyance infrastructure which would result in conversion of agricultural lands for segments of the canal or pipeline alignment.	Northern coastal, southern coastal

Project Type	Potential Agricultural Effects	Region(s) in Which Effects Would Likely Occur [a]
Groundwater recovery	In situations where such facilities are sited on agricultural properties, there is a potential that such work would result in conversion of Important Farmland. Surface water intakes and diversion intake facilities would generally be expected to have minimal construction-related permanent conversion of agricultural land, since they would generally be located along large riverine channels and not within actively farmed areas.	Northern inland, southern coastal, southern inland
Water recycling	Construction of such facilities would result in conversion of Important Farmland in areas where such farmland is present. In the southern inland region where a greater number of projects would be needed as a substitute for the action alternatives, the potential for effect would be greatly increased.	Northern coastal, northern inland, southern coastal, southern inland
Water use efficiency measures	Since these activities would occur within already developed areas, they would be expected to result in minimal to no permanent conversion of farmland.	Northern coastal, northern inland, southern coastal, southern inland

[a] See Chapter 2, *Project Description and Alternatives*, Section 2.5, *No Action Alternative*, for a complete definition of the geographic regions.

3.2.2.2 Effects and Mitigation

Impact AG-1: Convert a Substantial Amount of Prime Farmland, Unique Farmland, Farmland of Local Importance, or Farmland of Statewide Importance as a Result of Construction of Water-Conveyance Facilities

No Action Alternative

As stated previously, analysis of the No Action Alternative also considers a selection of the programs, plans, and projects included under the No Action Alternative which are germane to the analysis of agricultural resources within the study area. It is projected that the programs and plans already targeted for the study area would either directly cause or indirectly allow the permanent conversion of 20,000 of acres of Important Farmland to nonagricultural uses. Most of that conversion is expected to occur within San Joaquin County, in the periphery of the Delta—particularly in and around the City of Stockton. Various planned wetland and floodplain restoration projects scattered throughout the study area could also contribute to further conversion of Important Farmland to nonagricultural use.

Overall, continuing activities related to operation of SWP and CVP facilities would not result in the conversion of any Important Farmland to nonagricultural use; however, existing plans and programs would result in conversion of Important Farmland to nonagricultural uses in the study area. Water supply projects to be implemented throughout the state if the action alternatives were not constructed and operated would further contribute to conversion of Important Farmland.

All Action Alternatives

Construction of the water-conveyance infrastructure would result in temporary and permanent conversion of Important Farmland. Delta Conveyance Project Draft EIR Mapbooks 15-1–15-3[3] show the distribution of these effects under the central alignment (including Alternatives 1 and 2b), eastern alignment (including Alternatives 3 and 4b), and Bethany Reservoir alignment (DWR's Preferred Alternative), respectively (California Department of Water Resources 2022). The total extent of Important Farmland that would be temporarily or permanently affected ranges from approximately 2,350 acres under DWR's Preferred Alternative to approximately 3,800 acres under Alternative 1. The amount of temporary and permanent conversion of Important Farmland under Alternatives 2b, 3, and 4b would fall within this range at approximately 3,300 acres, 3,500 acres, and 2,900 acres, respectively.

Compensatory mitigation planned at the DWR I-5 Ponds 6, 7, and 8 and on Bouldin Island is expected to further result in additional permanent conversion of approximately 1,200 acres of Important Farmland, most of which would occur on Bouldin Island (Table 3.2-2). More specifically, the CMP for Bouldin Island would result in conversion of approximately 935 acres of Prime Farmland and 235 acres of Farmland of Local Importance. These totals represent less than 1% of all the Important Farmland available within the study area. The farmland would be converted to establish a suite of different land cover types, including freshwater marsh, grassland, lake/pond, riparian, and seasonal wetland.

Table 3.2-2. Estimated Conversion of Important Farmland as a Result of the Compensatory Mitigation Plan on DWR I-5 Ponds 6, 7, and 8 and on Bouldin Island (acres)

Important Farmland Type	Permanent Impacts
Prime Farmland	934.9
Farmland of Statewide Importance	22.8
Unique Farmland	5.1
Farmland of Local Importance	235.5
Total	1,198.3

The acres of Important Farmland that would be temporarily affected by construction are consistently just under 200 acres across all action alternatives. Permanent direct conversion of Important Farmland would vary from approximately 2,150 acres of Important Farmland under DWR's Preferred Alternative to approximately 3,600 acres under Alternative 1 (Table 3.2-3). The extent of direct permanent conversion of Important Farmland under Alternatives 2b, 3, and 4b would be approximately 3,130 acres, 3,280 acres, and 2,770 acres, respectively (Table 3.2-3). The difference in the range of anticipated effects between Alternative 1 and Alternative 3 vary by a few hundred acres, which represents a relatively small percentage difference given the extent of total Important Farmland conversion that is projected under these two alternatives. Similarly, the difference in permanent direct conversion of Important Farmland between Alternatives 2b and 4b, which have the same conveyance capacity, are within a few hundred acres, with the eastern alignment alternative (Alternative 4b) having a slightly reduced extent of anticipated permanent direct conversion.

[3] Mapbooks for the Draft EIR related to EIS Section 3.2, *Agricultural Resources*, are available for public viewing at https://cadwr.box.com/s/4zqkacka447fyv08t3r2ut62uzht3985.

Table 3.2-3. Estimated Direct Conversion of Important Farmland as a Result of Construction of Water-Conveyance Facilities by Alternative (acres)

	Permanent Effects					Temporary Effects						
County	Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal of Important Farmland	Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal	Grand Total	Percent of Study Area [a]
Alternative 1. Central Alignment, 6,000 cfs, Intakes B and C												
Alameda	33.7	–	0.4	–	34.1	–	–	–	–	–	34.1	0.01%
Contra Costa	1,183.9	230.5	115.1	137.4	1,666.9	1.6	1.3	0.1	3.7	6.7	1,673.6	0.35%
Sacramento	456.5	473.7	20.8	54.3	1,005.2	34.4	24.0	14.1	12.8	85.3	1,090.6	0.23%
San Joaquin	812.7	24.1	1.3	57.7	895.8	88.2	2.8	0.1	8.3	99.4	995.2	0.21%
Subtotal	2,486.7	728.3	137.7	249.4	3,602.0	124.2	28.1	14.3	24.8	191.4	3,793.5	0.79%
Alternative 2b. Central Alignment, 3,000 cfs, Intake C												
Alameda	33.7	–	0.4	–	34.1	–	–	–	–	–	34.1	0.01%
Contra Costa	1,183.9	230.5	115.1	137.4	1,666.9	1.6	1.3	0.1	3.7	6.7	1,673.6	0.35%
Sacramento	229.8	339.0	17.2	22.4	608.4	24.9	24.1	10.6	12.3	71.9	680.3	0.14%
San Joaquin	737.9	24.1	1.3	57.7	821.1	88.3	2.8	0.1	8.3	99.5	920.6	0.19%
Subtotal	2,185.3	593.6	134.0	217.5	3,130.4	114.8	28.2	10.8	24.3	178.1	3,308.5	0.69%
Alternative 3. Eastern Alignment, 6,000 cfs, Intakes B and C												
Alameda	33.7	–	0.4	–	34.1	–	–	–	–	–	34.1	0.01%
Contra Costa	1,213.3	230.9	116.4	137.4	1,698.0	1.5	1.3	0.1	3.7	6.5	1,704.5	0.35%
Sacramento	455.4	474.0	20.8	54.3	1,004.5	32.2	23.7	14.1	13.8	83.7	1,088.2	0.23%
San Joaquin	510.0	6.0	11.3	16.1	543.4	81.7	4.2	5.3	3.2	94.5	637.9	0.13%
Subtotal	2,212.3	710.9	148.9	207.8	3,279.9	115.3	29.2	19.5	20.8	184.7	3,464.7	0.72%
Alternative 4b. Eastern Alignment, 3,000 cfs, Intake C												
Alameda	33.7	–	0.4	–	34.1	–	–	–	–	–	34.1	0.01%
Contra Costa	1,183.9	230.5	115.1	137.4	1,666.9	1.6	1.3	0.1	3.7	6.7	1,673.6	0.35%
Sacramento	228.6	339.0	17.2	22.4	607.2	22.6	24.3	10.6	13.3	70.9	678.1	0.14%
San Joaquin	430.1	6.0	11.3	16.1	463.5	81.7	4.2	5.3	3.2	94.5	558.0	0.12%
Subtotal	1,876.3	575.5	144.0	175.9	2,771.7	105.9	29.8	16.1	20.3	172.0	2,943.7	0.61%

	Permanent Effects					Temporary Effects						
County	Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal of Important Farmland	Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Subtotal	Grand Total	Percent of Study Area [a]
DWR's Preferred Alternative. Eastern Alignment to Bethany Reservoir, 6,000 cfs, Intakes B and C												
Alameda	336.9	–	1.4	0.0	338.3	3.0	–	0.1	0.0	3.2	341.5	0.07%
Contra Costa	8.3	–	4.7	9.3	22.3	7.0	0.3	0.2	0.8	8.3	30.7	0.01%
Sacramento	453.8	528.0	23.7	86.7	1,092.2	32.2	23.2	14.1	13.3	82.8	1,174.9	0.24%
San Joaquin	677.0	–	11.0	13.3	701.3	78.6	2.8	5.4	4.8	91.6	792.8	0.16%
Subtotal	1,476.0	528.0	40.8	109.3	2,154.2	120.8	26.2	19.8	18.9	185.8	2,340.0	0.48%

cfs = cubic feet per second.

[a] Reflects the percentage of Important Farmland within the entire study area which would be affected by construction.

DWR's Preferred Alternative (the Bethany Reservoir alignment) would have markedly fewer effects when considering either total combined permanent and temporary effects or permanent effects alone compared to Alternatives 1, 2b, 3, or 4b. For example, DWR's Preferred Alternative would have approximately 32% and 38% fewer combined temporary and permanent effects on Important Farmland compared to Alternative 3 and Alternative 1, respectively, even though DWR's Preferred Alternative would have the same conveyance capacity. Furthermore, DWR's Preferred Alternative would also have fewer effects on Important Farmland relative to Alternatives 2b and 4b, even though those two alternatives would have less conveyance capacity.

As described in Delta Conveyance Project Draft EIR Appendix 15B, *Agricultural and Land Stewardship Considerations* (California Department of Water Resources 2022), the project's extensive initial siting and design process sought to minimize the extent of farmland that would be permanently converted as a result of project construction. One approach to minimize affected farmland involved was to acquire only the portion of an existing Important Farmland parcel that would be utilized to support construction activities and subsequent operation and maintenance of project facilities. The remaining areas of Important Farmland within the parcel not utilized by the project, hereafter referred to as remnant farmland areas, would be left intact. Some subset of these remnant farmland areas avoided by the construction footprint could nevertheless be too small to support ongoing agricultural operations, and thereby are considered indirectly converted as a result of project construction activities.

The totals of remnant farmland areas that were individually less than 20 contiguous acres were compiled for each alternative and are presented in Table 3.2-4. The remnant farmland area analysis conservatively assumed that the remnant areas identified in Table 3.2-4 would eventually be converted from agricultural to nonagricultural use following commencement of adjacent project-related construction activities. However, much of the remnant farmland acreage identified in Table 3.2-4 could ultimately remain in agricultural use. During the project's land acquisition phase, the applicant would coordinate with remnant farmland area landowners to determine the best use of the remnant farmland areas. If the landowner decides to continue farming operations or would like to utilize the property for another use, the remnant farmland area would not be acquired for the project. For example, high-value specialty crops (e.g., orchards, vineyards) commonly grown in the Delta are often grown on fewer than 20 contiguous acres. In addition, remnant farmland areas could be leased out to hobby farmers interested in managing small acreages of land at a time, or to agricultural operators who are interested in farming a remnant farmland area. Since there is reasonable uncertainty on whether there would be adequate interest by agricultural operators to ensure remnant farmland areas are productive for continued agricultural use, the project would indirectly result in their conversion to nonagricultural use. The remnant farmland area acreage is thereby conservatively considered to be a permanent impact. Mitigation Measure AG-1: *Preserve Agricultural Land* would minimize this potential indirect conversion of remnant areas of Important Farmland.

Table 3.2-4. Estimated Indirect Conversion of Land (acre) Based on Remnant Important Farmland Area Analysis

Alternative	Remnant Farmland Area
Alternative 1. Central Alignment, 6,000 cfs, Intakes B and C	363.3
Alternative 2b. Central Alignment, 3,000 cfs, Intake C	331.3
Alternative 3. Eastern Alignment, 6,000 cfs, Intakes B and C	268.7
Alternative 4b. Eastern Alignment, 3,000 cfs, Intake C	262.1
DWR's Preferred Alternative. Bethany Reservoir Alignment, 6,000 cfs, Intakes B and C	249.6

cfs = cubic feet per second.

Permanent effects are considered much more consequential to agricultural uses in the study area because their effects would be lasting, while areas that are considered temporarily affected are anticipated to be returned to productive farmland following the completion of construction activities on a particular property. Delta Conveyance Project Draft EIR Appendix 15B, *Agricultural and Land Stewardship Considerations* (California Department of Water Resources 2022), describes the methodology employed during the initial siting and design process to greatly minimize the extent of farmland that would be permanently converted as a result of buildout of the action alternatives. Implementation of Mitigation Measure AG-1: *Preserve Agricultural Land* would reduce the extent of the remaining effects that could not be avoided through careful planning. However, conservation of agricultural farmland through acquisition of agricultural conservation easements, even at a ratio of 1:1 or greater, would not avoid a net loss of Important Farmland in the study area.

Operation and maintenance of facilities established by the action alternatives would entail repair, cleaning, and inspection of new surface water diversions, fish screens, and water-conveyance infrastructure. Operation and maintenance of these structures and facilities would not convert additional farmland to nonagricultural use beyond what would be converted during construction.

Based on the information presented above, even with implementation of proposed mitigation measures and environmental commitments, the effect all action alternatives would have on Prime Farmland, Unique Farmland, Farmland of Local Importance, or Farmland of Statewide Importance may be significant.

Impact AG-2: Convert a Substantial Amount of Land Subject to Williamson Act Contract or under Contract in Farmland Security Zones to a Nonagricultural Use as a Result of Construction of Water-Conveyance Facilities

No Action Alternative

The No Action Alternative would have the potential to result in conversion of farmland currently under Williamson Act contract or under contract in a Farmland Security Zone. The effect mechanism would be the same as that previously discussed under Impact AG-1; however, the absolute magnitude of the effect would be smaller since the extent of lands under Williamson Act contract or under contract within a Farmland Security Zone is more limited compared to lands that have been mapped as Important Farmland. Adoption of the types of water supply–reliability projects by water agencies in lieu of the action alternatives may result in large-scale conversion of agricultural land under Williamson Act Contract or under contract in a Farmland Security Zone in areas of the state outside the study area. The extent of these potential conversions will be dependent on the distribution of lands under Williamson Act contract or under contract within Farmland Security Zones relative to where water supply–reliability projects will ultimately be sited. For those programs, plans, and projects expected to occur in the Delta, there is expected to be a conversion of thousands of acres of land under Williamson Act contract. The expected conversion of farmland under contract within a Farmland Security Zone is expected to be relatively modest (i.e., less than 100 acres) given that within the study area, they are only present in San Joaquin County.

All Action Alternatives

Temporary and permanent construction activities associated with building the proposed facilities would result in conversion of land subject to Williamson Act contracts or under contract within Farmland Security Zones. The only county with lands enrolled under contract in Farmland Security Zones in the study area is San Joaquin County. This conversion of farmland under Williamson Act contract or under contract within a Farmland Security Zone identified in Tables 3.2-5 and 3.2-6 largely represents a subset of those effects previously described under Impact AG-1 regarding conversion of Important Farmland, since most of the agricultural land in the study area is Important Farmland but only a fraction of that land is under Williamson Act contract and even a much smaller proportion is under contract in a Farmland Security Zone (Delta Conveyance Project Draft EIR, Appendix 15A, *Supplemental Table for Agricultural Resources Chapter* [California Department of Water Resources 2022], provides tables that show the differences in permanent effects on land under contract within a Farmland Security Zone by action alternative for individual water-conveyance features). Depending on the specific alternative, the total extent of land under Williamson Act contract that would be temporarily or permanently affected ranges from approximately 1,000 acres under Alternative 1 to nearly 1,100 acres under Alternative 3 and just under 1,200 acres under DWR's Preferred Alternative. Alternatives 2b and 4b would have reduced conveyance capacity relative to Alternatives 1, 3, and DWR's Preferred Alternative; however, they would also have slightly reduced extent of permanent and temporary conversion of land under Williamson Act contract of approximately 840 acres under Alternative 2b and 900 acres under Alternative 4b.

There is projected to be permanent conversion of approximately 35 acres of agricultural land under contract within a Farmland Security Zone under Alternatives 1 and 2b, which follow the central alignment. There would be 53 acres of permanent conversion under the eastern alignment (Alternatives 3 and 4b) and 18 acres under the Bethany Reservoir alignment (DWR's Preferred Alternative). The permanent effects on land under contract with a Farmland Security Zone would be associated with the shaft sites and power transmission lines, while the temporary effects would result from work associated with levee access roads and shaft sites.

Table 3.2-5. Estimated Conversion of Land under Williamson Act Contract as a Result of Construction of Water-Conveyance Facilities by Action Alternative (acres)

	Permanent Effects			Temporary Effects				
County	Non-Renewal	Active	Subtotal	Non-Renewal	Active	Subtotal	Grand Total	Percent of Study Area [a]
Alternative 1. Central Alignment, 6,000 cfs, Intakes B and C								
Alameda	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%
Contra Costa	0.0	88.9	88.9	0.0	0.0	0.0	88.9	0.02%
Sacramento	0.0	690.6	690.6	3.0	24.8	27.9	718.5	0.18%
San Joaquin	0.0	130.1	130.1	0.0	63.2	63.2	193.3	0.05%

County	Permanent Effects			Temporary Effects			Grand Total	Percent of Study Area [a]
	Non-Renewal	Active	Subtotal	Non-Renewal	Active	Subtotal		
Subtotal	0.0	909.6	909.7	3.0	88.1	91.1	1,000.8	0.26%
Alternative 2b. Central Alignment, 3,000 cfs, Intake C								
Alameda	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%
Contra Costa	0.0	88.9	88.9	0.0	0.0	0.0	88.9	0.02%
Sacramento	0.0	529.2	529.3	3.0	25.3	28.3	557.5	0.14%
San Joaquin	0.0	130.1	130.1	0.0	63.2	63.2	193.3	0.05%
Subtotal	0.0	748.3	748.3	3.0	88.5	91.5	839.8	0.21%
Alternative 3. Eastern Alignment, 6,000 cfs, Intakes B and C								
Alameda	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%
Contra Costa	0.0	88.9	88.9	0.0	0.0	0.0	88.9	0.02%
Sacramento	0.0	690.8	690.8	1.1	24.2	25.3	716.1	0.18%
San Joaquin	0.0	185.3	185.3	0.0	75.1	75.1	260.4	0.07%
Subtotal	0.0	965.0	965.1	1.1	99.3	100.4	1,065.5	0.27%
Alternative 4b. Eastern Alignment, 3,000 cfs, Intake C								
Alameda	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%
Contra Costa	0.0	88.9	88.9	0.0	0.0	0.0	88.9	0.02%
Sacramento	0.0	529.2	529.3	1.1	25.2	26.3	555.6	0.14%
San Joaquin	0.0	185.3	185.3	0.0	75.1	75.1	260.4	0.07%
Subtotal	0.0	803.5	803.5	1.1	100.3	101.4	905.0	0.23%
DWR's Preferred Alternative. Bethany Reservoir, 6,000 cfs, Intakes B and C								
Alameda	0.0	152.3	152.3	0.0	3.7	3.7	156.0	0.04%
Contra Costa	0.0	0.4	0.4	0.0	3.8	3.8	4.2	0.00%
Sacramento	0.0	765.7	765.8	1.1	23.6	24.7	790.5	0.20%
San Joaquin	0.0	153.7	153.7	0.0	73.9	73.9	227.6	0.06%
Subtotal	0.0	1,072.1	1,072.1	1.1	105.1	106.2	1,178.4	0.30%

cfs = cubic feet per second.

[a] Reflects the percentage of land under Williamson Act contract within the entire study area which would be affected by construction.

Table 3.2-6. Estimated Conversion of Land under Contract within a Farmland Security Zone as a Result of Construction of Water-Conveyance Facilities by Action Alternative (acres)

Action Alternative	Permanent Effects	Temporary Effects	Grand Total	Percent of Study Area [a]
Alternative 1. Central Alignment, 6,000 cfs, Intakes B and C	34.9	6.6	41.5	0.11%
Alternative 2b. Central Alignment, 3,000 cfs, Intake C	34.9	6.6	41.5	0.11%
Alternative 3. Eastern Alignment, 6,000 cfs, Intakes B and C	53.1	23.9	77	0.21%
Alternative 4b. Eastern Alignment, 3,000 cfs, Intake C	53.1	23.9	77	0.21%
DWR's Preferred Alternative. Bethany Reservoir, 6,000 cfs, Intakes B and C	18.2	21.2	39.4	0.11%

cfs = cubic feet per second.

[a] Reflects the percentage of land under Williamson Act contract within the entire study area, which would be affected by construction.

Regardless of the specific aerial extent to which lands under Williamson Act contract would be affected by construction of the water infrastructure facilities, each of the action alternatives is anticipated to result in a large conversion of land subject to Williamson Act contracts or under contract within a Farmland Security Zone.

The specific habitat mitigation plans for compensatory mitigation are focused on Bouldin Island and three of the I-5 ponds (Ponds 6, 7, and 8). None of these areas is subject to an existing Williamson Act contract or situated within a Farmland Security Zone.

Implementation of Mitigation Measure AG-1: *Preserve Agricultural Land* would be available to reduce the extent of the effect of conversion of farmland under Williamson Act contract or under contract within a Farmland Security Zone and the applicant would remain responsible for adherence to all relevant and applicable requirements under California Government Code Sections 51290–51295 as they pertain to acquiring lands subject to Williamson Act contracts. The CMP is described in detail in Appendix C3, *Compensatory Mitigation Plan for Special-Status Species and Aquatic Resources*.

Based on the information presented above, even with implementation of proposed mitigation measures and environmental commitments, the effect all action alternatives would have on land subject to the Williamson Act contract or under contract in Farmland Security Zones may be significant.

Impact AG-3: Other Effects on Agriculture as a Result of Constructing and Operating the Water-Conveyance Facilities Prompting Conversion of Prime Farmland, Unique Farmland, Farmland of Local Importance, or Farmland of Statewide Importance.

No Action Alternative

This effects analysis is focused on potential effects on farmland that extend beyond physical conversion of land use types. These effect mechanisms to existing farmland are inherently more indirect in nature. Some examples of these effect mechanisms include potential excessive seepage (e.g., from unlined surface water reservoirs) resulting in elevated groundwater elevations off-site which may contribute to root rot of planted crops; disruptions in irrigation or drainage infrastructure due to construction and operations activities; and degradations to water quality used for crop irrigation that are linked to crop yield declines and/or failure. Each of these effect mechanisms has the potential to contribute to long-term fallowing of Important Farmland that would have not otherwise occurred, contributing to a loss of Important Farmland. The No Action Alternative considers those water supply projects that would be adopted in lieu of the action alternatives, including various desalination, water recycling, groundwater management, and water use efficiency improvement projects and programs.

Construction of the ongoing and planned programs, plans, and projects that are reasonably expected to occur within the study area are not expected to contribute to further effects on agricultural resources not already discussed previously under Impacts AG-1 and AG-2. Generally, these programs, plans, and projects entail either new urban development or habitat restoration actions whose range of effects on agricultural resources are encapsulated in direct conversion of existing farmland to a nonagricultural use. Similarly, desalination of ocean water and brackish groundwater would similarly have effects on farmland limited to the physical footprint of those facilities and their appurtenant facilities, in situations when those projects are sited within existing farmland. It is generally expected that adequate environmental commitments would be in place to ensure that other types of water supply projects, such as groundwater management, would not contribute to meaningful changes in groundwater elevation to adjacent neighbor agricultural operators. These water supply projects would be required to comply with water quality thresholds established in regulations, minimizing the likelihood that their construction and operation would result in degradation to irrigation water quality to an extent where farmers likely fallow the affected land.

All Action Alternatives

Construction and operation of the water-conveyance infrastructure were analyzed to determine if they would indirectly affect agriculture by altering the elevation of the groundwater within portions of the study area. The nature of these effects is discussed in more detail in Section 3.11, *Groundwater*. Areas in which crop roots are exposed to a surplus of water could result in root rot, potentially compromising the viability of those crops. The potential for effects resulting from changes in groundwater elevations during construction and operation would be minimized by design elements such placement of seepage cutoff wall placements around the north Delta intakes and the Southern Forebay, where such issues are most likely to arise. Modeling outputs from the DeltaGW reveal no groundwater elevation changes in excess of 5 feet occurred in more than 5% of simulated months for any of the assessed alternatives. The modeling also indicates that groundwater supply wells will be largely unaffected by changes in groundwater elevation, with approximately only 2% of identified wells in the study area experiencing a greater than 5-foot drop in elevation, and no wells expected to undergo a 10-foot drop in groundwater levels. Groundwater monitoring would occur during construction to provide real-time feedback on groundwater conditions, allowing for modifications to groundwater extraction and recharge to minimize effects on nearby agricultural operators. The various future fieldwork investigations conducted during the preconstruction and construction phases involving hydrogeologic sampling and other construction test projects would be used to more specifically identify the appropriate groundwater monitoring programs that could be extended in the construction phase. Given the minimal changes to groundwater elevations projected by the modeling, the net effect of construction on groundwater levels would not prevent agricultural uses on neighboring properties with Important Farmland that are currently farmed.

Construction of the action alternatives could adversely affect local infrastructure supporting agricultural properties including drainage and irrigation facilities. Such disruptions could result in the areas serviced by this infrastructure to be fallowed. During planning, known infrastructure used to serve agricultural properties were avoided to the greatest extent possible; however, the presence of additional infrastructure (e.g., buried pipelines that are not visible on aerial imagery and not identified in publicly available maps) may be revealed during future site-level investigations. Delta Conveyance Project Draft EIR Appendix 15B, *Agricultural and Land Stewardship Considerations* (California Department of Water Resources 2022), describes the outreach made through the Stakeholder Engagement Committee, which provided a forum for interested parties in the Delta to provide feedback on conceptual designs and ways to minimize the effects of buildout of the action alternatives on a broad array of considerations including minimizing disturbances to farmland and agricultural operations. Over the course of the conceptual design development, major design considerations were implemented as an effort to minimize effects on the Delta communities during construction of the action alternatives. During the design phase, when the applicant acquires access to specific parcels, these facilities would be mapped for each site. Some irrigation and drainage systems that may serve parcels that would be acquired for the action alternatives plus adjacent parcels. If the facilities used by adjacent properties to move water from the existing diversion are located on a parcel to be used for a water-conveyance feature, pipelines or canals would be installed to maintain service to the adjacent properties. Although these disruptions may only for the duration of construction activity at a particular work area, such disruptions may persist for 7 to 15 years, depending on the facility being constructed. The effect would be permanent if the disruption to the infrastructure remains after construction is complete. Implementation of Mitigation Measure AG-3: *Replacement or Relocation of Impacted Infrastructure Supporting Agricultural Properties* would ensure that any agricultural infrastructure that is disrupted by construction activities would be relocated or replaced to support continued agricultural activities; otherwise, the affected landowner would be fully compensated for any financial losses resulting from the disruption.

The operation of the proposed new water-conveyance facilities were analyzed to determine if they would indirectly affect agricultural production by altering the groundwater elevation in localized areas and the quality of irrigation water in portions of the study area. Water quality modeling conducted for the action alternatives indicates that the operation of the new water-conveyance facilities would modestly increase salinity, as measured by electrical conductivity, relative to existing conditions at various locations within the study area. The amount of change varies by location, along with other factors such as time of year and water year type. The most notable change would occur in the western Delta. Growers in the western Delta are accustomed to conditions where Delta waters are more prone to be saline, as evidenced by the fact that much of the western Delta is managed in pastures, which are much more tolerant of salinity than the fruit and vegetable crops grown in other portions of the Delta. The natural interannual variability in Delta outflows would remain a much larger driver of electrical connectivity levels in the western Delta than the modeled changes in operations resulting from the proposed new water-conveyance facilities. As such, the changes in electrical connectivity levels are not expected to trigger any marked conversion of Important Farmland to non-agricultural uses. For additional discussion of operations effects, see Delta Conveyance Project Draft EIR Chapter 15, *Agricultural Resources* (California Department of Water Resources 2022).

Based on the information presented above, including proposed mitigation measures and environmental commitments, other effects on Prime Farmland, Unique Farmland, Farmland of Local Importance, or Farmland of Statewide Importance under all action alternatives do not appear to be significant.

3.2.2.3 Cumulative Analysis

Agricultural resources are expected to change as a result of past, present, and reasonably foreseeable future projects related to population grown and changes in economic activity in the study area. It is anticipated that some changes related to agriculture, including conversion of Important Farmland and land subject to Williamson Act contracts or in Farmland Security Zones, would take place, even assuming that reasonably foreseeable future projects would be designed to avoid such effects to the extent feasible.

Table 3.2-7 lists a selection of the plans, policies, and programs included in the cumulative analysis that could result in effects on agricultural resources.

1 **Table 3.2-7. Plans, Policies, and Programs Included in the Cumulative Analysis**

Program/Project	Agency	Status	Description of Program/ Project	Effects on Agricultural Resources
Lookout Slough Tidal Habitat Restoration	DWR	Planning phase	Tidal marsh restoration	Results in permanent conversion of 1,460-acre of Prime Farmland. Mitigation associated with the project would result in enhancing farmland quality on a nearby property to Prime Farmland quality.
Dutch Slough Tidal Restoration Project	DWR	Ongoing	Tidal marsh restoration	The project would result in the loss of approximately 920 acres of farmland because of conversion to open water, marsh, and upland habitat types for wildlife species.
City of Antioch Brackish Water Desalination Project	City of Antioch	Planning phase	Water supply project for the City of Antioch	No direct effect on irrigation water quality for Delta agricultural water users.
Lower Yolo Ranch Restoration Project	Westlands Water District	Planning phase	Tidal marsh restoration	Results in permanent conversion of approximately 230 acres of Important Farmland.
Three Creeks Parkway Restoration Project	Contra Costa County Flood Control and Water Conservation District	Planning phase	Riparian restoration along an approximately 4,000 linear foot section of Marsh Creek	There would be no effect on Important Farmland.
Winter Island Tidal Habitat Restoration Project	DWR	Planning phase	Tidal marsh restoration	There would be no effect on Important Farmland. The Farmland Mapping and Monitoring Program designated the project footprint as “other land.”
Envision Stockton 2040 General Plan	City of Stockton	Ongoing	Plan for future buildout of the City of Stockton	The general plan calls for 16,160 acres of Important Farmland to be converted to nonagricultural uses. The general plan’s Action LU-5.3C calls for either dedication of an agricultural conservation easement at a 1:1 ratio or payment of an in-lieu agricultural mitigation fee for conservation of Important Farmland.

Program/Project	Agency	Status	Description of Program/ Project	Effects on Agricultural Resources
Grizzly Slough Floodplain Restoration Project	DWR	Planning phase	Seasonal floodplain restoration	This project would not have effects on agricultural land with mitigation incorporated. Mitigation would involve conservation easement agreement on Staten Island to ensure protection of agricultural land.
McCormack-Williamson Tract Restoration Project	DWR	Planning phase	Tidal marsh restoration	This project would not have effects on agricultural land with mitigation incorporated. Mitigation would involve conservation easement agreement on Staten Island to ensure protection of agricultural land.

DWR = California Department of Water Resources.

The foreseeable projects listed in Table 3.2-7 and evaluated for consideration of cumulative effects include projects that would convert agricultural lands to nonagricultural uses or affect agricultural operations in some manner (e.g., affecting irrigation water quality). The Delta Conveyance Project, when considered in conjunction with these other projects that would affect agricultural resources in the study area, would result in a conversion of Important Farmland and land that is subject to Williamson Act contracts or under contract in a Farmland Security Zone to nonagricultural use. Agricultural land conversion in the study area would largely result from urban expansion within the study area under the *City of Stockton General Plan* along with habitat restoration projects, water supply projects, and flood risk reduction projects. While the amounts of land that may be converted in the future under the foreseeable projects cannot be precisely determined at this time, in combination with any of the action alternatives, they are expected to result in a cumulative effect because the acreage of Important Farmland and land that is subject to Williamson Act contracts or under contract in a Farmland Security Zone that would be lost throughout the study area would be substantial. The contribution of any of the action alternatives on the temporary or permanent conversion of Important Farmland and land that is subject to Williamson Act contracts or under contract in a Farmland Security Zone would be approximately 2,400 acres at a minimum.

3.3 Air Quality

This section describes the affected environment for air quality and greenhouse gases (GHGs) and analyzes effects that could occur in the study area from construction, operation, and maintenance of the proposed action and alternatives, as well as the No Action Alternative. Mitigation and minimization measures that would avoid, minimize, rectify, reduce, or compensate potentially adverse effects are included as part of each action alternative. Additional information on the affected environment, methods, and the anticipated effects of the project can be found in Delta Conveyance Project Draft EIR Chapter 23, *Air Quality and Greenhouse Gases* (California Department of Water Resources 2022).

The large-scale operation of the SWP, including the facilities proposed in the action alternatives, is outside USACE authority under CWA Section 404, Section 408, and RHA Section 10. Therefore, the Draft EIS focuses only on those actions under USACE authority. Operations of the action alternatives are discussed briefly and qualitatively throughout the EIS, and readers should refer to the Delta Conveyance Project Draft EIR (California Department of Water Resources 2022) for a more in-depth analysis of operations and associated effects on the environment.

3.3.1 Affected Environment

Air quality and GHGs are important considerations for the action alternatives because of current regional air quality conditions, which exceed certain federal and state ambient air quality standards, and because GHGs generated by the action alternatives may contribute to global climate change.

Ambient air quality standards are established by the U.S. Environmental Protection Agency (USEPA) and California Air Resources Board (CARB) to protect public health and protect public welfare. The ambient air quality standards define clean air and represent the maximum amount of pollution that can be present in outdoor air without any harmful effects on people and the environment.

Criteria pollutants are a group of six common air pollutants for which the federal and state governments have set national ambient air quality standards (NAAQS) and California ambient air quality standards (CAAQS), respectively. Criteria pollutants are defined as ozone, carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and particulate matter (PM), which consists of particulates 10 microns in diameter or less (PM10) and 2.5 microns in diameter or less (PM2.5). Ozone is considered a regional pollutant because its precursors affect air quality on a regional scale; nitrogen oxides (NO_X) and reactive organic gases (ROGs) react photochemically to form ozone, and this reaction occurs at some distance downwind of the emissions source. Pollutants such as CO, NO_2, SO_2, and Pb are considered local pollutants that tend to accumulate in the air locally. PM is both a local and regional pollutant. The primary criteria pollutants generated by the action alternatives are ozone precursors (NO_X and ROGs), CO, NO_2, SO_2, and PM.[4]

The study area for air quality encompasses the areas directly and indirectly affected by construction of the action alternatives and operations and maintenance activities. Two geographic scales define

[4] Pb is also a criteria pollutant, and there are state standards for sulfates, hydrogen sulfide, vinyl chloride, and visibility particulates. However, these pollutants are typically associated with industrial sources, which are not included as part of the proposed action. Accordingly, they are not evaluated further.

the air quality study area—the *local* study area is the project footprint plus areas within 1,000 feet of the construction and operational fence line, and the *regional* study area is the affected air basins. The water-conveyance alignments and primary haul routes for the action alternatives are in the Sacramento Valley Air Basin (SVAB), San Joaquin Valley Air Basin (SJVAB), and San Francisco Bay Area Air Basin (SFBAAB). These air basins combined compose the regional air quality study area. The study area for GHGs includes the entire state and global atmosphere.

Local monitoring data are used to designate areas as nonattainment, maintenance, attainment, or unclassified for the NAAQS and CAAQS.[5] Table 3.3-1 summarizes the attainment status of the portions of the SVAB, SJVAB, and SFBAAB along the water-conveyance alignments with regard to the NAAQS and CAAQS. For the purposes of this analysis, three CARB air monitoring stations, one in each air basin, were selected to represent existing conditions along the project footprint: Sacramento T Street (in the SVAB), Stockton-Hazelton Street (in the SJVAB), and Bethel Island Road (in the SFBAAB). These stations were selected from the available monitoring network based on their proximity to the project footprint. Data from the Sacramento T Street and Stockton-Hazelton Street stations are more representative of existing conditions in portions of the study area nearest to cities and roadways. Emissions sources along more rural parts of the study area in Sacramento and San Joaquin counties (e.g., through the Delta) are much less concentrated, and as such, monitored pollutant concentrations from the Sacramento T Street and Stockton-Hazelton Street provide a conservative representation of ambient conditions. Between 2018 and 2020, monitored CO and NO_2 concentrations did not exceed any federal or state standards at any of the three monitoring locations. However, the state and federal standards for ozone and PM10 and federal standard for PM2.5 were exceeded.

For the purposes of air quality analysis, *sensitive land uses* are defined as locations where human populations, especially children, seniors, and sick persons, are located and where there is reasonable expectation of continuous human exposure according to the averaging period for the air quality standards (e.g., 24-hour, 8-hour, and 1-hour). *Sensitive receptors* include residences, medical facilities, nursing homes, schools and schoolyards, daycare centers, and parks and playgrounds.

Table 3.3-2 shows the number of sensitive receptors within 1,000 feet (305 meters) of surface construction features and adjacent haul routes. Residential receptors are the only receptor type within this area. The table identifies the distances in feet to the closest residential receptor. Figures showing sensitive receptors within 1,000 feet of surface construction features and adjacent haul routes for each conveyance alignment can be found in Delta Conveyance Project Draft EIR, Chapter 23, *Air Quality and Greenhous Gases* (California Department of Water Resources 2022).

[5] The four NAAQS and CAAQS attainment status designations are defined as 1) Nonattainment—assigned to areas where monitored pollutant concentrations consistently violate the standard in question; 2) Maintenance—assigned to areas where monitored pollutant concentrations exceeded the standard in question in the past but are no longer in violation of that standard; 3) Attainment—assigned to areas where pollutant concentrations meet the standard in question over a designated period; and Unclassified—assigned to areas where data are insufficient to determine whether a pollutant is violating the standard in question.

Table 3.3-1. Federal and State Attainment Status along the Water Conveyance Alignments within the SVAB, SJVAB, and SFBAAB

Pollutant	SVAB Federal	SVAB State	SJVAB Federal	SJVAB State	SFBAAB Federal	SFBAAB State
Ozone (O_3)	Nonattainment (moderate/ severe 15 [a])	Nonattainment	Nonattainment (extreme)	Nonattainment	Nonattainment (marginal)	Nonattainment
Particulate matter (PM10)	Maintenance (moderate)	Nonattainment	Maintenance (serious)	Nonattainment	Attainment/ Unclassified	Nonattainment
Particulate matter (PM2.5) (24-hour)	Nonattainment (moderate)	–	Nonattainment (serious)	–	Nonattainment (moderate)	–
Particulate matter (PM2.5) (annual)	Attainment	Attainment	Nonattainment (serious)	Nonattainment	Attainment	Nonattainment
Carbon monoxide (CO)	Attainment	Attainment	Attainment	Attainment	Attainment	Attainment
Nitrogen dioxide (NO_2)	Attainment/ Unclassified	Attainment	Attainment/ Unclassified	Attainment	Attainment/ Unclassified	Attainment
Sulfur dioxide (SO_2)	Attainment/ Unclassified	Attainment	Attainment/ Unclassified	Attainment	Attainment/ Unclassified	Attainment

Sources: California Air Resources Board 2020; U.S. Environmental Protection Agency 2020.

CO = carbon monoxide; NAAQS = national ambient air quality standards; NO2 = nitrogen dioxide; O3 = ozone; PM2.5 = particulate matter 2.5 microns or less in diameter; PM10 = particulate matter 10 microns or less in diameter; SFBAAB = San Francisco Bay Area Air Basin; SJVAB = San Joaquin Valley Air Basin; SO2 = sulfur dioxide; SVAB = Sacramento Valley Air Basin; – = no standard.

[a] The Sacramento metropolitan area is designated moderate nonattainment for the 2015 8-hour ozone standard and severe 15 nonattainment for the 2008 8-hour ozone standard. Areas classified as severe-15 must attain the NAAQS within 15 years of the effective date of the nonattainment designation.

Table 3.3-2. Closest Receptor Distance (feet) and Total Number of Residential Receptors within 1,000 feet of Surface Construction Features and Adjacent Haul Routes

Alternative	Distance of Closest Receptor	Number of Receptors within 1,000 Feet
1	59	707
2b	59	612
3	11	536
4b	11	441
5	11	345

Note: Table shows the closest residential receptor to surface construction features by alternative. The distance was measured from a point digitized on the structure to the edge of the nearest water-conveyance feature boundary. There are no educational, medical, or recreational receptors within 1,000 feet of surface construction features and adjacent haul routes.

The air quality analysis also assesses the potential effects from toxic air contaminants, valley fever, and nuisance odors. TACs are an air quality concern because of their potential to increase the risk of developing cancer or because of their acute or chronic health risks. While NAAQS and CAAQS have not established ambient air quality standards for toxic air contaminants (TACs), the primary TAC of concern associated with the action alternatives is diesel particulate matter (DPM). Valley fever is a disease caused by inhaling *Coccidioides immitis* (*C. immitis*) fungus spores. The spores are found in certain types of soil and become airborne when the soil is disturbed. If inhaled, the spores can cause flu-like symptoms within 2 to 3 weeks of exposure. While *C. immitis* is not typically found in the Sacramento area or Bay Area, the fungus is endemic to the Central Valley (U.S. Geological Survey 2000:3).

3.3.2 Environmental Consequences

This section describes the assessment methods used to analyze potential environmental effects and identifies the direct, indirect, and cumulative effects on air quality and GHGs associated with the action alternatives, as well as the No Action Alternative.

3.3.2.1 Methods for Analysis

Mass Emissions Modeling

Construction of the action alternatives and compensatory mitigation sites would generate emissions of criteria pollutants and precursors (ROG, NO_X, CO, SO_2, PM10, and PM2.5), and GHGs (CO_2, CH_4, N_2O, SF_6, and HFCs) that could result in air quality and GHG effects. Emissions during construction would originate from off-road equipment exhaust, marine vessel exhaust, locomotive exhaust, helicopter exhaust, employee and haul truck vehicle exhaust, earth and materials movement, paving, electricity consumption, and concrete batching.

Analysts estimated combustion exhaust, fugitive dust (PM10 and PM2.5), and fugitive off-gassing (volatile organic compounds [VOC]) based on action alternative-specific construction data (e.g., schedule, equipment, truck volumes) provided by the Delta Conveyance Design and Construction Authority (DCA) and a combination of emissions factors and methodologies from the California Emissions Estimator Model (CalEEMod), version 2016.3.2; the EMissions FACtors model

(EMFAC2017 and CT-EMFAC2017);[6] the USEPA *AP-42 Compilation of Air Pollutant Emissions Factors* (AP-42); and other relevant agency guidance and published literature. Daily and annual criteria pollutant and GHG emissions were quantified based on concurrent construction activity. Emissions estimates for activities that span more than one air district were apportioned based on the location of construction activity.

Analysts estimated emissions during operations and maintenance activities using action alternative-specific activity data and emissions factors and methodologies from CalEEMod, EMFAC models, the USEPA's AP-42, and other relevant agency guidance and published literature. The emissions intensity of operations and maintenance activities was estimated under 2020 conditions to define baseline conditions. Refer to Delta Conveyance Project Draft EIR Appendix 23A, *Mass Emissions Estimation Methodology* (California Department of Water Resources 2022), for a detailed description of the analysis method.

Construction of the proposed action and compensatory mitigation sites would alter existing land uses, resulting in changes to present-day (baseline) GHG emissions or removals. Analysts quantified the net GHG effect of land-use changes associated with construction of the central, eastern, and Bethany Reservoir alignments and compensatory mitigation sites. The GHG effect of the proposed action was determined by calculating GHG emissions and removals relative to existing conditions. Proposed action GHG emissions and removals over time were compared to the baseline scenarios to estimate the cumulative net GHG effect.

Air quality and GHG modeling includes implementation of quantifiable air quality environmental commitments described in Appendix C1, *Environmental Commitments and Best Management Practices*. Refer to Delta Conveyance Project Draft EIR Appendix 23A, *Mass Emissions Estimation Methodology*, for a detailed description of the analysis method and Appendix 23B, *Air Quality and GHG Analysis Activity Data*, for modeling assumptions (California Department of Water Resources 2022).

Localized Criteria Pollutant Concentration Modeling

Analysts conducted a quantitative ambient air quality analysis (AAQA) to assess the potential for construction-generated criteria pollutants to cause new or contribute to existing violations of the NAAQS and CAAQS. The AAQA considers both long-term (annual) emissions and short-term (less than 24 hours) effects of all criteria pollutants, as applicable based on the established NAAQS and CAAQA. Analysts modeled on-site concentrations of pollutants using the mass emissions modeling results and the AERMOD dispersion model. A representative maximum emissions scenario for short-term effects was developed for major construction features based on maximum activity levels that could take place concurrently. All major design components of the action alternatives were quantitatively analyzed. Analysts also assessed the combined effect of emissions from geographically proximate construction. Refer to Delta Conveyance Project Draft EIR Appendix 23C, *Health Risk Assessment and Ambient Air Quality Analysis Methodology* (California Department of Water Resources 2022), for a detailed description of the analysis method.

[6] CARB released EMAFC2021 on January 15, 2021, but this version has not yet been approved by USEPA. Accordingly, this analysis uses EMAFC2017, which was available at the time of notice of preparation and is the current USEPA approved version of EMFAC.

Operations and maintenance activities would require minimal equipment and vehicles, and in some cases, would only occur annually or every few years. Analysts therefore assessed potential changes in localized pollutant concentrations qualitatively, except for stationary standby engine generators.

Health Risk Assessment

Analysts conducted a quantitative health risk assessment (HRA) to assess the potential effects associated with public exposure to DPM.[7] The HRA was conducted using the guidelines provided by the OEHHA (2015) and local air districts (Bay Area Air Quality Management District 2020; San Joaquin Valley Air Pollution Control District 2019; Sacramento Metropolitan Air Quality Management District 2020). The USEPA's AERMOD dispersion model was used to quantify annual average DPM concentrations at nearby receptor locations for each feature. Three representative meteorological datasets, which broadly cover the different meteorological conditions found along the proposed alignment, were used in the analysis. Various construction work areas were assumed to characterize construction activities and emissions. Cancer and noncancer health effects on the surrounding community were calculated based on the results of the dispersion modeling, OEHHA's (2015) guidance on risk calculations, and local air district guidance. Refer to Delta Conveyance Project Draft EIR Appendix 23C, *Health Risk Assessment and Ambient Air Quality Analysis Methodology* (California Department of Water Resources 2022), for a detailed description of the analysis method.

Operations and maintenance activities would require minimal equipment and vehicles, and in some cases, would only occur infrequently. Analysts, therefore, assessed health risks qualitatively, except for stationary standby engine generators.

Valley Fever and Odor Analyses

The valley fever and odor analyses are likewise qualitative and consider the potential for receptors to be exposed to *C. immitis* fungus spores and nuisance odors. The qualitative valley fever and odor analyses draws on guidance published by the U.S. Geological Survey (2000:3) and local air districts (Bay Area Air Quality Management District 2017; San Joaquin Valley Air Pollution Control District 2015; Sacramento Metropolitan Air Quality Management District 2020).

Operations and maintenance activities would require minimal equipment and vehicles and would be unlikely to disturb large areas of soil containing *C. immitis* fungus spores. Analysts, therefore, assessed the potential for valley fever qualitatively. The odor analysis is likewise qualitative and considers the potential for sensitive receptors to be exposed to nuisance odors from operations and maintenance activities.

No Action Alternative

The No Action Alternative accounts for projects, plans, and programs that would be reasonably expected to occur in the foreseeable future if none of the action alternatives were approved and the proposed action's purpose and need were not met. Many of these projects, such as construction of desalination plants or water recycling facilities, would involve construction and operation of facilities by individual public water agencies to ensure local water supply reliability for its

[7] While DPM is a complex mixture of gases and fine particles that includes more than 40 substances listed by USEPA and CARB as hazardous air pollutants, OEHHA guidance (2015) indicates that the cancer potency factor developed to evaluate cancer risks was developed based on total (gas and PM) diesel exhaust.

constituents. A more comprehensive list of projects and programs is provided in Appendix E, *No Action Alternative and Cumulative Projects*. Analysis of the No Action Alternative focuses only on those projects that would happen in absence of the Delta Conveyance.

Water agencies participating in the Delta Conveyance Project are divided into four regions. Each region would likely pursue a specific suite of water supply projects in a No Action Alternative scenario. Activities associated with the various water supply projects could result in the generation of criteria pollutants, TACs, and GHG emissions from on-road vehicle movement, use of mobile and stationary equipment, and earthmoving (e.g., grading). Emissions would vary depending on the level of activity, length of the activity, specific operations, types of equipment, number of personnel, wind and precipitation conditions, and soil moisture content. Operational activities typically include inspection, monitoring, testing, maintenance, and facility operations. These activities could generate emissions from mobile and stationary equipment, on-road vehicles, energy consumption, and fugitive processes.

The specific types and amounts of construction and operational activities would differ depending on the water supply project. Table 3.3-3 summarizes potential construction and operational emissions that may be generated by the project categories based on a review of other similar project types; the regions in which the projects are expected to be required; and the relevant air districts with local air quality management authority.

Table 3.3-3. Summary of No Action Alternative Activities and Potential Emissions

Project type	Region [a]	Air Districts	Potential Construction Emissions	Potential Operational Emissions
Increased/ accelerated desalination	Northern coastal, southern coastal	BAAQMD, SCAQMD, SDAPCD, AVAQMD, SJVAPCD, SLOAPCD, VCAPCD	Exhaust emissions and fugitive dust from construction equipment, vehicles, employee commutes required for facility construction and pipeline installation.	Exhaust emissions and fugitive dust from maintenance and employee vehicle trips. Exhaust emissions from stationary source fuel combustion. GHG emissions from electricity consumption.
Groundwater recovery (brackish water desal)	Northern inland, southern coastal, southern inland	BAAQMD, SLOAPCD, VCAPCD, SJVAPCD, EKAQMD, MDAQMD, AVAQMD, SCAQMD	Exhaust emissions and fugitive dust from construction equipment, vehicles, employee commutes required for facility construction and pipeline installation.	Exhaust emissions and fugitive dust from maintenance and employee vehicle trips. Exhaust emissions from stationary source fuel combustion. GHG emissions from electricity consumption. Potential odors from treatment process.
Groundwater management	Northern coastal, southern coastal	BAAQMD, SCAQMD, SDAPCD, AVAQMD, SJVAPCD, SLOAPCD, VCAPCD	Exhaust emissions and fugitive dust from equipment and vehicles for well drilling, construction of supporting facilities, and vegetation management.	Exhaust emissions and fugitive dust from maintenance and employee vehicle trips. Exhaust emissions from fossil-fueled powered pumps. GHG emissions from electric-powered pumps.
Water recycling	Northern coastal, northern inland, southern coastal, southern inland	BAAQMD, SLOAPCD, VCAPCD, SJVAPCD, EKAQMD, MDAQMD, AVAQMD, SCAQMD	Exhaust emissions and fugitive dust from equipment and vehicles for facility construction, pipeline installation, vegetation management, grading, and trenching.	For new treatment facilities, exhaust emissions and fugitive dust from maintenance and employee vehicle trips. Exhaust emissions from stationary source fuel combustion. GHG emissions from electricity consumption and water treatment, with potential offsetting of

Project type	Region [a]	Air Districts	Potential Construction Emissions	Potential Operational Emissions
				emissions increased due to reduced water consumption.
Water Use efficiency measures	Northern coastal, southern coastal, southern inland	BAAQMD, SLOAPCD, VCAPCD, SJVAPCD, EKAQMD, MDAQMD, AVAQMD, SCAQMD	Minor exhaust emissions and fugitive dust is pipeline or canal construction is required.	Reduced GHG emissions from lower water sector energy consumption. Potential for increased odors and GHG emissions in wastewater treatment systems due to lower pipe velocities. Fugitive dust is agriculture lands are fallowed.

[a] See Chapter 2, *Project Description and Alternatives*, Section 2.5, *No Action Alternative*, for a complete definition of the geographic regions.

AVAQMD = Antelope Valley Air Quality Management District; BAAQMD = Bay Area Air Quality Management District; EKAQMD = Eastern Kern Air Quality Management District; GHG = greenhouse gas; MDAQMD = Mojave Desert Air Quality Management District; SCAQMD = South Coast Air Quality Management District; SDAPCD = San Diego Air Pollution Control District; SJVAPCD = San Joaquin Valley Air Pollution Control District; SLOAPCD = San Luis Obispo Air Pollution Control District; VCAPCD = Ventura County Air Pollution Control District.

Calculated annual electricity consumption for SWP/CVP pumping under existing conditions and the No Action Alternative are presented in Delta Conveyance Project Draft EIR Chapter 22, *Energy* (California Department of Water Resources 2022). Because power plants are located throughout the state, criteria pollutant emissions associated with electricity demand from SWP/CVP pumping under the No Action Alternative cannot be ascribed to a specific air basin or air district within the study area and it cannot be determined whether the air pollutant emissions associated with electricity generation would degrade air quality in a specific air basin or air district within the study area. Consequently, effects relating to the electricity consumption from SWP/CVP pumping under the No Action Alternative through a comparison of electricity-related emissions to the *de minimis* thresholds, which are applicable to specific regions based on local ambient air quality conditions, would be infeasible.

3.3.2.2 Thresholds of Significance

The general conformity requirements would apply to the federal action for each pollutant for which the total of direct and indirect emissions caused by the federal action equal or exceed the *de minimis* emissions rates shown in Table 3.3-4. These emissions rates are expressed in units of tons per year (tpy) and are compared to the total of direct and indirect emissions caused by the project in each air basin for the calendar year. Table 3.3-4 shows the applicable threshold levels for the pollutants for which general conformity is required in the study area.

Table 3.3-4. General Conformity Rule *de minimis* Thresholds for the Action Alternatives (tons per year)

Air Basin	ROG	NO_X	CO [a]	PM10	PM2.5	SO_2 [b]
SVAB	25	25	None	100	100	100
SJVAB	10	10	None	100	70	70
SFBAAB	100	100	None	None	100	100

Source: 40 CFR Section 93.153.

SVAB = Sacramento Valley Air Basin; SJVAB = San Joaquin Valley Air Basin; SFBAAB = San Francisco Bay Area Air Basin; ROG = reactive organic gases; lbs = pounds; NO_X = nitrogen oxide; PM10 = particulate matter that is 10 microns in diameter and smaller; PM2.5 = particulate matter that is 2.5 microns in diameter and smaller; CO = carbon monoxide; SO_X = sulfur oxide.

[a] The project area is in attainment for CO (see Table J-8).

[b] Although the project area is in attainment for SO_2, because SO_2 is a precursor for PM2.5, the PM2.5 general conformity *de minimis* thresholds are used.

3.3.2.3 Effects and Mitigation

Impact AQ-1: Result in Effects on Regional Air Quality

No Action Alternative

USEPA's General Conformity Rule (40 CFR Parts 51 and 93) applies to federal actions that are taken in USEPA-designated "nonattainment" or "maintenance" areas. Accordingly, as outlined in Section III.A of the General Conformity Rule, "only actions which cause emissions in designated nonattainment and maintenance areas are subject to the regulations." The four regions covered by the No Action Alternative include areas currently designated nonattainment or maintenance for the NAAQS. Projects, plans, and programs under the No Action Alternative that are subject to general conformity and located in nonattainment or maintenance areas for the NAAQS must demonstrate project-level compliance with the General Conformity Rule if emissions exceed the General Conformity *de minimis* thresholds.

The plans, projects, and programs implemented in lieu of the action alternatives would generate construction and operational criteria pollutant emissions. The example water reliability projects shown in Table 3.3-3 could occur if none of the action alternatives were approved and the proposed action's purpose and need were not met. While it cannot be anticipated what ultimate suite of projects would be chosen by each of the regions, it would likely be a mix of various types of projects reasonably feasible within that region.

Desalination projects would most likely be pursued in the northern and southern coastal regions. The southern coastal regions would likely require larger and more desalination projects than the northern coastal region to replace the water yield that otherwise would have been received through Delta Conveyance. Groundwater recovery (brackish water desalination) could occur across the northern inland, southern coastal, southern inland regions. Physical construction activities required desalination and groundwater recovery projects would be similar and could include clearing, grubbing, and grading; trenching; and construction of pipelines, tanks, pumps, electrical equipment, and buildings. Long-term emissions associated with operation of desalination and groundwater recovery facilities typically include emissions from maintenance and employee vehicle trips, stationary sources, and consumption of electricity and natural gas.

Groundwater management projects would occur in the northern and southern coastal regions. Construction activities for each project could include site clearing; excavation and backfill; and construction of basins, conveyance canals, pipelines, diversions, and pump stations. Operational activities may include maintenance and repair of banks, berms, and concrete structures, and removal of debris, sediment, and vegetation. These activities normally require the use of heavy-duty construction equipment and vehicles, typically on an annual basis prior to the wet season. Emissions may also be generated by work trucks and employee commute vehicles. New diesel-powered pump stations would generate criteria pollutants.

Water recycling projects could be pursued in all four regions. The northern inland region would require the fewest number of wastewater treatment/water reclamation plants, followed by the northern coastal region, followed by the southern coastal region. The southern inland region would require the greatest number of water recycling projects to replace the anticipated water yield that it would receive through the Delta Conveyance Project. Construction techniques for water recycling projects would vary depending on the type of project (e.g., for landscape irrigation, groundwater recharge, dust control, industrial processes) but could require earthmoving activities, grading, excavation, trenching, and facility erection. Operations activities could result in emissions from employee commute, on-site heavy-duty equipment, stationary equipment, electricity consumption, natural gas consumption, and wastewater treatment processes.

Water efficiency projects could be pursued in all four regions and involve a wide variety of project types, such as flow measurement or automation in a local water delivery system, lining of canals, use of buried perforated pipes to water fields, and detection and repair of leaking pipes. Projects requiring physical construction (e.g., lining of canals) could generate minor amounts of emissions from ground disturbance and equipment operation. Physical changes in water levels in reservoirs, rivers, and streams from implementation of conservation measures would not result in long-term criteria pollutant emissions. However, required water conservation could result in agricultural land fallowing, which could result in increased fugitive dust if crop or vegetation stubble cover or vegetative regrowth does not remain.

As shown in Table 3.3-3, construction activities required for water use efficiency measures may be relatively minor. However, more intensive construction may be required for new or expanded facilities, including desalination, groundwater recovery, and water recycling facilities, which may generate emissions above General Conformity *de minimis* thresholds. Information on the location, types, and quantity of construction equipment required for each project is unavailable. Likewise, the levels of potential long-term operations and maintenance activities that may result from implementation of individual projects and plans are currently unknown. While some project activities (e.g., routine operations and maintenance, including inspections and minor repairs) may not markedly increase operations and maintenance activities, other projects would install entirely new facilities representing a new long-term source of emissions that could exceed General Conformity *de minimis* thresholds.

This effect is expected to be further evaluated and identified in the subsequent project-level environmental analysis conducted for the plans, projects, and programs under the No Action Alternative. Minimization measures and environmental commitments similar to those proposed for the Delta Conveyance Project are likely to be available to reduce emissions, but the extent of the reductions is unknown.

All Action Alternatives

The predominant pollutants associated with construction of the action alternatives would be fugitive dust (PM10 and PM2.5) from earthmoving activities and concrete batching. Combustion pollutants, particularly ozone precursors, would also be generated by heavy equipment and vehicles. Emissions would vary notably depending on the level of activity, length of the construction period, specific construction operations, types of equipment, number of personnel, wind and precipitation conditions, and soil moisture content.

Table 3.3-5 summarizes estimated construction emissions that would be generated in the SVAB, SJVAB, and SFBAAB in tons per year by each action alternative. Emissions estimates include implementation of the following air quality environmental commitments.

- Environmental Commitment EC- 7: *Off-Road Heavy-Duty Engines* would minimize exhaust emissions from off-road equipment by requiring all heavy-duty equipment used during construction to meet Tier 4 engine requirements. Tier 4 engine requirements are currently the strictest emissions standards adopted by the CARB and USEPA. The environmental commitment also requires use of renewable diesel, which is produced from nonpetroleum renewable resources and waste products and generates much fewer emissions than traditional diesel per gallon combusted. This commitment does not preclude use of electric-powered equipment over diesel engines, to the extent they become commercially available. However, because the penetration of electric engines in the construction fleet is currently unknown, the emissions analysis conservatively assumes all equipment would use diesel engines.
- Environmental Commitment EC-9: *On-Site Locomotives* would minimize exhaust emissions from locomotives operating within the Twin Cities Complex, Southern Complex, and/or Lower Roberts Island by requiring they meet Tier 4 engine requirements.
- Environmental Commitment EC-10: *Marine Vessels* would minimize exhaust emissions from marine vessels by requiring they operate engines no older than model year 2010 (manufactured or retrofitted).
- Environmental Commitment EC-11: *Fugitive Dust Control* would minimize fugitive dust emissions through the implementation of a dust control plan. The fugitive dust control plan would outline measures such as watering exposed soil, applying dust suppressants to unpaved roads, stabilizing stockpiles with biopolymers, installing wind breaks, enclosing conveyors and mechanical driers, washing vehicles before exiting the construction site, and protecting disturbed areas following construction.
- Environmental Commitment EC-12: *On-Site Concrete Batching Plants* would minimize fugitive dust emissions from concrete batching through implementation of control measures, such as water sprays, enclosures, hoods, and other suitable technology.

Table 3.3-5. Criteria Pollutant Emissions from Construction of the Proposed Project in the SVAB, SJVAB, and SFBAAB (tons/year)[a]

	SVAB						SJVAB						SFBAAB					
Year	ROG	NO_X	CO	PM10	PM2.5	SO_2	ROG	NO_X	CO	PM10	PM2.5	SO_2	ROG	NO_X	CO	PM10	PM2.5	SO_2
Alternative 1																		
PFIY 1	1	3	12	1	<1	<1	1	4	20	1	<1	<1	<1	1	4	<1	<1	<1
PFIY 2	1	3	11	1	<1	<1	1	4	20	1	<1	<1	<1	1	4	<1	<1	<1
CY 1	<1	7	5	3	1	<1	1	5	11	3	1	<1	<1	1	4	2	<1	<1
CY 2	1	11	22	6	2	<1	1	7	16	4	1	<1	1	5	32	1	<1	<1
CY 3	1	14	18	7	2	<1	1	8	17	3	1	<1	1	11	39	15	2	<1
CY 4	1	21	21	5	1	<1	2	**11**	31	6	2	<1	1	11	25	19	3	<1
CY 5	4	**57**	119	13	4	<1	2	**23**	29	9	2	<1	3	19	100	15	4	<1
CY 6	5	**67**	142	14	4	<1	2	**23**	28	8	2	<1	3	19	86	21	4	<1
CY 7	4	**54**	140	14	4	<1	1	**20**	22	9	2	<1	2	19	75	50	8	<1
CY 8	2	**31**	60	13	3	<1	1	**12**	15	8	2	<1	2	14	56	62	10	<1
CY 9	1	**26**	30	11	2	<1	1	9	12	10	2	<1	2	22	64	70	11	<1
CY 10	1	24	17	9	2	<1	1	**13**	11	11	2	<1	2	18	50	87	13	<1
CY 11	1	15	11	7	1	<1	<1	7	7	4	1	<1	1	9	29	78	12	<1
CY 12	<1	2	8	8	1	<1	<1	1	1	<1	<1	<1	<1	<1	2	<1	<1	<1
CY 13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CY 14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alternative 2b																		
PFIY 1	1	2	10	1	<1	<1	1	3	19	1	<1	<1	<1	1	4	<1	<1	<1
PFIY 2	1	2	9	1	<1	<1	1	3	19	1	<1	<1	<1	1	4	<1	<1	<1
CY 1	<1	7	4	3	<1	<1	1	5	11	3	1	<1	<1	1	4	2	<1	<1
CY 2	1	13	22	6	2	<1	1	7	17	4	1	<1	1	7	41	4	1	<1
CY 3	1	11	16	6	2	<1	1	6	15	2	1	<1	1	14	41	22	3	<1
CY 4	1	23	21	3	1	<1	2	**12**	32	5	2	<1	2	15	57	17	3	<1
CY 5	3	**43**	90	10	3	<1	2	**19**	25	7	2	<1	3	22	104	23	5	<1
CY 6	3	**49**	78	9	3	<1	1	**19**	22	6	2	<1	3	20	89	36	7	<1
CY 7	2	**40**	57	8	2	<1	1	**17**	16	6	2	<1	2	19	73	50	8	<1
CY 8	1	**27**	28	7	2	<1	1	**13**	11	6	1	<1	2	13	54	47	8	<1
CY 9	1	**26**	20	6	1	<1	1	**11**	10	6	1	<1	2	23	69	71	11	<1
CY 10	<1	12	9	2	1	<1	<1	7	7	7	1	<1	1	13	30	76	11	<1
CY 11	<1	7	13	5	1	<1	<1	2	2	1	<1	<1	<1	2	8	75	11	<1
CY 12	<1	1	1	<1	<1	<1	<1	<1	1	<1	<1	<1	<1	<1	1	<1	<1	<1
CY 13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	SVAB						SJVAB						SFBAAB					
Year	ROG	NO_X	CO	PM10	PM2.5	SO_2	ROG	NO_X	CO	PM10	PM2.5	SO_2	ROG	NO_X	CO	PM10	PM2.5	SO_2
CY 14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alternative 3																		
PFIY 1	1	3	11	1	<1	<1	1	3	18	1	<1	<1	<1	1	4	<1	<1	<1
PFIY 2	1	2	10	1	<1	<1	1	3	18	1	<1	<1	<1	1	4	<1	<1	<1
CY 1	<1	6	5	3	1	<1	1	5	11	3	1	<1	<1	1	4	2	<1	<1
CY 2	1	9	22	5	2	<1	1	5	13	3	1	<1	1	5	32	1	<1	<1
CY 3	1	8	17	6	2	<1	<1	4	9	2	<1	<1	1	11	38	13	2	<1
CY 4	1	17	20	5	1	<1	1	8	18	6	1	<1	1	11	24	18	3	<1
CY 5	4	**57**	122	13	4	<1	2	**23**	28	9	2	<1	3	21	100	22	5	<1
CY 6	5	**70**	146	14	4	<1	2	**26**	31	8	2	<1	3	21	86	30	5	<1
CY 7	4	**55**	143	15	4	<1	2	**22**	27	7	2	<1	2	22	76	60	9	<1
CY 8	2	**32**	62	13	3	<1	1	**14**	19	5	1	<1	2	14	56	63	10	<1
CY 9	1	**27**	33	11	2	<1	1	**11**	17	6	1	<1	2	23	66	72	11	<1
CY 10	1	**25**	20	10	2	<1	1	**15**	18	9	2	<1	2	20	52	93	14	<1
CY 11	1	17	15	8	2	<1	1	7	10	9	2	<1	1	9	29	77	12	<1
CY 12	<1	4	9	10	2	<1	<1	2	1	6	1	<1	<1	2	6	73	11	<1
CY 13	<1	2	1	<1	<1	<1	<1	1	<1	<1	<1	<1	<1	1	4	73	11	<1
CY 14	0	0	0	0	0	0	0	0	0	0	0	0	<1	<1	<1	9	1	<1
Alternative 4b																		
PFIY 1	1	2	9	1	<1	<1	1	3	17	1	<1	<1	<1	1	4	<1	<1	<1
PFIY 2	<1	2	8	1	<1	<1	1	3	17	1	<1	<1	<1	1	4	<1	<1	<1
CY 1	<1	6	4	3	<1	<1	1	5	11	3	1	<1	<1	1	4	2	<1	<1
CY 2	1	11	25	6	3	<1	1	5	13	3	1	<1	2	7	47	4	1	<1
CY 3	<1	6	11	4	1	<1	<1	3	8	2	<1	<1	1	11	35	10	2	<1
CY 4	1	20	20	3	1	<1	1	10	18	6	2	<1	2	14	60	12	2	<1
CY 5	3	**42**	91	10	3	<1	1	**18**	25	8	2	<1	3	21	103	22	5	<1
CY 6	3	**49**	81	9	3	<1	1	**20**	24	7	2	<1	3	20	89	36	7	<1
CY 7	2	**38**	60	9	2	<1	1	**17**	22	6	2	<1	2	18	70	50	8	<1
CY 8	1	**26**	31	9	2	<1	1	**14**	17	4	1	<1	2	13	56	48	8	<1
CY 9	1	**25**	23	7	2	<1	1	**12**	16	5	1	<1	2	23	69	72	11	<1
CY 10	1	15	13	3	1	<1	<1	9	11	5	1	<1	1	11	24	74	11	<1
CY 11	1	12	18	5	1	<1	<1	3	4	5	1	<1	<1	6	15	76	12	<1
CY 12	<1	1	1	<1	<1	<1	<1	1	<1	<1	<1	<1	<1	<1	2	<1	<1	<1
CY 13	0	0	0	0	0	0	<1	<1	<1	<1	<1	<1	0	0	0	0	0	0
CY 14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	SVAB						SJVAB						SFBAAB					
Year	ROG	NO_X	CO	PM10	PM2.5	SO_2	ROG	NO_X	CO	PM10	PM2.5	SO_2	ROG	NO_X	CO	PM10	PM2.5	SO_2
DWR's Preferred Alternative																		
PFIY 1	1	2	11	1	<1	<1	1	3	17	1	<1	<1	<1	1	4	<1	<1	<1
PFIY 2	1	2	9	1	<1	<1	1	3	17	1	<1	<1	<1	1	4	<1	<1	<1
CY 1	<1	7	5	3	<1	<1	1	4	10	3	1	<1	<1	2	5	6	1	<1
CY 2	1	4	14	3	1	<1	<1	3	12	3	<1	<1	<1	1	2	2	<1	<1
CY 3	<1	4	12	4	1	<1	1	4	19	3	1	<1	<1	3	13	1	<1	<1
CY 4	1	18	21	5	1	<1	1	**10**	28	8	2	<1	1	13	46	5	1	<1
CY 5	4	**49**	118	12	4	<1	2	**22**	30	9	2	<1	2	20	71	14	3	<1
CY 6	4	**58**	142	13	4	<1	2	**25**	32	10	2	<1	2	15	57	33	5	<1
CY 7	4	**45**	140	14	4	<1	2	**21**	26	9	2	<1	2	15	55	35	5	<1
CY 8	2	**28**	61	12	3	<1	1	**16**	22	11	2	<1	2	20	72	38	6	<1
CY 9	1	**27**	33	12	3	<1	1	**15**	21	16	3	<1	2	22	81	39	6	<1
CY 10	1	20	19	9	2	<1	1	**16**	20	18	3	<1	2	26	69	41	6	<1
CY 11	1	11	13	8	2	<1	1	9	10	18	3	<1	1	7	21	5	1	<1
CY 12	<1	2	8	12	2	<1	<1	3	5	12	2	<1	<1	1	4	1	<1	<1
CY 13	<1	1	<1	<1	<1	<1	1	1	2	1	<1	<1	<1	<1	1	<1	<1	<1
CY 14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Threshold	*25*	*25*	–	*100*	*100*	*100*	*10*	*10*	–	*100*	*70*	*70*	*100*	*100*	–	–	*100*	*100*

CO = carbon monoxide; NO_X = nitrogen oxide; PM10 = particulate matter that is 10 microns in diameter and smaller; PM2.5 = particulate matter that is 2.5 microns in diameter and smaller; ROG = reactive organic gases; SO_2 = sulfur dioxide; PFIY = preliminary field investigation year; CY = construction year.

[a] Emissions results include implementation of air quality environmental commitments (EC-7 and EC-9 through EC-12). Exceedances of federal *de minimis* thresholds are shown in **bolded underline**.

Comparable emissions levels are anticipated in the SVAB among Alternatives 1, 2b, 3, 4b, and DWR's Preferred Alternative because the amount of construction (e.g., equipment operating hours, earthmoving), and thus construction emissions, would be similar for alternatives with the same design capacity (i.e., 6,000 cubic square feet and 4,500 cubic square feet, respectively). Construction of Alternatives 2b and 4b, which include only one intake, would require less earthmoving and heavy-duty equipment and vehicles, and thus, would generate fewer total emissions compared to Alternatives 1, 3, and DWR's Preferred Alternative. Within the SJVAB, the amount of construction equipment and vehicles, and thus construction exhaust emissions (e.g., VOC, NO_X) would be greatest under Alternatives 1 and 3. Because of its lower conveyance capacity (i.e., 4,500 cubic square feet), exhaust emissions would be the least under Alternatives 2b and 4b. Fugitive dust emissions in the SJVAB would be highest under DWR's Preferred Alternative. This is because under DWR's Preferred Alternative, two launch shafts would be constructed at Lower Roberts Island, effectively doubling the amount of earthmoving and vehicles traveling on unpaved surfaces at this location, compared to all other action alternatives. Within the SFBAAB, emissions would be comparable among Alternatives 1, 2b, 3, and 4b. Emissions estimated under DWR's Preferred Alternative are lower because the alternative does not include major tunneling operations, such as those required at the Southern Complex (Alternatives 1, 2b, 3, and 4b).

As shown in Table 3.3-5, construction-phase emissions, compared to the *de minimis* thresholds, are as follows.

- Annual estimated NO_X emissions in the SVAB are <u>greater</u> than the applicability rate of 25 tons per year between the fifth and tenth years of construction, depending on the action alternative, with implementation of environmental commitments.
- Annual estimated NO_X emissions in the SJVAB are <u>greater</u> than the applicability rate of 10 tons per year between the fourth and tenth years of construction, depending on the action alternative, with implementation of environmental commitments.
- Annual estimated VOC, SO_2, PM10, and PM2.5 emissions are <u>less</u> than the applicability rates in the SVAB and SJVAB with implementation of environmental commitments.
- Annual estimated VOC, SO_2, NO_X, and PM2.5 emissions in the SFBAAB are <u>less</u> than the applicability rates in the SFBAAB with implementation of environmental commitments

A general conformity determination is required for NO_X for the years during construction when the emissions would exceed the *de minimis* thresholds in the SVAB and SJVAB and do not meet any of the exceptions cited in 40 CFR Section 93.154(c). Because NO_X is a precursor to PM and can contribute to PM formation, NO_X emissions above the applicable PM2.5 and PM10 *de minimis* thresholds (100 tons per year in Sacramento County and 70 tons per year in SJVAB) trigger a potential secondary PM precursor impact. NO_X emissions in these quantities can contribute to PM formation, and thus conflict with the applicable PM10 and PM2.5 state implementation plans. However, as shown in Table 3.3-5, the secondary PM precursor threshold is not triggered under any action alternative.

A general conformity determination has been prepared for the action alternatives and is included in Appendix J, *General Conformity Determination.* As shown in Appendix J, USACE determines that the selected action alternative as designed would conform to the approved state implementation plan based on the following.

- The applicant would commit that construction-phase NO_X emissions would be offset consistent with the applicable federal regulations through a memorandum of understanding (MOU) and project-level voluntary emissions reduction agreement (VERA) with Sacramento Metropolitan Air Quality Management District (SMAQMD) and San Joaquin Valley Air Pollution Control District (SJVAPCD), respectively.
- The applicant, SMAQMD and SJVAPCD would enter into a contractual agreement to mitigate NO_X emissions by providing funds for SMAQMD's MOU and SJVAPCD's project-level VERA to fund grants for projects that achieve the necessary emissions reductions. Should the applicant be unable to enter what they regard as a satisfactory agreement with SMAQMD or SJVAPCD, the applicant would develop an alternative or complementary off-site mitigation program to reduce NO_X emissions.
- SMAQMD and SJVAPCD would seek and implement the necessary emissions reduction measures, using the applicant's funds.
- SMAQMD and SJVAPCD would serve as administrators of the emissions reduction projects and verifiers of the successful mitigation effort.

Mitigation Measure AQ-1: *Offset Construction-Generated Criteria Pollutants in the Sacramento Valley Air Basin,* and Mitigation Measure AQ-2*: Offset Construction-Generated Criteria Pollutants in the San Joaquin Valley Air Basin* ensure conformity requirements for NOx are met.

Maintenance would be conducted daily or at varying frequencies, depending on the type of activity. Daily activities include inspections, security checks, and operations oversight. Less frequent activities include operability testing, cleaning, sediment removal, dewatering, and repaving. Maintenance emissions are expected to be comparable among all action alternatives. Maintenance activities under all action alternatives would not exceed *de minimis* thresholds; refer to the Delta Conveyance Project Draft EIR Chapter 23, *Air Quality and Greenhouse Gases,* Tables 23-23, 23-33, 23-44, and 23-54 (California Department of Water Resources 2022).

Long-term operation of the action alternatives would require the use of electricity for pumping. While fossil fuel–powered electrical-generating facilities emit criteria pollutants, these facilities are regulated and permitted at a maximum emissions level. Therefore, operational emissions associated with electricity consumption are not included in the analysis because these emissions have already been evaluated and accounted for in existing permit and environmental documents.

Based on the information presented above, including proposed mitigation measures and environmental commitments, the effect of all action alternatives on regional air quality does not appear to be significant.

Impact AQ-2: Result in Exposure of Sensitive Receptors to Substantial Localized Criteria Pollutant Emissions

No Action Alternative

Construction activities required for plans, projects, and programs implemented in absence of the Delta Conveyance Project have the potential to cause elevated criteria pollutant concentrations proximate to construction areas. These elevated concentrations may cause or contribute to exceedances of the short- and long-term NAAQS and CAAQS and affect local air quality and public health. As shown in Table 3.3-3, construction activities required for water use efficiency measures may be relatively minor. However, more intensive construction may be required for new or expanded facilities, including desalination, groundwater recovery, and water recycling facilities, which may generate emissions above the NAAQS and CAAQS. These new facilities may also result in long-term emissions that could exceed standards.

This effect is expected to be further evaluated and identified in the subsequent project-level environmental analysis conducted for the plans, projects, and programs under the No Action Alternative. Minimization measures and environmental commitments similar to those proposed for the Delta Conveyance Project are likely to be available to reduce localized pollutant concentrations, but the extent of the reductions is unknown.

All Action Alternatives

Construction of any of the action alternatives has the potential to cause elevated criteria pollutant concentrations proximate to construction areas. The criteria pollutants of concern with established annual standards are NO_2, PM10, and PM2.5. The criteria pollutants of concern with established hourly or daily standards are the following: CO (1 hour and 8 hours); PM10 and PM2.5 (24 hours); NO_2 (1 hour); and SO_2 (1 hour and 24 hours). Total pollutant concentration, which reflects the incremental contribution from the action alternatives plus the existing concentration, was compared to the CAAQS and NAAQS to determine if construction would cause an ambient air quality violation (Delta Conveyance Project Draft EIR Chapter 23, *Air Quality and Greenhouse Gases,* Tables 23-55 through 23-57). Incremental increases in PM10 and PM2.5 concentrations from the action alternatives within areas where background concentrations exceed the CAAQS or NAAQS were compared to the applicable significant impact level (SIL) to analyze the potential for the action alternatives to worsen existing PM2.5 and PM10 violations; refer to Delta Conveyance Project Draft EIR Chapter 23, *Air Quality and Greenhouse Gases,* Table 23-58. The modeled concentrations of criteria pollutants include implementation of quantifiable air quality environmental commitments.

Even with incorporation of environmental commitments, construction of all action alternatives would result in an impact on local air quality. Within SMAQMD, construction of any action alternative would generate maximum 24-hour PM10 concentrations above SIL (CAAQS/NAAQS). Construction of all action alternatives would generate maximum annual PM10 concentrations above the SIL (NAAQS). Construction of any action alternative would generate maximum 24-hour PM2.5 and annual PM2.5 concentrations above the SIL (NAAQS and CAAQS, respectively). The highest exceedances are predicted to occur along the construction fence line of the Twin Cities Shaft.

Within the SJVAPCD, construction of any action alternative would generate maximum 24-hour PM10 concentrations above the NAAQS and SIL (CAAQS), maximum annual PM2.5 concentrations above the SIL (CAAQS and NAAQS), and maximum 24-hour PM2.5 concentrations above the SIL (NAAQS). These violations would primarily occur along the fence line of shaft locations. Construction of Alternatives 1, 2b, and DWR's Preferred Alternative would generate maximum 1-hour NO_2 concentrations above the NAAQS.

Within the Bay Area Air Quality Management District (BAAQMD), construction of any action alternative except DWR's Preferred Alternative would generate maximum annual PM2.5 concentrations above NAAQS and CAAQS and maximum annual PM10 concentrations above CAAQS along the construction fence line of the Southern Complex. Construction of all action alternatives would generate maximum 24-hour PM2.5 and PM10 above the SIL (NAAQS and CAAQS, respectively) along the construction fenceline of the Southern Complex (central and eastern alignment alternatives) and Bethany Complex (Bethany Reservoir alternative).

Environmental Commitments (EC-7: *Off-Road Heavy-Duty Engines* through EC-13: *DWR Best Management Practices to Reduce GHG Emissions*) would minimize construction emissions through implementation of the best available on-site controls. Mitigation Measure AQ-5: *Avoid Public Exposure to Localized Particulate Matter and Nitrogen Dioxide Concentrations* is required to reduce potential public exposure to elevated ambient concentrations of PM and NO_2 during construction.[8] The measure requires additional PM and NO_2 modeling to provide a more refined estimate of hourly and annual concentrations that are expected to occur during the construction period. If the refined modeling predicts an exceedance of the SIL or violation of the NO_2 NAAQS, the measure requires the applicant to conduct ambient air quality monitoring during construction. Results of the monitoring will be used to inform decision making on further actions to reduce pollutant concentrations. While these actions would lower exposure to air pollution generated by the action alternatives, it may not be feasible to completely eliminate all localized exceedances of the SILs and ambient air quality standards.

Operations and maintenance activities would be conducted daily or at varying frequencies, depending on the type of activity. Emissions generated by these activities would be limited in duration, with some activities requiring less than a day to complete only once per year. Maximum daily and total annual criteria pollutant emissions estimated for operations and maintenance activities are not expected to exceed the ambient air quality standards or markedly contribute to an existing or projected violation.

Based on the information presented above, even with implementation of proposed mitigation measures and environmental commitments, the effect of all action alternatives on sensitive receptors from localized criteria pollutant emissions appears to be significant.

Impact AQ-3: Result in Exposure of Sensitive Receptors to Substantial Toxic Air Contaminant Emissions

No Action Alternative

Construction activities required for plans, projects, and programs implemented in absence of the Delta Conveyance Project have the potential to generate DPM that could expose nearby sensitive receptors to increased cancer and noncancer risks. As shown in Table 3.3-3, construction activities required for water use efficiency measures may be relatively minor. It is also likely construction of these types of projects would be relatively short term and thus potential receptor exposure to elevated DPM concentrations would be limited. More intensive construction may be required for new or expanded facilities, including desalination, groundwater recovery, and water recycling facilities. Depending on the location of a construction sites and surrounding land uses, sensitive receptors could be exposed to substantial DPM concentrations and associated health risks. Some of these facilities may also install stationary fossil-fuel powered equipment (e.g., generators, boilers) that could expose receptors to a long-term source of TAC emissions.

The effect of increases in receptor cancer and noncancer health hazards above risk levels recommended by local air districts (e.g., SMAQMD, SJVAPCD) would be detrimental. This effect is expected to be further evaluated and identified in the subsequent project-level environmental

[8] Although Mitigation Measures AQ-1 and AQ-2 would offset NOx and PM emissions, as required, these offsets could occur regionally throughout the SVAB and SJVAB. Accordingly, the emission reductions achieved by these offsets may not contribute to enough localized reductions to avoid a project-level violation of the ambient air quality standards or SIL.

analysis conducted for the plans, projects, and programs under the No Action Alternative. Minimization measures and environmental commitments similar to those proposed for the Delta Conveyance Project are likely to be available to reduce DPM and other TAC emissions, but the extent of the reductions is unknown.

All Action Alternatives

Inhalation of DPM from construction of the action alternatives has the potential to create health risks, which may exceed air district significance thresholds for increased cancer and noncancer health hazards at receptor locations adjacent to the action alternatives. Construction would result in DPM emissions primarily from diesel-fueled off-road equipment and heavy-duty trucks, as well as toxic metal emissions from concrete batch plants. Cancer risk from exposure to diesel exhaust is much higher than the risk associated with any other air toxics from construction of the action alternatives.

The modeled health risks include implementation of Environmental Commitments EC-7: *Off-Road Heavy-Duty Engines*; EC-9: *On-Site Locomotives*; and EC-10: *Marine Vessels* (EC-11: *Fugitive Dust Control* and EC-12: *On-Site Concrete Batching Plants* would not affect risks, and EC-8: *On-Road Haul Trucks* and EC-13: *DWR Best Management Practices to Reduce GHG Emissions* were not quantified). The highest modeled off-site cancer risk within each air district, which typically occurs adjacent to or within a few hundred yards of the construction footprint, ranged from 1 to 8 per million; refer to Delta Conveyance Project Draft EIR Chapter 23, *Air Quality and Greenhouse Gases,* Table 23-64 (California Department of Water Resources 2022). These predicted health risks would not exceed any air district thresholds.

Daily and weekly maintenance activities include inspections, security checks, and operations oversight that would only generate emissions from predominately gasoline-powered employee commute vehicles. Less frequent activities (e.g., monthly, quarterly, annually, long-term) may result in additional emissions from diesel-powered trucks and mobile equipment. Total annual PM10 and PM2.5 exhaust emissions from maintenance would not exceed 1 ton per year in any air district. Diesel emissions from vehicles and mobile equipment would also be limited in duration, with some activities requiring less than a day to complete only once per year. Accordingly, vehicles and mobile equipment would not expose receptors to substantial pollutant concentrations or result in notable cancer and noncancer health risks.

Standby engine generators would be maintained at each of the intakes, Southern/Bethany Complex, South Delta Outlet and Control Structure, Delta Mendota Canal Control Structure, and Bethany Reservoir Outlet Structure to provide emergency backup power in the event of an electricity outage. These generators would be tested monthly. Regular testing of stationary engine generators would not result in cancer or noncancer health risks above air district thresholds; refer to Delta Conveyance Project Draft EIR Chapter 23, *Air Quality and Greenhouse Gases,* Table 23-66 (California Department of Water Resources 2022).

Based on the information presented above, including the proposed mitigation measures and environmental commitments, the effect of exposure of sensitive receptors to substantial toxic air contaminant emissions resulting from all action alternatives does not appear to be significant.

Impact AQ-4: Result in Exposure of Sensitive Receptors to Asbestos, Lead-Based Paint, or Fungal Spores That Cause Valley Fever

No Action Alternatives

Construction activities required for plans, projects, and programs implemented in lieu of the action alternatives can inadvertently disperse contaminants into the environment. Asbestos may be found in existing structures that were built with asbestos-containing material (ACM) or lead-based paint. Asbestos also occurs naturally in certain rock types (e.g., serpentinites) or soil. Inhalation of airborne asbestos fibers is the primary way that people are exposed, and this can result in serious respiratory health issues (U.S. Environmental Protection Agency 2018). Accordingly, demolition of existing structures or substantial disturbance of asbestos-containing soil, could adversely affect receptors in the vicinity of the construction activity. However, the demolition of ACM and lead-based paint is subject to the limitations of the National Emissions Standards for Hazardous Air Pollutants (40 CFR Parts 61 and 63) regulations. Construction activities would also be subject to local air district rules, which often contain fugitive dust control and asbestos monitoring requirements for activities located in areas known to contain naturally occurring asbestos.

Coccidioidomycosis, also referred to as valley fever, is an infection that is caused by inhaling the spores of *C. immitis* or *C. posadasii* (*Coccidioides* spp.), soil-dwelling fungal species (Centers for Disease Control and Prevention 2019). Disturbance of soil containing the fungus through earthmoving activities required for plans, projects, or programs implemented in absence of the action alternatives could disperse fungal spores, which can then be inhaled by people in the area. Required water conservation implemented pursuant to water use efficiency measures could result in agricultural land fallowing. Fallowed land could result in exposed soils and windblown fugitive dust, which could increase the likelihood of exposure to *Coccidioides* spp. However, some fallowed fields would retain crop stubble cover, ultimately experience regrowth, or both. The root material and regrowth would stabilize soils to some extent and reduce their potential for increased windblown erosion. Additionally, fallowing lands may result in a reduction in windblown dust because these lands would not be in active agricultural production, which includes large amounts of soil disturbance from tillage, crop harvesting, and other activities.

All Action Alternatives

The alternatives require similar demolition and, therefore, have similar potential to encounter and expose receptors to effects from asbestos and lead-based paint. However, the demolition of ACM and lead-based paint is subject to the limitations of the National Emissions Standards for Hazardous Air Pollutants (40 CFR Parts 61 and 63) regulations. SMAQMD, SJVAPCD, and BAAQMD would be consulted before demolition begins. The action alternatives would include strict compliance with existing asbestos regulations, as required by law. The applicant would also implement Mitigation Measure HAZ-2: *Perform a Phase I Environmental Site Assessment Prior to Construction Activities and Remediate*, which would require a phase I environmental site assessment in conformance with the ASTM International Standard Practice E1527-05, *Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process*. If materials such as ACM or lead-based paint are identified through the assessment, these materials would be properly managed and disposed of prior to or during the demolition process.

Receptors adjacent to the construction area may be exposed to increased risk of inhaling *C. immitis* spores and subsequent development of Valley fever. Dust-control measures are the primary defense against infection (U.S. Geological Survey 2000:2). The action alternatives would include all best available fugitive dust control measures (Environmental Commitment EC-11: *Fugitive Dust Control*), which would avoid dusty conditions and reduce the risk of contracting Valley fever through routine watering and other measures.

Once constructed, the action alternatives would not require any further demolition, grading, or excavation beyond periodic roadway maintenance. Accordingly, none of the action alternatives would expose sensitive receptors to asbestos, lead-based paint, or fungal spores that cause Valley fever during operations and maintenance.

Based on the information presented above, and considering proposed mitigation measures and environmental commitments, the effect of exposure of sensitive receptors to asbestos, lead-based paint, or fungal spores that cause Valley fever resulting from all action alternatives does not appear to be significant.

Impact AQ-5: Result in Exposure of Sensitive Receptors to Substantial Odor Emissions

No Action Alternatives

The generation and severity of odors depends on several factors, including the nature, frequency, and intensity of the source; wind direction; and the location of the receptor(s). Odors rarely cause physical harm but can be a nuisance, leading to complaints to regulatory agencies.

Construction activities generally do not create objectionable odors affecting a significant number of people. Odors may be generated during construction through exhaust emissions from diesel equipment, for example, or from activities such as laying asphalt as part of a road construction/renovation project. However, construction-related emissions from equipment would not be localized long-term (i.e., remain in one location for long periods of time) and these emissions would be intermittent over the course of construction. Generally, construction-related odors would be temporary and would likely dissipate from the source relatively rapidly.

Small amounts of mildly odorous compounds (e.g., sodium hypochlorite and aqueous ammonia) may be used at groundwater recovery facilities. However, if used, these compounds are typically stored in sealed containers and used in small quantities. Increased water conservation implemented pursuant to water use efficiency measures could also affect operations at existing municipal wastewater treatment plants, water recycling facilities, and throughout the wastewater conveyance system, resulting in increased odors from lower pipe velocities and longer detention times. In some situations, and under specific meteorological conditions, decreased discharge rates and longer effluent detention times could lead to temporary increases in odors. However, municipal wastewater treatment plants and water recycling facilities typically have odor management plans as conditions of operation. It is therefore unlikely that incremental changes in water treatment processes would result in an increase of objectionable odor emissions that affect a significant number of receptors.

All Action Alternatives

Sources of odor during construction would include diesel exhaust from construction equipment, asphalt paving, and excavated organic matter from the removal of surface soils and sediment. Several construction sites would maintain underground septic systems to process on-site wastewater from employee bathrooms. The applicant would require maintenance of the bathrooms and septic systems to avoid sources of foul odor.

All air districts in the local air quality study area have adopted rules that limits the amount of VOC emissions from cutback asphalt. Accordingly, potential odors generated during asphalt paving would be addressed through mandatory compliance with air district rules (SMAQMD Rule 453, SJVAPCD Rule 4641, BAAQMD Regulation 8, Rule 15, and Yolo Solano Air Quality Management District (YSAQMD) Rule 2.28). Odors from equipment exhaust would be localized and generally confined to the immediate area surrounding the construction site. These odors would be temporary and localized, and they would cease once construction activities have been completed.

Odors from excavated materials are primarily generated from hydrogen sulfide gases through decomposition of organic materials in the soil particles (Reinhart et. al. 2004:10). Hydrogen sulfide is commonly described as having a foul or “rotten egg” smell (Occupational Safety and Health Administration 2005). Hydrogen sulfide results from the anaerobic metabolism by soil microbes in flooded or water-logged soils.

Testing shows that surface soils in the local air quality study area are predominantly composed of silt and clay, with a variety of non-odorous inorganic materials (California Department of Water Resources 2010:3-1 through 3-23). Leachate sampling and published literature further indicate volatile sulfides in surface soil are below the method detection limits and are, thus, unlikely to cause a nuisance impact on humans (Hansen et al. 2018:1–9; Office of Environmental Health Hazard Assessment 2008). Drying and stockpiling of the removed surface soil and sediment would also occur under aerobic conditions, which would further limit any potential malodorous products.

RTM excavation would occur at least 120 feet below the ground surface. Testing shows that subsurface RTM does not contain a large proportion of organic material and is predominately composed of silt, clay, and other inorganic materials (California Department of Water Resources 2010: 3-1 through 3-23). If hydrogen sulfide gas was present, these chemical compounds would generally be dissolved in the groundwater and not absorbed onto soil particles and retained in the RTM. A ventilation system will be installed in the tunnel and at the tunnel launch shaft to control the excavation atmosphere to acceptable levels in accordance with the California Division of Occupational Safety and Health’s Tunnel Safety Orders so that the tunnel can be excavated in a safe manner. The collected gas would be extracted through the ventilation system back to the tunnel launch shaft to be treated prior to release of the gases into the air.

The primary source of odors during operations and maintenance is diesel exhaust from heavy equipment and vehicles. Heavy equipment and vehicles would be used minimally. Any potential odors from diesel combustion from these activities would be infrequent and spread throughout the water-conveyance facilities (e.g., intakes, tunnel shafts).

Based on the information presented above, including compliance with air district rules and California Division of Occupational Safety and Health’s Safety Orders, the effect of exposure of sensitive receptors to substantial odor emissions resulting from all action alternatives does not appear to be significant.

Impact AQ-6: Result in Effects on Global Climate Change from Construction and Operations and Maintenance

No Action Alternatives

The plans, projects, and programs implemented in absence of the action alternatives would generate construction and operational GHG emissions. The example water reliability projects shown in Table 3.3-3 could occur if none of the action alternatives were approved and the proposed action's purpose and need were not met. While it cannot be anticipated what ultimate suite of projects would be chosen by each of the regions, it would likely be a mix of various types of projects reasonably feasible within that region.

There would be no marked changes in CVP and SWP energy production or use for the No Action Alternative. This is because there would be no change in the operations of the existing CVP and SWP hydroelectric generation facilities or pumping facilities. Based on current information, the projections regarding carbon intensity of electricity generation will be much lower in 2040 because of Senate Bill 100, which requires zero-carbon resources comprise 100% of electric retail sales to end-use customers by 2045. Accordingly, while CVP and SWP electricity consumption are not expected to change markedly under the No Action Alternative, GHG emissions generated by the production and transmission of that electricity are predicted to be lower under the No Action Alternative compared to existing conditions; refer to Delta Conveyance Project Draft EIR Chapter 23, *Air Quality and Greenhouse Gases,* Table 23-13 (California Department of Water Resources 2022).

While electricity related GHG emissions from SWP pumping and displaced purchases of CVP electricity are expected to decrease, as discussed under Impact AQ-1, the projects, and programs implemented in absence of the action alternatives, would generate construction and operational GHG emissions. Construction activities required for water use efficiency measures and groundwater management may be relatively minor. More intensive construction is likely to be required for new or expanded facilities, including desalination, groundwater recovery, and water recycling facilities. Construction activities required for these types of facilities are, therefore, expected to result in greater emissions of GHGs. Long-term GHG emissions associated with operation of desalination, groundwater recovery, and water recycling facilities typically include emissions from operations and maintenance and employee vehicle trips, stationary sources, and consumption of electricity and natural gas. In particular, desalination is an energy-intensity process, potentially resulting in marked quantities of GHGs, depending on the source of electricity (e.g., electrical grid, on-site renewable infrastructure).

This effect is expected to be further evaluated and identified in the subsequent project-level environmental analysis conducted for the plans, projects, and programs under the No Action Alternative. Mitigation measures and environmental commitments similar to those proposed for the Delta Conveyance Project are likely to be available to reduce emissions, but the extent of the reductions is unknown.

All Action Alternatives

Construction of the action alternatives would generate GHG emissions from heavy-duty construction equipment, construction worker vehicles, haul trucks, locomotives, marine vessels, helicopters, wastewater generation, circuit breakers, and electricity consumption; refer to Delta Conveyance Project Draft EIR Chapter 23, *Air Quality and Greenhouse Gases,* Table 23-69 (California Department of Water Resources 2022). The emissions results assume implementation of Environmental

Commitments EC-7: *Off-Road Heavy-Duty Engines*; EC-9: *On-Site Locomotives*; and EC-10: *Marine Vessels* (EC-11: *Fugitive Dust Control* and EC-12: *On-Site Concrete Batching Plants* would not affect GHG emissions, and EC-8: On-Road Haul Trucks and EC-13: *DWR Best Management Practices to Reduce GHG Emissions* were not quantified). Total estimated GHG emissions from construction equipment for the action alternatives (exclusive of the compensatory mitigation) are between 452,397 and 644,279 metric tons of carbon dioxide equivalent (CO_2e), with Alternative 3 generating the most emissions, and Alternative 2b generating the least.

Operations and maintenance of the action alternatives would generate GHG emissions from fossil-fuel-powered equipment, on-road crew trucks, employee vehicle traffic, and circuit breakers. Changes in operational SWP pumping and displaced purchases of CVP electricity would result in emissions from electricity consumption. Operations and maintenance emissions will decline over time because of improvements in engine technology and regulations to reduce combustion emissions. Likewise, the projections regarding carbon intensity of electricity generation would be much lower in 2040 because of Senate Bill 100, which requires zero-carbon resources comprise 100% of electric retail sales to end-use customers by 2045.

Emissions from maintenance and operation of the SWP with implementation of the action alternatives would not conflict with the *California Department of Water Resources Climate Action Plan Phase 1: Greenhouse Gas Emissions Reduction Plan Update 2020* or the applicant's ability to achieve carbon neutrality by mid-century, as articulated under Executive Order (EO) B-55-18. Net annual emissions from construction and displaced purchases of CVP electricity are summarized in Delta Conveyance Project Draft EIR Chapter 23, *Air Quality and Greenhouse Gases* Tables 23-72 through 23-74 (California Department of Water Resources 2022). The tables present annual net emissions from these sources between the start of construction to 2045.

Total net additional emissions from construction and displaced purchases of CVP electricity over the analysis period for the action alternatives are estimated to be between 453,412 to 646,491 metric tons CO_2e (exclusive of the compensatory mitigation), with Alternative 3 generating the most emissions and Alternative 2b generating the least. The applicant would implement Mitigation Measure AQ-9: *Develop and Implement a GHG Reduction Plan to Reduce GHG Emissions from Construction and Net CVP Operational Pumping to Net Zero* to reduce GHG emissions generated during construction to net zero, and to demonstrate that ongoing net emissions from displaced purchases of CVP electricity are reduced to zero in advance of Senate Bill 100 and forthcoming amendments to the SF_6 Switchgear Regulation. This measure ensures net additional construction and displaced CVP electricity emissions would not result in notable GHG effect.

Based on the information presented above, and considering the proposed mitigation measures and environmental commitments, the effect of all action alternatives on global climate change does not appear to be significant.

Impact AQ-7: Result in Effects on Global Climate Change from Land Use Change

No Action Alternative

Construction activities required for plans, projects, and programs implemented in absence of the Delta Conveyance Project have the potential to alter existing land use GHG emissions and sequestration. Crops and mineral soils impacted during construction can result in a temporary or permanent removal of a GHG sink. Projects that remove permanent crops (trees and vines) would remove carbon stored in the biomass, which would then be converted to CO_2. After crop removal, organic and highly organic mineral soils exposed to air would continue to release GHGs. Projects that excavate peat or topsoil would result in additional CO_2 and N_2O emissions from oxidation of organic material.

As discussed in Impact AQ-1, new or expanded facilities, including desalination, groundwater recovery, and water recycling facilities, are likely to require the most intensive construction, and therefore have the greatest potential to result in land use change GHG emissions. This effect is expected to be further evaluated and identified in the subsequent project-level environmental analysis conducted for the plans, projects, and programs under the No Action Alternative. Minimization measures and environmental commitments similar to those proposed for the Delta Conveyance Project are likely to be available to reduce emissions, but the extent of the reductions is unknown.

All Action Alternatives

Land-use changes and earth moving during construction would alter existing GHG emissions and sequestration. Unlike construction emissions from equipment and vehicles, which cease when the engine is turned off, many of the GHG emissions and sequestration associated with land use changes occur annually and can vary depending on the growth rate of vegetation and other factors. The Delta Conveyance Project Draft EIR Chapter 23, *Air Quality and Greenhouse Gases,* Table 23-76 (California Department of Water Resources 2022) summarizes the net GHG impact of project construction based on the change in land use GHG emissions and removals relative to present day land use conditions through 2070. The confidence in emissions projections beyond 2070 is limited and would be speculative, and as such, the analysis uses 2070 as the analysis horizon for the consideration of future GHG effects from land use change.

The net cumulative GHG effect of land use changes due to construction activities through full buildout is estimated to range from a decrease of 77 to 45,888 metric tons CO_2e over the confidence interval and depending on the alternative. Through 2070, the net cumulative GHG effect will range from a decrease of 30,150 to an increase of 41,475 metric tons CO_2e. The increased cumulative emissions under Alternatives 1, 2b, 3, and 4b to full buildout result mainly from the removal of crops on mineral soils, such as alfalfa and wheat, and the removal of woody crops such as grapes and pears. The largest GHG effect is predicted under Alternatives 3 and 4b. Effects of Alternatives 1, 2b, and DWR's Preferred Alternative are one order of magnitude lower than effects of Alternatives 3 and 4b. The capping of organic and highly organic mineral soils provided by construction at Bouldin Island represents a significant benefit in decreasing emissions to 2070 with respect to baseline for Alternatives 1 and 2b. DWR's Preferred Alternative is notably different due to the absence of emissions associated with construction in the Southern Complex, which is the most relevant feature for Alternatives 1, 2b, 3, and 4b in terms of GHG emissions and removals.

Cumulative net emissions will continue to decrease with time. This is due primarily to diminishing effects of peat oxidation and the long-term benefit resulting from project features that provided capping or wetting to organic and highly organic mineral soils. Also, the effects of temporary crop removal will disappear within 20 years after construction due to regrowth of permanent woody crops

Because cumulative emissions from land use change are projected to decrease relative to baseline by 2070, Alternatives 1, 2b, 3, and DWR's Preferred Alternative would not impede the state's ability to achieve their GHG reduction goals. However, because cumulative emissions from land use change under Alternatives 3 and 4b are projected to remain positive relative to baseline by 2070, this alternative could conflict with the state's long-term emissions reduction trajectory. Implementing

Mitigation Measure CMP: *Compensatory Mitigation Plan* would offset GHG emissions from construction land use change through expanded habitat creation; refer to Delta Conveyance Project Draft EIR Chapter 23, *Air Quality and Greenhouse Gases,* Table 23-78 (California Department of Water Resources 2022).

Based on the information presented above, the effect on global climate change from land use change under all action alternatives does not appear to be significant.

3.3.2.4 Cumulative Analysis

The SVAB, SJVAB, and SFBAAB are in nonattainment or maintenance status for the CAAQS and NAAQS for multiple pollutants because of the emissions from past and present projects. Construction and operations of future projects, including the action alternatives, may further contribute to regional nonattainment or maintenance of the CAAQS and NAAQS before mitigation. Mitigation Measures AQ-1 and AQ-2 will be implemented to reduce criteria pollutant emissions, as applicable, to below air district thresholds or to net zero, as required.

There are areas throughout the local air quality study area where background concentrations already exceed the PM2.5 and PM10 CAAQS and NAAQS. Construction and operations of future projects, including the action alternatives, would increase PM10 and PM2.5 emissions, further contributing to existing violations of ambient air quality standards and potentially leading to new violations in areas currently in attainment. Construction of Alternatives 1, 2b, and DWR's Preferred Alternative would also increase localized NO_2 concentrations above existing levels, potentially contributing to new violations of the NO_2 NAAQS. The action alternatives' contribution to this cumulative effect during construction would be because of new or worsened violations of the ambient air quality standards even after implementation of Mitigation Measure AQ-5.

A cumulative HRA was performed for construction of the action alternatives located within BAAQMD, consistent with BAAQMD requirements. The results of the analysis demonstrate that levels of health risk associated with TACs emitted by the action alternatives, in combination with the levels of health risk associated with other nearby TAC sources, would not contribute cumulatively to local health risk cumulative effects in the BAAQMD (Delta Conveyance Project Draft EIR Chapter 23, *Air Quality and Greenhouse Gases*, Tables 23-86 and 23-87). Current SMAQMD, SJVAPCD, and YSAQMD guidance indicates that if the project assessment demonstrates that potential health cumulative effects are not adverse, one could conclude that the action alternatives would not have a cumulative effect (Sacramento Metropolitan Air Quality Management District 2020:8-8; Siong pers. comm.; Yolo-Solano Air Quality Management District 2007). As discussed in Impact AQ-3, construction would not exceed SMAQMD, SJVAPCD, and YSAQMD health risk thresholds.

Construction of any of the action alternatives would result in a one-time increase in GHG emissions. Construction activities would also alter existing land uses, resulting in changes to present-day (baseline) GHG emissions and removals. Following construction, operations and maintenance activities and changes in SWP operational pumping and displaced purchases of CVP electricity would generate direct and indirect GHG emissions. These annual emissions would decline over time as improvements in engine technology and regulations to reduce combustion emissions reduce the carbon intensity of equipment, vehicles, and electricity generation.

Maintenance and operational SWP pumping activities are covered by the applicant's 2020 Update (California Department of Water Resources 2020), which was prepared by the applicant to provide a departmental strategy for meeting California's 2030 and 2045 emissions reduction goals California

Department of Water Resources 2020). Total net additional emissions generated by construction of any of the action alternatives and displaced purchases of CVP electricity will be reduced to net zero through Mitigation Measure AQ-9. Implementing Mitigation Measure CMP: *Compensatory Mitigation Plan* would offset GHG emissions from construction land use change under Alternatives 3 and 4b through expanded habitat creation. Accordingly, through a combination of mitigation and consistency with the applicant's 2020 Update (California Department of Water Resources 2020), none of the action alternatives would result in a cumulatively adverse GHG effect.

3.4 Fisheries and Aquatic Habitat

This section describes the affected environment for fish and aquatic resources and analyzes the effects that could occur in the study area from construction, operation, and maintenance of the action alternatives, as well as the No Action Alternative. Mitigation measures that would avoid, minimize, rectify, reduce, or compensate potentially adverse effects are included as part of each action alternative. Additional information on the affected environment, methods, and the anticipated effects of the action alternatives can be found in Delta Conveyance Project Draft EIR Chapter 12, *Fish and Aquatic Resources* (California Department of Water Resources 2022).

3.4.1 Affected Environment

The study area for the aquatic environment analysis includes the Delta. Fish and aquatic species were selected for analysis in this Draft EIS based on their importance, vulnerability, and potential to be affected by construction activities of the action alternatives. These fish species, referred to here as the *species of management concern*, include species listed by state or federal agencies as endangered or threatened or listed as Species of Special Concern. Species of management concern also include those of tribal, commercial, or recreational importance. The species of management concern are listed in Table 3.4-1. Species descriptions are provided in Delta Conveyance Project Draft EIR Appendix 12A, *Environmental Setting Background Information* (California Department of Water Resources 2022).

Table 3.4-1. Fish Species of Management Concern Potentially Affected by the Action Alternatives

Species and *ESU/DPS*	Federal Status	State Status	Tribal, Commercial, or Recreational Importance
Winter-run Chinook salmon (*Oncorhynchus kisutch)* *Sacramento River ESU*	Endangered	Endangered	Yes
Spring-run Chinook salmon (*Oncorhynchus kisutch)* *Central Valley ESU*	Threatened	Threatened	Yes
Fall-run/late fall–run Chinook salmon (*Oncorhynchus kisutch)* *Central Valley ESU*	Species of Concern	Species of Special Concern	Yes
Steelhead (*Oncorhynchus mykiss)* *Central Valley DPS*	Threatened	None	Yes
Delta smelt (*Hypomesus transpacificus)*	Threatened	Endangered	No
Longfin smelt (*Spirinchus thaleichthys)* *Bay Delta DPS*	Candidate	Threatened, Species of Special Concern	No
Green sturgeon (*Acipenser medirostris)* *Southern DPS*	Threatened	Species of Special Concern	Yes
White sturgeon (*Acipenser transmontanus)*	None	Species of Special Concern	Yes
Pacific lamprey (*Entosphenus tridentatus)*	Species of Concern	Species of Special Concern	Yes

Species and *ESU/DPS*	Federal Status	State Status	Tribal, Commercial, or Recreational Importance
River lamprey (*Lampetra ayresii)*	None	Species of Special Concern	Yes
Sacramento hitch (*Lavinia exilicauda exilicauda*)	None	Species of Special Concern	No
Sacramento splittail (*Pogonichthys macrolepidotus)*	None	Species of Special Concern	No
Hardhead (*Mylopharadon conocephalus)*	None	Species of Special Concern	No
Central California roach (*Hesperoleucus symmetricus*)	None	Species of Special Concern	No
Starry flounder (*Platichthys stellatus)*	None	None	Yes
Northern anchovy (*Engraulis mordax)*	None	None	Yes
Striped bass (*Morone saxatilis)*	None	None	Yes
American shad (*Alosa sapidissima)*	None	None	Yes
Threadfin shad (*Dorosoma petenense)*	None	None	Yes
Black bass (largemouth, smallmouth, spotted) (*Micropterus*)	None	None	Yes
California bay shrimp *(Crangon franciscorum)*	None	None	Yes

ESU = evolutionarily significant unit; DPS = distinct population segment.

USACE is coordinating with the NMFS and the applicant is coordinating with the California Department of Fish and Wildlife (CDFW to provide accurate information for compliance with the Endangered Species Act (ESA) and the California Endangered Species Act (CESA), respectively. USACE will initiate Section 7 formal consultation when the information is available and appropriate for the process. All information will be updated for the Final EIS.

3.4.1.1 Habitat Conditions and Environmental Stressors

Major environmental stressors are factors that limit a habitat's capacity to support the life stages present. The below descriptions focus on stressors that potentially would be affected by the project. For example, turbidity may affect predation risk of fish species of management concern. Major environmental stressors potentially limiting turbidity include the supply of suspended sediment entering the Delta and invasive aquatic macrophytes slowing water velocity and allowing suspended sediment to settle.

Delta and Suisun Bay/Marsh

Within the Delta, environmental stressors for fish populations include degradation and disconnection of aquatic habitat, loss of nutrients and foodweb support, decline of turbid conditions, an increase in contaminants in excess of regulatory standards, straying, extended exposure to predators, and entrainment during outmigration due to pumping water for exports, increases in nonnative invasive species and their habitat, predation of native species, and changes in aquatic macrophyte community composition and distribution.

Within the Suisun Bay/Marsh, environmental stressors for fish populations include changes in salinity in the Suisun Marsh and Bay system, biodiversity within Suisun tidal aquatic habitats, and fish entrainment. The Yolo Bypass experiences environmental stressors for fish populations primarily from seasonal inundation frequency, which provides food, spawning and rearing habitat, and possibly reduced losses of eggs and larvae to aquatic predators (Sommer et al. 1997), and impediments to fish passage from the Fremont Weir.

San Pablo and San Francisco Bay Area

Environmental stressors for fish populations in San Francisco and San Pablo Bays include water and sediment quality, exposure to toxic substances, reduction in Delta outflows, legal and illegal harvest, food availability, reduction in seasonally inundated wetlands, wave and wake erosion, introduced nonnative plant and animal species, and competition for food resources with nonnative fish and macroinvertebrates (e.g., filter feeding by the nonnative mollusks) (CALFED Bay-Delta Program 2000; Armor et al. 2005; Baxter et al. 2008).

Detailed descriptions of the habitats and environmental stressors that limit a habitat's capacity to support the life stages of fish species of management concern present in the study area are presented in Delta Conveyance Project Draft EIR Chapter 12, *Fish and Aquatic Resources,* Section 12.1, *Environmental Setting* (California Department of Water Resources 2022). Environmental stressors that could be affected by the action alternatives include habitat availability for fish, such as riparian habitat availability for rearing juvenile salmonids.

3.4.2 Environmental Consequences

This section describes the assessment methods used to analyze potential environmental effects and identifies the direct, indirect, and cumulative effects on fish and aquatic resources that would result from construction, operation, and maintenance of all action alternatives.

3.4.2.1 Methods for Analysis

Effects on fish and aquatic resources would occur if construction, operation, and maintenance activities negatively affect a species' life stages or habitat. The potential for effects from construction activities in the Delta was assessed both qualitatively and quantitatively based on the proposed facilities under each action alternative. The qualitative analysis focused on activities potentially affecting the in-water environment, in particular construction of facilities (north Delta intakes, the southern forebay emergency spillway, and bridge crossings), and associated activities (e.g., barge traffic transporting construction materials, withdrawal and discharge of surface water for construction purposes). The primary quantitative analysis involved estimating the potential area affected by impact pile-driving, as well as the area subject to effects from construction footprint effects. The assessment of effects from maintenance activities was based largely on a qualitative evaluation for the various facilities included under the action alternatives. The assessment of operations effects was based on consideration of qualitative and quantitative methods. Note that detailed assessment of operations effects covered in this NEPA analysis is limited to near-field effects resulting from the presence of the installed structures. Other operations effects, such as far-field effects on channel flows as a result of north Delta intake diversions, are not covered in this NEPA analysis, although a summary of these effects is provided in Section 3.4.2.3, *Operations Effects on Fisheries not Covered in This Draft EIS.*

The No Action Alternative takes into account projects, plans, and programs that would be reasonably expected to occur in the foreseeable future if none of the action alternatives were approved and the proposed action's purpose and need were not met. Many of these projects, such as construction of desalination plants or water recycling facilities, would involve construction and operation of facilities by individual public water agencies to ensure local water supply reliability for its constituents. Construction, operation, and maintenance of these water supply–reliability projects have the potential to affect special status fish and aquatic resources depending on location.

Water agencies participating in the Delta Conveyance Project have been grouped into four geographic regions. The water agencies within each geographic region would likely pursue a similar suite of water supply projects under the No Action Alternative. Construction of water supply projects under the No Action Alternative would result in construction of new or expanded facilities (e.g., desalination plants, water recycling facilities, groundwater recharge and recovery systems, etc.) that could result in negative effects on special status fish and aquatic resources.

Construction and operation of water supply–reliability projects have the potential to affect special status fish and aquatic resources in the four regions (Chapter 2, *Project Description and Alternatives*). Table 3.4-2 provides examples of how fish and aquatic resources be affected. Table 3.4-3 lists examples of special status fish species that could be affected by these projects.

Table 3.4-2. Examples of Effects on Fish and Aquatic Resources from Construction and Operation of Projects in Lieu of the Project

Project Type	Potential Fish and Aquatic Resources Effects	Region(s) in Which Effects Would Likely Occur [a]
Desalination	Grading and excavation at the desalination and groundwater recovery plant sites would be necessary for construction of foundations, and trenching would occur for installation of water delivery pipelines and utilities. Ground-disturbing activities in these types of units would have the potential to disturb fish and aquatic resources, because of runoff from construction activities, for example. Operations effects, such as entrainment or impingement of fish and aquatic species during water diversions for desalination could occur. These effects would be minimized by intake screening and would involve relatively small quantities of water in relation to source waterbodies (City of Carlsbad 2005:4.3-32). Mitigation, such as provision of habitat based on established methods (e.g., area of production foregone) would likely be used to offset potential entrainment and impingement losses if found to be significant.	Northern coastal, southern coastal
Groundwater management	Projects would occur in association with an underlying aquifer but could occur in a variety of locations. Excavation of varying depths could be required, and these construction activities have the potential to affect waterbodies containing special status fish and aquatic resources, depending on location.	Northern coastal, southern coastal
Groundwater recovery	Similar effects to desalination.	Northern inland, southern coastal, southern inland

Project Type	Potential Fish and Aquatic Resources Effects	Region(s) in Which Effects Would Likely Occur [a]
Water recycling	Various construction activities would involve ground-disturbing activities, such actions could negatively affect special status fish and aquatic resources, depending on location. In the southern inland region where a greater number of projects would be needed as a substitute for Delta Conveyance, the potential for effects would also be greatly increased.	Northern coastal, northern inland, southern coastal, southern inland
Water use efficiency measures	Could occur anywhere in the regions and most would involve little ground disturbance or would occur in previously disturbed areas, thereby limiting their potential for construction effects on special status fish and aquatic species.	Northern coastal, northern inland, southern coastal, southern inland

[a] See Chapter 2, *Project Description and Alternatives*, Section 2.5, *No Action Alternative*, for a complete definition of the geographic regions.

Table 3.4-3. Examples of Special-Status Fish Species That Could be Affected by Water Supply–Reliability Projects under the No Action Alternative

Region [a]	Special Status Fish Species
Northern coastal	Chinook salmon (Sacramento River winter-run ESU, Central Valley spring-run ESU, Central Valley fall-/late fall-run ESU), steelhead (Central Valley DPS and Central California Coast DPS), longfin smelt, North American green sturgeon (southern DPS), white sturgeon, Pacific lamprey, river lamprey, starry flounder, northern anchovy, striped bass, American shad, California bay shrimp, tidewater goby (*Eucyclogobius newberryi*)
Northern inland	Steelhead (Central California Coast DPS)
Southern coastal	Tidewater goby, steelhead (southern California coastal DPS), California halibut (*Paralichthys californicus*), cheekspot goby (*Ilypnus gilberti*), walleye surfperch (*Hyperprosopon argenteum*), queenfish (*Seriphus politus*), kelp bass (*Paralabrax clathratus*), California grunion (*Leuristhes tenuis*), northern anchovy
Southern inland	Santa Ana sucker (*Catostomus santaanae*), Santa Ana speckled dace (*Rhinichthys osculus*)

[a] See Chapter 2, *Project Description and Alternatives*, Section 2.5, *No Action Alternative*, for a complete definition of the geographic regions.
ESU = Evolutionary Significant Unit; DPS = Distinct Population Segment.

3.4.2.2 Effects and Mitigation

Impact AQUA-1: Effects of Construction of Water-Conveyance Facilities on Fish and Aquatic Species

No Action Alternative

Proposed actions under consideration in the study area could have operations and maintenance effects related to aquatic species. Proposed actions occurring outside of the study area are anticipated to have similar effects on different aquatic species. Following is a summary of the potential exposure of covered fish species to effects from construction of other projects under the

No Action Alternative. Effects on aquatic species include turbidity, accidental spills, disturbance of contaminated sediment, underwater noise, fish stranding, in-water work activities, loss of spawning, rearing or migration habitat, and predation.

Under the No Action Alternative, existing facilities and operations would be continued. Detailed discussions of these programs are provided in Appendix E, *No Action Alternative and Cumulative Projects*. Construction and maintenance of projects or programs under the No Action Alternative, which would involve in-channel and/or near-channel construction activities (e.g., dredging, dam removal), would result in the temporary generation and release of suspended sediments to the water column, and other potential construction-related water quality effects. Similarly, routine construction activities that may occur for urbanization and infrastructure to accommodate population growth would generally be anticipated to involve relatively dispersed, temporary, and intermittent land disturbances across the affected environment. However, effects on fish from increases in turbidity during in- or near-water construction and maintenance activities would be minimized through adherence to applicable federal, state, and local regulations, project-specific designs, best management practices, and environmental commitments intended to avoid, prevent, or minimize turbidity (e.g., implementation of site-specific erosion and sediment control plans).

Potential construction-related water quality effects associated with other project and program actions that may occur under the No Action Alternative may include the inadvertent release of construction-related chemicals (e.g., fuels, solvents, and oils) and construction-related wastes (e.g., concrete, asphalt, cleaning agents, paint, and trash) to surface waters, which would result in localized water quality degradation. This could, in turn, result in adverse effects on covered fish species through direct injury and mortality or delayed effects on growth and survival, depending on the nature and extent of the spill and the contaminants involved. It is expected that adverse effects on fish from inadvertent spills would be avoided through adherence to applicable federal, state, and local regulations, project-specific design, best management practices, and environmental commitments intended to avoid, prevent, or minimize hazardous spills and other construction-related hazards and/or mitigate for such occurrences (e.g., spill prevention and control plans and hazardous materials management plans).

Sediment in many locations throughout the study area has been contaminated by historical and current urban discharges (e.g., hydrocarbons, metals, and polychlorinated biphenyls), agricultural runoff containing persistent pesticides (e.g., organochlorines), and mercury from historic mining. Construction and maintenance projects and programs implemented under the No Action Alternative that require disturbance of sediment (e.g., periodic channel dredging) have the potential resuspend contaminated sediments, which could result in direct and indirect effects on covered fish species. Individual fish could be directly exposed to the suspended contaminants if they are in the immediate vicinity of disturbed contaminated sediments. The potential effects of such events on covered fish species would depend on the types and concentrations of the toxicants in disturbed sediments and exposure time and, therefore, cannot be predicted at this time.

Construction of projects or programs under the No Action Alternative requiring the installation of in-channel structures where the use of pile driving is necessary (e.g., cofferdams and diversion intakes) has the potential for adverse effects on covered fish species if they are present in the vicinity of pile driving.

However, adverse effects on covered fish species under this alternative from pile driving would be avoided or minimized through project-specific avoidance and minimization measures, best management practices, environmental commitments and/or mitigation measures, which could include seasonal timing restrictions on in-water activities; the use of vibratory pile drivers when possible; the use of noise attenuation devices; and limitations on the duration of impact pile driving activities.

In-water work activities (e.g., dredging, cofferdam installation, placement of riprap) associated with the implementation of maintenance and restoration projects under the No Action Alternative have the potential to cause take of covered fish species through direct effect from construction activities and through the process of trapping and rescuing fish from construction areas. Although most fish would likely avoid the noise and activity of in-water construction and maintenance activities, depending on the nature of the activity, its seasonal timing and duration, there could be a potential for fish (of multiple species) to be harmed, harassed, injured, or killed. However, take of fish related to construction and maintenance activities would be minimized by implementation of project-specific avoidance and minimization measures, best management practices, environmental commitments and/or mitigation measures, which could include seasonal timing restrictions on in-water activities, and implementation of species-specific fish rescue and salvage plans.

In-water construction and maintenance activities of programs and projects implemented under the No Action Alternative (e.g., levee repair, Ocean Climate Action Plan-related restoration projects) could temporarily or permanently alter habitat conditions for covered fish species in the vicinity of these activities and thereby adversely affect spawning, rearing and/or migration habitat. For example, any activities that occurs in a species' migration corridor have the potential to affect species behavior (i.e., through a change in migration route within the channel, delay from a noise deterrent, artificial light sources).

For any projects implemented under the No Action Alternative that include in-water construction and maintenance activities, there would be the potential to affect fish species through direct or indirect effects, and the potential to alter spawning, rearing and/or migration habitat of covered fish species through direct loss or modification. However, such projects would be subject to specific environmental permitting processes, which would minimize potential effects through the implementation of project-specific avoidance and minimization measures, best management practices, environmental commitments and/or mitigation measures. Each project implemented under the No Action Alternative would require its own separate environmental compliance process. As a result, it is assumed that appropriate mitigation would be implemented.

All Action Alternatives

Construction of water-conveyance facilities for all action alternatives has the potential to affect special status fish species, principally Chinook salmon and steelhead. Potential effects from construction activities would consist of the following. Note that the discussion below focuses on open parts of the Delta; additional construction would occur at the Bethany Reservoir discharge structure under DWR's Preferred Alternative but would be limited to effects on a likely almost entirely nonnative and isolated fish assemblage that would not meaningfully add to the construction effects discussed in this section.

Underwater noise from pile-driving, boat operations, dredging, geotechnical investigations, riprap placement, and tunnel boring machine (TBM) activities has the potential to affect aquatic species. Each of the action alternatives includes physical or structural components that would require vibratory and/or impact driving of temporary and permanent piles during construction. Several of these components involve pile-driving activities within or adjacent to waterbodies supporting fish and aquatic species, resulting in potential exposure of species to pile-driving noise. Barge/tugboat operations would be limited to delivery of riprap at the intake structures and removal of dredged materials. It is unlikely that conventional dredging operations would cause physical injury to fish species. Temporary hearing losses could occur if fish remained in the vicinity of a dredge for lengthy duration; however, this risk is considered low. Geotechnical investigations would likely be conducted with a rotary drilling rig mounted on a shallow-draft barge or ship, with the potential for temporary acoustic effects from boat noise being limited to behavioral effects similar to dredging. Placement of riprap has the potential to result in temporary loud noises, although the available data from analogous situations in the Delta suggest such effects would be limited. Tunnel boring along the central alignment (Alternatives 1 and 2b) would pass beneath seven waterbodies a total of eight times. Tunnel boring along the eastern alignment (Alternatives 3 and 4b) would pass beneath 13 waterbodies a total of 16 times. Tunnel boring along the Bethany alignment (DWR's Preferred Alternative) would pass beneath 14 waterbodies a total of 17 times. Infrasound created by TBMs along tunneling alignments, however, is not expected to affect fish migratory routing and habitat accessibility.

The construction of the alternatives would result in the generation and release of suspended sediments to the water column, temporarily increasing water column turbidity above ambient levels and altering habitat conditions for fish and aquatic resource species. Increased turbidity and suspended sediments would occur from bed and bank disturbance during cofferdam placement and removal, dredging for riprap placement adjacent to the new intake locations, placement of bed and bank armoring, and propeller wash associated with construction-related boat traffic.

Water quality degradation from accidental spills of contaminants, such as cement, oil, fuel, hydraulic fluids, paint, and other construction-related materials. The greatest potential for an adverse water quality effect is associated with an accidental spill from construction activities occurring in or near surface waters. The north Delta intakes in particular involve extensive in-water work (albeit with much of the work occurring inside a cofferdam). Discharge of water from construction sites could also affect water quality for fish and aquatic species.

Direct physical injury or mortality from in-water work, such as pile-driving, barge/tugboat operations, dredging, dewatering, riprap placement, and construction water diversion from surface waters. Installation of piles or placement of riprap could involve fish being crushed, although it would be expected that risk would be very low based on the limited spatial extent of the work and the high probability of fish avoiding such activities; therefore, displacement of fish away from habitat near construction activities seems the most likely negative effect. Dredging activities may crush or entrain fish and aquatic species, although the limited spatial and temporal extent of dredging would limit the potential for negative effects. Dredging entrainment effects are most likely to occur on eggs and larvae, with mobile (juvenile and adult) fish less likely to be affected; of the latter, entrainment rates are highest for benthic species or those in high density, and fish that are entrained have a reasonable probability of surviving and avoiding injury (Wenger et al. 2017:978–979). Fish entrapped in construction areas enclosed by cofferdams that are subsequently dewatered would die without fish rescue activities, although the number of fish being trapped in such areas would be a low proportion of individuals relative to the overall extent of species' ranges. Barge and tugboat operations could result in direct physical injury or mortality from propeller entrainment/strikes. Given the relatively limited use of barges and tugboats (i.e., 42–94 trips per intake associated with intake construction [staggered by one year per intake], 2 trips for the test pile program, 2 trips per intake for geotechnical investigations, and 18–20 trips for geotechnical investigations at bridges and tunnel crossings, plus maneuvering at each site), such effects would be expected to be limited.[9] Water for construction may, in part, be supplied by diversions from adjacent surface waters at construction sites, which could result in entrainment of fish and aquatic species.

Construction of the action alternatives has the potential to reduce prey availability (e.g., zooplankton, benthic invertebrates, small fish) for fish and aquatic species through disturbance of aquatic habitat. Prey species may be affected by pile-driving (e.g., from noise effects or direct physical contact), barge and tugboat operations (e.g., noise and sediment disturbance), dredging (e.g., direct entrainment and sediment disturbance), removal of riparian aquatic habitat (i.e., reducing habitat structures for prey in or above water) and riprap placement (e.g., direct physical contact and sediment disturbance). Isolation of construction areas with cofferdams would prevent fish and aquatic species access to prey in these areas.

In-water structures used during construction would have the potential to provide habitat for predatory species. The cofferdams to be used during construction at the north Delta intakes would include flutes (vertical grooves), which may make them suitable as predatory fish habitat (Vogel 2008:24). In-water structures, particularly cofferdams at the north Delta intakes may, therefore, result in negative effects on small fish such as downstream-migrating juvenile salmonids, or positive effects on larger predatory fish such as black bass. Overall, however, the potential effects from presence of in-water structure during construction would be limited as the overall extent of the in-water structures relative to overall aquatic habitat would be low.

Removal of trees where necessary at construction sites for the alternatives would reduce the extent of shaded riparian aquatic habitat. This could increase water temperature and have negative effects on fish and aquatic species, depending on species-specific temperature preferences. However, such increases would be extremely localized and would be likely only to occur in any small, semi-isolated shallow areas away from the main river channel that are shaded by trees; such small, semi-isolated shallow areas do not occur at the construction sites, particularly the north Delta intakes, which include modified riverbanks often with considerable extents of revetment.

Compensatory mitigation has the potential for positive effects on fish and aquatic species, e.g., restored tidal habitat areas could provide foraging habitat for juvenile Chinook salmon along marsh edges (Brown 2003) or a greater extent of inundated vegetated habitat for occupancy (Hellmair et al. 2018). Analysis included in Delta Conveyance Project Draft EIR Chapter 9, *Water Quality* (Impact WQ-14), found that compensatory mitigation would have less-than-significant impacts on CHABs.

Construction of the action alternatives would result in reduced habitat extent and potentially habitat access for fish and aquatic species. The overall footprint of construction activities is approximately 1.5 to 8.6 acres of temporary impact[10] and approximately 5.6 to 15.7 acres of permanent impact to tidal perennial habitat (Table 3.4-4). The footprint impact on channel margin habitat in the

[9] For example, NMFS (2017:256–263) estimated that ~23 barge trips per year to a location ~2 river miles upstream of Intake B from the west Delta along the Sacramento River (a distance of 73 km [46 miles]) during June–October would result in annual propeller entrainment mortality of 0–1 juvenile winter-run Chinook salmon, 0 juvenile spring-run Chinook salmon, 104–199 juvenile fall-run Chinook salmon, 47–91 juvenile late fall–run Chinook salmon, and 1–2 juvenile steelhead. There would be 42 to 94 barge trips per intake plus several additional trips for geotechnical work and the test pile program, potentially resulting in somewhat greater annual propeller entrainment mortality than estimated by NMFS (2017: 256–263) but still very low in population-level terms.

[10] Temporary effects is the habitat extent acreage that can be returned to original basic use following completion of construction; permanent effects is the habitat acreage that cannot be returned to original basic use following completion of construction.

Sacramento River is approximately 60–495 linear feet of temporary impact and approximately 1,700–3,100 linear feet of permanent impact (Table 3.4-5).

Table 3.4-4. Summary of Tidal Perennial Habitat Affected by Construction Activities (acres)

Impact Type	Feature	Waterbody	Alt. 1	Alt. 2b	Alt. 3	Alt. 4b	Alt. 5
Permanent Surface Impact	Access Railroad	Burns Cutoff	0.000	0.000	0.000	0.000	0.163
Permanent Surface Impact	Access Road	Brushy Creek	0.031	0.031	0.031	0.031	0.000
Permanent Surface Impact	Access Road	Burns Cutoff	0.000	0.000	0.094	0.094	0.090
Permanent Surface Impact	Access Road	Connection Slough	0.804	0.804	0.000	0.000	0.000
Permanent Surface Impact	Access Road	Unknown	0.130	0.130	0.140	0.140	0.061
Permanent Surface Impact	Access Road/Power – Underground New	Unknown	0.000	0.000	0.048	0.048	0.009
Permanent Surface Impact	Access Road/SCADA – Underground New	Brushy Creek	0.024	0.024	0.024	0.024	0.000
Permanent Surface Impact	Access Road/SCADA – Underground New	Burns Cutoff	0.000	0.000	0.107	0.107	0.107
Permanent Surface Impact	Access Road/SCADA – Underground New	Unknown	0.048	0.048	0.060	0.060	0.000
Permanent Surface Impact	Caltrans Road	Little Potato Slough	2.728	2.728	0.000	0.000	0.000
Permanent Surface Impact	County Road	Unknown	0.163	0.000	0.163	0.000	0.163
Permanent Surface Impact	Forebay	Italian Slough	6.807	6.807	6.807	6.807	0.000
Permanent Surface Impact	Intake	Sacramento River	4.983	2.494	4.983	2.494	4.983
Permanent Surface Impact	Levee Improvement Area	Potato Slough	0.001	0.001	0.000	0.000	0.000
Permanent Surface Impact	Levee Improvement Area	San Joaquin River	0.001	0.001	0.000	0.000	0.000
Permanent Surface Impact	Shaft Site	Burns Cutoff	0.000	0.000	0.159	0.159	0.000
Permanent Surface Impact	**All Combined Permanent**	**All Combined**	**15.719**	**13.068**	**12.614**	**9.963**	**5.574**
Temporary Surface Impact	Access Road	Brushy Creek	0.031	0.031	0.031	0.031	0.000
Temporary Surface Impact	Access Road	Unknown	0.041	0.041	0.041	0.041	0.000
Temporary Surface Impact	Caltrans Road	Little Potato Slough	2.396	2.396	0.000	0.000	0.000
Temporary Surface Impact	County Road	Unknown	0.244	0.000	0.244	0.000	0.244
Temporary Surface Impact	Forebay Work Area	Italian Slough	0.046	0.046	0.046	0.046	0.000
Temporary Surface Impact	Intake Boundary	Sacramento River	0.834	0.381	0.834	0.381	0.834
Temporary Surface Impact	Levee Access Road	Little Potato Slough	0.000	0.000	0.000	0.000	0.000
Temporary Surface Impact	Levee Access Road	Potato Slough	0.002	0.002	0.000	0.000	0.000
Temporary Surface Impact	Levee Access Road	San Joaquin River	0.000	0.000	0.000	0.000	0.000
Temporary Surface Impact	Power – Underground New	Unknown	0.000	0.000	0.000	0.000	0.010

Impact Type	Feature	Waterbody	Alt. 1	Alt. 2b	Alt. 3	Alt. 4b	Alt. 5
Temporary Surface Impact	Railroad Work Area	Brushy Creek	0.266	0.266	0.266	0.266	0.000
Temporary Surface Impact	Railroad Work Area	Burns Cutoff	0.000	0.000	0.054	0.054	0.054
Temporary Surface Impact	Railroad Work Area	Unknown	0.497	0.497	0.497	0.497	0.000
Temporary Surface Impact	Road Work Area	Burns Cutoff	0.000	0.000	0.297	0.297	0.297
Temporary Surface Impact	Road Work Area	Connection Slough	4.227	4.227	0.000	0.000	0.000
Temporary Surface Impact	Road Work Area	Unknown	0.000	0.000	0.084	0.084	0.084
Temporary Surface Impact	Road Work Area/Power – Underground New	Unknown	0.000	0.000	0.000	0.000	0.025
Temporary Surface Impact	SCADA – Underground New	Unknown	0.000	0.000	0.016	0.016	0.000
Temporary Surface Impact	**All Combined Temporary**	**All Combined**	**8.585**	**7.888**	**2.410**	**1.712**	**1.548**

Alt. = alternative; ROW = right-of-way; SCADA = supervisory control and data acquisition.

Table 3.4-5. Summary of Channel Margin Habitat Affected by Construction Activities (linear feet)

Impact Type	Feature	Waterbody	Alt. 1	Alt. 2b	Alt. 3	Alt. 4b	Alt. 5
Permanent surface impact	Intake	Sacramento River	3,124	1,651	3,124	1,651	3,124
Temporary surface impact	Intake	Sacramento River	494	63	494	63	494

Alt. = alternative.

Construction effects on fish and aquatic species would be minimized by implementation of Mitigation Measures AQUA-1a: *Develop and Implement an Underwater Sound Control and Abatement Plan*, AQUA-1b: *Develop and Implement a Barge Operations Plan*, and AQUA-1c: *Develop and Implement a Fish Rescue and Salvage Plan*, and compensatory mitigation (Mitigation Measure CMP: *Compensatory Mitigation Plan*), specifically CMP-24*: Tidal Perennial Habitat Restoration for Construction Impacts on Habitat for Fish and Aquatic Resources,* and CMP-25: *Channel Margin Habitat Restoration for Construction Impacts on Habitat for Fish and Aquatic Resources.* See Attachment C3.1, *Compensatory Mitigation Design Guidelines*, to Appendix C3, *Compensatory Mitigation Plan for Special-Status Species and Aquatic Resources*), as well as several environmental commitments described in Appendix C1, *Environmental Commitments and Best Management Practices* (Environmental Commitments EC-1: *Conduct Worker Awareness Training*; EC-2: *Develop and Implement Hazardous Materials Management Plans*; EC-3: *Develop and Implement Spill Prevention, Containment, and Countermeasure Plans*; EC-4a: *Develop and Implement Erosion and Sediment Control Plans*; EC-4b: *Develop and Implement Stormwater Pollution Prevention Plans*; EC-14: *Construction Best Management Practices for Biological Resources*). These mitigation measures and environmental commitments would minimize construction effects by avoiding and controlling underwater construction noise, addressing effects related to barge operations (e.g., bottom scour, bank erosion, spills), relocating fish trapped in areas closed off by construction, restoring channel margin habitat, training construction personnel on how to avoid or report environmental resources, and developing and implementing hazardous material, spill, and sediment-control plans.

Based on the information presented above, including proposed mitigation measures and environmental commitments, the effects of construction of water-conveyance facilities on fish and aquatic species under all action alternatives does not appear to be significant.

Impact AQUA-2: Long-Term Effects of Construction of the Water-Conveyance Facilities on Fish and Aquatic Species

No Action Alternative

Projects under consideration in the study area could have operations and maintenance effects related to aquatic species. Projects occurring outside the study area, such as desalination projects, are anticipated to have similar effects on different fish species as a result of construction.

Predation

Programs and projects implemented under the No Action Alternative that involve the construction of in- and over-water structures (e.g., docks and associated piles) could result in increased predation on covered fish species relative to Existing Conditions. These types of structures can provide suitable predator habitat by providing shade and cover for predatory fishes, and perching areas for piscivorous birds.

In the study area ecosystem, predation rates on covered fish species may increase under the No Action Alternative should trends of increasing abundance of nonnative species continue (see, for example, Mahardja et al. 2017), as well as increases in invasive aquatic plants, such as water hyacinth and *Egeria* (see, for example, discussion related to the submerged aquatic vegetation species *Egeria densa* by Conrad et al. 2016:251), and other projected environmental trends that are expected to decrease native fish habitat suitability over time. Nonnative aquatic vegetation provides habitat for nonnative predators, such as bass and sunfish, which can prey on and otherwise exclude native fish species; it also increases water clarity which can improve foraging efficiency of all visual predators.

Upstream Migration of Delta Smelt

No programs or projects under the No Action Alternative are currently anticipated that would create an in-water structure, which would create such in-stream velocities that the potential for migrating adult delta smelt to migrate upstream to spawning areas in the northern Delta would be reduced.

Maintenance

Maintenance of projects or programs under the No Action Alternative that would involve in-channel and/or near-channel construction activities (e.g., dredging, dam removal), would result in the temporary generation and release of suspended sediments. Further, certain maintenance activities, such as levee repair and maintenance, could result in temporary increases in water turbidity. Erosion of disturbed soils and associated sediment load could enter surface waterbodies. Increased suspended sediments would temporarily increase water column turbidity, altering habitat conditions in the study area for fish and other aquatic species. In-water work activities (e.g., dredging, cofferdam installation, placement of riprap) associated with the implementation of maintenance projects under the No Action Alternative have the potential to cause take of covered fish species through direct effect from maintenance activities. For any projects implemented under the No Action Alternative that include in-water construction and maintenance activities, there would be the potential to stress, injure, or kill covered fish species through direct or indirect effects, and the potential to alter spawning, rearing and/or migration habitat of covered fish species through direct loss or modification. However, effects on fish during in- or near-water maintenance activities would be minimized through adherence to applicable federal, state, and local regulations, project-specific designs, best management practices, and environmental commitments intended to avoid, prevent, or minimize turbidity (e.g., implementation of site-specific erosion and sediment control plans). Each project implemented under the No Action Alternative would require its own separate environmental compliance process.

All Action Alternatives

Predation

Increased predation of fish and aquatic species at the north Delta intakes could occur if predatory fish aggregate along the north Delta intake cylindrical tee screens or associated in-water structures (i.e., the floating log boom and its support pilings) at greater density than existing conditions. Studies in the Delta have shown greater abundance of predatory fish at manmade structures (Sabal et al. 2016) but the relatively limited extent of in-water manmade structures in the Delta suggests that these are unlikely to have a population-level effect on species such as migrating juvenile salmonids (Lehman et al. 2019). Two Central Valley studies provide an assessment of predation in the vicinity of cylindrical screens (Demetras et al. 2013) or intakes projecting into the river (Michel et al. 2014). Demetras et al. (2013) found very few potential juvenile salmonid predators and no predator aggregations near cylindrical fish screens in the Sacramento River at Redding (Bella Vista Water District's Wintu Pumping Plant). There was no evidence of predation upon juvenile salmonids that might be attributed to or influenced by the design of the diversion facility (Demetras et al. 2013). In the Delta, Michel et al. (2014) found predation rate at the City of Sacramento Water Treatment Plant diversion was similar to other nondiversion bank locations in the vicinity.

Aggregation of predatory fish has been previously observed at the Hamilton City intake (Vogel 2008), which is the only completed study of predation at long fish screens in the Central Valley, and that involved calculation of survival along the fish screen based on recapture of marked juvenile Chinook salmon released from several locations. Vogel's (2008) study found that mean survival of tagged juvenile Chinook salmon at the Hamilton City intake in 2007—the only year of the study in which flow-control blocks at the weir at the downstream end of the fish screen were removed to reduce predatory fish concentration—was approximately 95% along the fish screen. However, the percentage of tagged juvenile Chinook salmon released at the upstream end of the fish screen that were recaptured at a downstream sampling location was similar to or slightly greater than for fish released at the downstream end of the fish screen, when standardized for the distance that the fish had to travel to the recapture site. These data suggest that survival along the screen was at least similar to survival in the portion of the channel without the screen (i.e., screen survival was similar to baseline survival, if the latter is assumed to be represented by the channel downstream of the screen). However, test fish providing the estimate of survival in the channel downstream of the screen were released prior to the fish that were released at the upstream end of the fish screen, which could have confounded comparisons of relative survival between these groups if predatory fishes became partly satiated prior to the arrival of the fish released at the upstream end of the screen (thus potentially making their survival relatively higher than otherwise would have occurred) (Vogel 2008:12). In addition, batch releases of relatively high numbers of test fish could have given greater survival than if smaller numbers of fish had passed along the fish screen (Vogel 2008:20).

A recent study of acoustically tagged juvenile late fall–run Chinook salmon survival by Henderson et al. (2019) primarily provides information regarding far-field effects of flow but also has value in allowing inference regarding near-field effects of diversions. Henderson et al. (2019: Table 1) hypothesized that the density of diversions (number per kilometer) would be negatively related to survival because of higher predator densities near the diversions. In fact, they found the opposite, and speculated that greater survival with higher diversion density may be more a function of habitat conditions where diversions are more abundant, for example, armored banks resulting in reduced predator density and predation mortality (Henderson et al. 2019:1558). Reach-specific survival estimates by Henderson et al. (2019) provide context for the near-field effects provided by the physical structure of the existing long Red Bluff Diversion Dam and Glenn Colusa Irrigation District Hamilton City intakes. During the 2007–2011 study years, survival in the reach including the Red Bluff intake ranged in rank from highest survival (2007, 2011) to second lowest survival of 19 reaches in 2008. Survival in the Hamilton City reach ranged from highest survival (2010, 2011) to 12th highest survival of 19 reaches in 2008. The studies by Henderson et al. (2019) and Vogel (2008) are not inconsistent in suggesting that near-field survival at large fish screens does not appear to be greatly different from reaches without intakes. (These studies do not quantify predation directly. It is assumed that predation is the main reason for survival differences, although it is possible that factors, such as injury from screen contact and subsequent mortality, could occur, although this appears less likely based on the laboratory studies of Swanson et al. [2004])

Overall, the weight of available information suggests that near-field predation effects of the north Delta intakes on fish and aquatic species would be limited, albeit with some uncertainty given that the studies were not of long cylindrical tee screen structures in the north Delta. Fisheries studies would be undertaken to provide information on predatory fish and predation rate at the north Delta intakes once they are operational, to inform the development of future operations and adaptive management.

<u>Upstream Migration Effects on Delta Smelt</u>

The north Delta intakes could reduce the potential for migrating adult delta smelt to migrate upstream to spawning areas in the northern Delta based on replacement of low velocity nearshore habitat at the north Delta intake locations with fish screens and associated structures. Previous analyses demonstrated that the tidal surfing behavior typically employed by adult delta smelt elsewhere in the Delta (Bennett and Burau 2015) would not allow passage upstream of the north Delta intakes because of the primarily downstream flow in the intake reach (ICF International 2016:6-75) and more recent analyses exploring a variety of tidal migration and other behaviors also found that all investigated behaviors would result in minimum numbers of fish entering the Sacramento River above Rio Vista (Gross et al. 2021); therefore active swimming is required. As described by USFWS (U.S. Fish and Wildlife Service 2017:318), for a delta smelt to swim upstream at all, river velocity has to be less than its sustainable swimming speed. Assuming that river velocity at Freeport is representative of river velocity near the north Delta intakes (which would be designed to have adequate sweeping velocity to meet downstream juvenile salmon migration requirements), the distance that a delta smelt can swim over a sustainable swimming period of 1 hour can be calculated based on maximum sustainable swimming speed (0.91 feet per second [ft/s]; Swanson et al. 1998). Methods for the upstream migration analysis are described in more detail in Delta Conveyance Project Draft EIR Appendix 12B, *Bay-Delta Methods and Results*, Section 12B.11, *Delta Smelt*

Upstream Migration Past North Delta Diversions (California Department of Water Resources 2022). Note that the method is applicable to fish in close proximity to the screens under the assumption that fish are swimming along the screens; as discussed further below, areas of low velocity that occur near the river bottom or channel margins could also be used for migration.

Based on the methods described in Delta Conveyance Project Draft EIR Appendix 12B, Section 12B.11, historical water velocity data during the main upstream migration period (December–March) indicate that downstream velocity would be sufficiently low for adult delta smelt to successfully migrate upstream within an hour past a single, approximately 30-foot cylindrical tee screen at Intakes B, and C just under 15% of the time, compared to 10% of the time for a combined screen length of 900 feet (i.e., the approximate screen length of each of Intakes B and C with 3,000-cubic feet per second [cfs] capacity). The results for 450-foot and 900-foot screen lengths may also be representative of conditions along the vertical wall behind the cylindrical tee fish screens, should delta smelt occur in that area rather than along the fish screens.

It is uncertain what proportion of upstream-migrating adult delta smelt occurring in the Sacramento River would experience the potential reduction in upstream passage by the north Delta intakes suggested by the above analysis. Although suitably low velocity for upstream migration based on Freeport channel velocity may occur during a relatively low proportion of time, it is possible that upstream migration would be concentrated during these limited periods In addition, the two-dimensional (2D) hydraulic modeling conducted to illustrate potential north Delta intake effects on river hydrodynamics shows that there is a considerable extent of sufficiently low-velocity habitat on the opposite (west/right) bank of the Sacramento River from the north Delta intakes, although the greatest extent is on the east/left bank (the same side as the proposed intakes), particularly during higher flows. USFWS (2017:318) considered that it is unlikely that delta smelt could exclusively use the west bank to migrate past the north Delta intakes because the Sacramento River makes six major bends between Isleton and Freeport. This would shunt the highest velocity parts of the river cross section back and forth across the channel, requiring fish to change banks to avoid being swept downstream. In addition, USFWS (2017:318) considered that it seems unlikely that delta smelt could keep swimming up one bank of the river to areas upstream because they would eventually need to avoid a predator or be displaced off the shoreline at night when they lose visual reference and become less active. While these factors may increase the risk of passage delay by the north Delta intakes, the cylindrical tee fish screens and their associated manifolds, as well as the support piles for the log boom structure may provide velocity refuge for upstream migrating adult delta smelt occurring near the intakes, thereby reducing the extent of the potential negative effect. Low-velocity habitat for migration may also occur near the riverbed and field studies have shown delta smelt use the bottom half of the water column, such as on ebb tides (Feyrer et al. 2013). In addition, if encountering high-velocity habitat at the Northern Delta intakes, delta smelt could also switch banks to seek low-velocity habitat, thereby avoiding complete passage blockage and only perhaps resulting in some migration delay. Historical beach seine data at Clarksburg illustrate use of the opposite bank from Intake B (Delta Conveyance Project Draft EIR Chapter 12, *Fish and Aquatic Resources,* Table 12-87 [California Department of Water Resources 2022]). Statistical analysis of the Freeport Regional Water Authority intake in the north Delta did not find evidence that the intake reduced upstream occurrence of delta smelt during and following construction, in comparison to the pre-construction period (Delta Conveyance Project Draft EIR Appendix 12B, *Bay-Delta Methods and Results,* Section 12B.22, *Delta Smelt Occurrence Upstream of Freeport Regional Water Authority Intake* [California Department of Water Resources 2022]). Although the Freeport intake is shorter and has a different (flat plate) screen design than the proposed north Delta intakes, the analysis suggests that delta smelt are able to pass intakes to migrate upstream. Uncertainty in the potential effects on upstream passage of adult delta smelt would be addressed by field studies involving methods such as beach seining or environmental DNA.

Maintenance

Maintenance of the north Delta intake facilities for each action alternative would have very limited effects on the adjacent aquatic environment and hence little potential for effects on fish and aquatic resources. According to the *Intakes Operations and Maintenance Equipment and Facility Needs Technical Memorandum* (Delta Conveyance Design and Construction Authority 2021:11), for cleaning purposes, the cylindrical tee screens would be lifted out of the water with the intake's gantry crane and may be fixed at the top of the guide rail before being washed with high-pressure mobile power washer. This process would occur approximately every 6 months and last approximately 15 days at each 3,000-cfs intake and 8 days at each 1,500-cfs intake (i.e., approximately half a day of associated work including 1 hour of actual washing for each screen at each intake). This washing process may cause removed sediment and aquatic growth or vegetation to reenter the river, resulting in redistribution by river currents, and minimal effects on the river and fish and aquatic species because of the very small amount of material compared to the size of the receiving waterbody. In general, the velocity through the cylindrical tee screen system and piping should be sufficient to keep sediment moving until it reaches the settling basins (Delta Conveyance Design and Construction Authority 2021:13). Sediment jetting would only be required at the base of the screen structure to help keep sediment from accumulating beneath the screens; this would be done frequently (hourly to daily, depending on needs) thereby resulting in minimal changes to suspended sediment/turbidity, with sediment jetted from the screen rapidly dispersing within the river channel and therefore having very limited or no effects on any fish and aquatic species occurring in the vicinity. When the screen units are lifted up to the deck for cleaning, solid panels would be installed behind the screen in the back guide rail for the unit being cleaned. These panels would seal off that unit's intake area from diversions, so there would be no potential to divert water through an unscreened area while the screen is being cleaned and, therefore, no risk of fish entrainment.

Based on the information presented above, the long-term effects from construction on fish and aquatic species under all action alternatives do not appear to be significant.

3.4.2.3 Operations Effects on Fisheries and Aquatic Habitat not Covered in This Draft EIS

This section summarizes operational effects outside USACE jurisdiction based on Delta Conveyance Project Draft EIR Chapter 12, *Aquatic Resources* (California Department of Water Resources 2022). No significance conclusions related to these effects are included in this Draft EIS. The following listed items indicate the relative effect of the action alternatives compared to existing conditions.

Upstream Effects

- Detailed analysis of upstream areas was not necessary because of the limited magnitude of difference between scenarios.

Winter-Run Chinook Salmon

- Minimal risk of juvenile entrainment or impingement at north Delta intakes because of cylindrical tee screen design, including hydraulic bypass effect, smooth surface, frequent cleaning, and low approach velocity
- Similar or slightly lower south Delta entrainment risk, with continuation of existing management under the NMFS 2019 Biological Opinion (BiOp) and the CDFW 2020 Incidental Take Permit (ITP)
- Potentially lower through-Delta survival and availability of riparian bench habitat because of north Delta intakes, mitigated by tidal habitat and channel margin restoration (Mitigation Measure CMP: *Compensatory Mitigation Plan*, specifically CMP-23 and CMP-24; see Attachment C3.1, *Compensatory Mitigation Design Guidelines*, to Appendix C3, *Compensatory Mitigation Plan for Special-Status Species and Aquatic Resources*)
- Minimal differences in water temperature
- Little difference in selenium or methylmercury bioaccumulation

Spring-Run Chinook Salmon

- Effects generally as described for winter-run Chinook salmon, although with less north Delta intake potential for effects because of greater overlap with spring period when north Delta diversions are less, and effects mitigated by the same mitigation undertaken for winter-run
- Similar through-Delta survival of San Joaquin River Basin fish

Fall-/Late Fall–Run Chinook Salmon

- Effects generally as described for winter-run Chinook salmon, although with less north Delta intake potential for effects because of greater overlap with spring period when north Delta diversions are less, and effects reduced by mitigation undertaken for winter-run and spring-run
- Similar through-Delta survival of San Joaquin River Basin fish
- Potentially lower straying of adult San Joaquin River fish because of less south Delta exports
- No increase in risk to Mokelumne River fish (from south Delta juvenile entrainment related to south Delta exports or adult straying related to Delta Cross Channel opening)

Central Valley Steelhead

- Effects generally as described for winter-, spring-, and fall-/late-fall run Chinook salmon, with mitigation by tidal habitat and channel margin restoration

Delta Smelt

- Potential entrainment and impingement to few delta smelt that may occur at the north Delta intakes
- Similar south Delta entrainment risk, with continuation of existing management under USFWS 2019 BiOp and CDFW 2020 ITP

- Entrainment of a relatively small percentage of Sacramento River suspended sediment by the north Delta intakes, with likely limited effects on turbidity-related habitat for delta smelt, to be monitored and assessed further through adaptive management
- Little potential for negative effects on *Eurytemora affinis* (delta smelt zooplankton food) availability because of differences in March–May X2
- Similar or less *Pseudodiaptomus forbesi* (delta smelt zooplankton food) availability because of less Delta outflow needed to meet Delta salinity requirements, with effect uncertain because of likely small magnitude relative to other factors such as clam grazing
- Low level of food web material (phytoplankton carbon) entrainment at the north Delta intakes, with very limited potential for effects on delta smelt because in situ production of phytoplankton carbon in the Delta is much greater than inputs from freshwater inflow
- Generally similar extent of low-salinity habitat overlapping physically larger habitat areas in Honker Bay, with minor reductions in October–December caused by less Delta outflow needed to meet Delta salinity requirements
- Similar or lower Delta outflow during the June–August period, with statistical analyses having shown outflow is positively correlated with survival
- Similar or slightly greater (up to 0.9 mile/1.5 kilometer) September–November X2, with statistical analyses having shown X2 is negatively correlated with recruitment the subsequent year
- Potentially similar or slightly greater predation risk from silversides as a result of similar or slightly less March–May south Delta exports and June–September Delta inflow, with appreciable uncertainty because of correlative rather than causal relationship and outflow differences (caused by less Delta outflow needed to meet Delta salinity requirements) that are not very large
- Little potential for negative effects as a result of differences in selenium
- Mitigation for flow-related operations effects provided by tidal habitat restoration

Longfin Smelt

- Potential entrainment and impingement to very few longfin smelt that may occur at the north Delta intakes
- Generally similar or slightly lower south Delta entrainment risk, with continuation of existing management under the CDFW 2020 ITP
- Little potential for negative effects on food availability because of small difference suggested for *E. affinis* (see delta smelt summary) and positive relationship of mysids with X2
- Uncertain negative effect on population abundance index caused by less December–May Delta outflow, mitigated by tidal habitat restoration

White Sturgeon

- Potential larval entrainment/juvenile impingement at north Delta intakes but limited effects because of cylindrical tee screen design and limited diversions during the spring period of susceptibility to near-field effects

- Similar south Delta entrainment risk
- Little difference in selenium or methylmercury bioaccumulation
- Highly uncertain reduction in year-class strength based on March–July Delta outflow statistical relationship because of less Delta outflow needed to meet Delta salinity requirements (little difference when based on April–May relationship)

Green Sturgeon

- Potential juvenile impingement at north Delta intakes but very small effects because of cylindrical tee screen design (including very low approach velocity)
- Little difference in south Delta entrainment risk
- Little difference in selenium or methylmercury bioaccumulation
- Highly uncertain negative effects of changes in Delta outflow based on possibly similar mechanism to that discussed for white sturgeon

Pacific Lamprey and River Lamprey

- Potential entrainment of ammocoetes smaller than 40–50 millimeters total length and impingement of larger individuals but limited effects because of cylindrical tee screen design and most migration occurring during elevated river flow/precipitation that would coincide with reduced diversions (pulse flow protection measures)
- Similar south Delta entrainment risk

Native Minnows (Sacramento Hitch, Sacramento Splittail, Hardhead, and Central California Roach)

- Potential entrainment at north Delta intakes for Sacramento splittail (other species are generally upstream of the Delta) but limited effects because of cylindrical tee-screen design, most larvae/juveniles occurring on inundated floodplains and avoiding the intakes when emerging from the Yolo Bypass or limited diversions in lower flow years because of bypass flow criteria, and limited diversions during the spring period of susceptibility to near-field effects
- Similar south Delta entrainment risk for Sacramento splittail (other species salvaged in very low numbers)

Starry Flounder

- Little to no potential for near-field effects of north Delta intakes because of species generally being downstream
- Similar or slightly lower south Delta entrainment risk
- Similar or slightly lower abundance indices, though species is wide-ranging along Pacific coast

Northern Anchovy

- No risk of near-field effects because of distribution well downstream of north Delta intakes
- Little effect from minor differences in salinity relative to salinity tolerance of the species

Striped Bass

- Potential egg impingement at north Delta intakes but limited effects because of cylindrical tee screen design, relatively limited diversions during spring spawning period, and lack of discernible population-level effects from historical entrainment studies
- Similar or lower south Delta entrainment risk
- Little difference in juvenile survival or abundance indices because of differences in April–June X2
- No increase in frequency of exceedance of EC objective for striped bass spawning in lower San Joaquin River

American Shad

- Potential entrainment at north Delta intakes but limited effects because of appreciable numbers rearing upstream of the Delta and relatively low north Delta diversions during the spring period of entrainment susceptibility
- Similar south Delta entrainment risk
- Little difference in abundance index because of differences in February–May X2

Threadfin Shad

- Limited effects from north Delta intakes because species is widespread in the Delta and greatest abundance by far is in the southwest Delta near Stockton
- Similar or slightly lower south Delta entrainment risk

Black Bass (Largemouth Bass, Smallmouth Bass, and Spotted Bass)

- Potential entrainment/impingement at north Delta intakes but minimal population-level effects because species are widespread in the Delta and nearshore habitat makes them less susceptible to entrainment
- Similar south Delta entrainment risk

California Bay Shrimp

- No risk of near-field effects because of distribution well downstream of north Delta intakes
- Little difference in abundance index because of differences in April–June X2

3.4.2.4 Cumulative Analysis

The cumulative effects analysis for fish and aquatic species considers past, present, and reasonably foreseeable future programs, projects, and policies being completed in combination with the effects of the action alternatives.

As previously discussed for Impact AQUA-1, the action alternatives include Mitigation Measures AQUA-1a: *Develop and Implement an Underwater Sound Control and Abatement Plan*, AQUA-1b: *Develop and Implement a Barge Operations Plan*, AQUA-1c: *Develop and Implement a Fish Rescue and Salvage Plan*, and Mitigation Measure CMP: *Compensatory Mitigation Plan*, specifically CMP-23: *Tidal Perennial Habitat Restoration for Construction Impacts on Habitat for Fish and Aquatic Resources* and CMP-24: *Channel Margin Habitat Restoration for Construction Impacts on Habitat for Fish and*

Aquatic Resources, as well as several environmental commitments described in Appendix C1, *Environmental Commitments and Best Management Practices* (Environmental Commitments EC-1: *Conduct Worker Awareness Training*; EC-2: *Develop and Implement Hazardous Materials Management Plans*; EC-3: *Develop and Implement Spill Prevention, Containment, and Countermeasure Plans*; EC-4a: *Develop and Implement Erosion and Sediment Control Plans*; EC-4b: *Develop and Implement Stormwater Pollution Prevention Plans*; and EC-14: *Construction Best Management Practices for Biological Resources*). Other programs, projects, and policies involving construction include or would be anticipated to include similar mitigation and environmental commitments as the action alternatives (e.g., in-water construction windows) to reduce effects.

3.5 Natural Communities, Special-Status Terrestrial Species, and Wetlands and Other Waters

This section describes the affected environment for biological resources, including natural communities and a discussion of regulated wetlands and other waters and special-status terrestrial species, and analyzes effects that could occur in the biological resources study area from construction, operation, and maintenance of the action alternatives and the No Action Alternative. Mitigation and minimization measures that would avoid, minimize, rectify, reduce, or compensate potentially adverse effects are included as part of each action alternative. Additional information on the affected environment, methods, and the anticipated effects of the action alternatives can be found in Delta Conveyance Project Draft EIR Chapter 13, *Terrestrial Biological Resources* (California Department of Water Resources 2022).

3.5.1 Affected Environment

This section describes the affected environment for the terrestrial biological resources present in the biological resources study area. The biological resources study area primarily comprises the statutory Delta, as well as a few areas east of this boundary, to capture infrastructure and areas to the southwest of the statuary Delta to include the area around Bethany Reservoir for one of the action alternatives. This section presents the natural communities and other land cover types, the special-status terrestrial wildlife and plants, and the terrestrial invasive plants found in the study area. Special-status plant and wildlife species considered for inclusion in this section, as well as their status, range, and potential to occur in the study area, are presented in Delta Conveyance Project Draft EIR Appendix 13A, *Special-Status Species with Potential to Occur in the Study Area* (California Department of Water Resources 2022).

Delta Conveyance Project Draft EIR Chapter 13, *Terrestrial Biological Resources*, Section 13.1, *Environmental Setting*, presents a detailed description of the biological resources in the study area (California Department of Water Resources 2022).

3.5.1.1 Wetlands and Other Waters of the United States

The term *waters of the United States* is used by USACE for areas that are subject to federal regulation under CWA Section 404. Waters of the United States are categorized as either wetlands or other waters. Each of these two categories is briefly described below, and a more detailed discussion of waters of the United States under the CWA is included in Appendix G, *Regulatory Setting*.

In general, wetlands are characterized as having a dominance of hydrophytic vegetation, hydric soils, and wetland hydrology.

Other waters of the United States are generally linear features (e.g., streams) and open water habitats that can be tidal or nontidal.

The applicant conducted an aquatic resources delineation in the delineation study area, which includes the project footprint (potential impact areas from project construction) and areas within approximately 1,000 feet of the project footprint. The delineation study area is approximately 143,733 acres and captures all potential impact areas from alternative alignments and associated infrastructure in the greater biological resources study area and also includes several areas that are outside of the biological resources study area (where infrastructure was considered but later removed from alternative alignments). Wetland features within the delineation study area were identified based on the *Corps of Engineers Wetlands Delineation Manual* (U.S. Army Corps of Engineers 1987) and *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (U.S. Army Corps of Engineers 2008), technical guidance documents that describe and define the characteristics of wetlands. In these guidance documents, wetlands are defined as areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (U.S. Army Corps of Engineers 2008:2).

At the time of the delineation, a lack of access to properties under private ownership resulted in only a limited portion of the study area being accessible to conduct field delineation; therefore, the decision was made to conduct the entire delineation via aerial imagery interpretation in order to maintain consistency across the study area. The delineation study area acreage will continue to be refined and updated for inclusion in the Final EIS.

The aquatic resources delineation was conducted by GEI Consultants, Inc. and Stillwater Sciences, working under the direction of DWR's Delta Conveyance Office. The team used aerial imagery interpretation in GIS to identify and delineate aquatic features in the study area by identifying signatures typically associated with, and indicative of, wetlands, including areas of inundation or saturation on wet season imagery, hydrophytic vegetation signatures that persisted over multiple years, and soil map unit properties as obtained from the Natural Resources Conservation Service (NRCS) Soil Survey. Other imagery signatures that were evaluated included variation in soil color and areas of active agriculture where cropped lands showed reduced growth and/or vigor. Light detection and ranging (LiDAR) imagery was routinely used to identify minor variations in topography to correlate potential wetland signatures on aerial imagery to topographic depressions and to delineate wetland polygons.

Wetlands and other waters were mapped using the following data sources.

- 1-foot resolution true-color digital orthorectified aerial imagery flown on December 14–20, 2017 (U.S. Geological Survey 2017)
- 2017 Sacramento–San Joaquin Delta LiDAR Digital Elevation Model data from flights conducted on December 9, 2017, through January 21, 2018 (U.S. Geological Survey 2017)
- 1-meter pixel resolution true-color digital aerial imagery from the National Agriculture Imagery Program (NAIP) captured in 2018 (National Agriculture Imagery Program 2018)
- Soil data from the NRCS Web Soil Survey database (Natural Resources Conservation Service 2019)

Additional sources of information included historical aerial imagery available on Google Earth, U.S. Geological Survey topographic maps, earlier NAIP imagery, the USFWS National Wetland Inventory (U.S. Fish and Wildlife Service 2020), and the 2011 Delta Vegetation and Land Use Data (Chico State Research Foundation, Geographical Information Center 2019). Wetland mapping products that were developed by DWR for the Bay Delta Conservation Plan/California WaterFix were also consulted.

Aquatic resources were categorized as perennial or seasonal, based on persistence of hydrology as evidenced by sustained inundation or saturation visible on aerial imagery. Perennial wetlands were further classified into emergent wetlands, scrub-shrub wetlands, or forested wetlands based primarily on vegetative life form (i.e., herbaceous, shrub dominated, or tree dominated). Seasonal wetlands were further classified as alkaline wetland or vernal pool, as these habitats have unique soil and distinctive vegetation assemblages. The seasonal wetland category also includes a third class generalized as "seasonal wetland" to capture the diversity of nonspecialized vegetation assemblages that are associated with a range of soil types and are subject to temporary inundation of a duration that supports a hydrophytic vegetation assemblage.

Linear features and open water habitats that may qualify as other waters of the United States were categorized based on tidal influence as nontidal or tidal. Nontidal waters include natural channels, depressions, and agricultural ditches. Tidal classifications include tidal channel, which includes major waterways, and conveyance channel, which was used for conveyance features associated with the SWP and Central Valley Project (CVP).

A final aquatic resources delineation was verified by USACE in March 2022. The results of the delineated aquatic resources that occur in the biological resources study area (encompassing all potential impact areas from alternative alignments and associated infrastructure) are summarized below in Table 3.5-1. The table includes the broader natural communities in which these wetlands and other waters are placed.

Table 3.5-1. Area (acres) of Delineated Jurisdictional Aquatic Resources in the Biological Resources Study Area

Wetlands and Other Waters	Associated Natural Communities and Land Cover	Delineated Aquatic Resources in the Biological Resources Study Area Total (acres)
Wetlands		
Emergent wetland	Tidal Freshwater Emergent Wetland, Nontidal Freshwater Emergent Wetland	1,515
Scrub-shrub wetland	Valley/Foothill Riparian	875
Forested wetland	Valley/Foothill Riparian	566
Vernal pool	Vernal Pool Complex	62
Seasonal wetland	Other Seasonal Wetlands	2,261
Alkaline wetland	Alkaline Seasonal Wetland Complex	343
Wetlands Subtotal		5,622
Other Waters		
Agricultural ditch	Agricultural	2,385
Natural channel	Tidal Perennial Aquatic, Nontidal Perennial Aquatic	16
Depression	Nontidal Perennial Aquatic	516
Tidal channel	Tidal Perennial Aquatic	7,418
Conveyance channel	Tidal Perennial Aquatic, Nontidal Perennial Aquatic	124
Other Waters Subtotal		10,459
Total		16,081

Perennial Wetlands

Perennial wetlands are dominated by persistent hydrophytic vegetation. Three types of perennial wetlands (Emergent Wetland, Scrub-Shrub Wetlands, and Forested Wetlands) were mapped in the delineation study area based on the growth form of the vegetation.

Seasonal Wetlands

Three classes of seasonal wetlands (Vernal Pool, Seasonal Wetland, and Alkaline Wetland) were mapped in the delineation study area. Seasonal wetlands experience temporary inundation or saturation, typically in the winter or spring months of water years that receive normal or above normal precipitation. Inundation and saturation are most evident on aerial images captured during wet months. Due to the seasonality of saturated or inundated conditions, hydrophytic vegetation is transitory, and these areas are prone to colonization by annual upland grasses and forbs late in the growing season as the soils dry. Aerial image evaluation in addition to the primary image source years of 2017 and 2018 was often necessary to aid in the determination of seasonal wetlands.

Nontidal Waters

Three types of nontidal waters were mapped in the delineation study area (Agricultural Ditches, Natural Channels, and Depressions). Nontidal features include naturally occurring features and anthropogenic features on the landscape that are the result of ditching or excavation. Nontidal waters are subject to CWA Section 404 up to the ordinary high water mark.

Tidal Waters

Tidal waters are the open water portions of linear aquatic features that are influenced by the rise and fall of the tides. Human-made structures such as gates or culverts may restrict tidal influence to varying degrees. Tidal waters are subject to regulation under CWA Section 404 up to the mean higher high water elevation (e.g., high tide line) and are subject to Section 10 of the Rivers and Harbors Act of 1899 up to the mean high water level. Two types of tidal waters (Tidal Channels and Conveyance Channels) were mapped in the delineation study area.

Relationship to Waters of the State

Under the Porter-Cologne Water Quality Control Act of 1969 (Porter-Cologne Act), waters of the State include “any surface water or groundwater, including saline waters, within the boundaries of the state,” which is a broader definition than that of waters of the United States. Because the applicant’s delineation did not exclude any such wetlands and waters, the delineation also potentially represents what would be considered waters of the State within the delineation study area.

3.5.2 Environmental Consequences

This section describes the assessment methods used to analyze potential environmental effects and identifies the direct, indirect, and cumulative effects associated with terrestrial biological resources that would result from construction, operation, and maintenance of all action alternatives.

3.5.2.1 Methods for Analysis

This section describes the quantitative and qualitative methods used to assess the effects of implementing the action alternatives on terrestrial biological resources. The methods used for the different phases of the action alternatives are broken out into separate subheadings below.

Generally, for all phases of the action alternatives and resources, the analysis contains an assessment of both the direct and reasonably foreseeable indirect effects of the action alternatives.

All quantified acreage effects are reported out to the hundredths place, which is in line with the level of rounding used in the applicant's aquatic resources delineation.

Effect Mechanisms

Effect mechanisms that are common to construction, operations, maintenance, and restoration associated with the Compensatory Mitigation Plan (CMP) include the following.

- Ground disturbance: Most common examples include grading, excavation, trenching, drilling, and placement of fill and vibrations associated with those ground-disturbing activities.
- Vegetation removal: Examples include grubbing, trimming, and mowing.
- Hazardous materials: Examples include spills of fuels, oils, and cement and herbicide application.
- Vehicle movement: Examples include construction personnel vehicles, haul trucks, and grading equipment movement on local roads, construction access roads, and off road in portions of work areas.
- Noise: Examples include equipment operation, pile driving, and helicopters.
- Visual disturbance: Includes permanent lighting at water-conveyance facilities, temporary lighting used for construction, and disturbances caused by the presence of construction vehicles and personnel.
- Water quality: Includes the creation and mobilization of methylmercury, selenium, pesticides, and microcystins.
- Dewatering: Includes pumping and draining of waterbodies.
- Dust: Results from ground disturbance and vegetation removal.

Methods Used to Assess Effects on State- and Federally Protected Aquatic Resources

The effects on state- and federally protected aquatic resources were analyzed both quantitatively and qualitatively. The quantitative analysis involved intersecting the GIS layer of aquatic resources mapped by the applicant with the GIS layers depicting all action alternative features that could result in the potential for permanent and temporary discharge of dredged and fill material in these aquatic resources. While all permit decisions will use verified delineation data, the landcover used for the analysis of terrestrial biological resources, including jurisdictional aquatic resources, uses a combination of verified and unverified aquatic resources delineation data due to changes in the project footprint. The aquatic resources delineation data consistently identifies aquatic resources that could be affected by the project footprints across all alternatives and is, therefore, sufficient for comparison of impacts between action alternatives. The quantitative difference between the unverified delineation data and the verified delineation data is an approximately 0.10 acre increase in impacts per alternative, which represents an approximately 0.1% increase and does not change the findings of the analysis, nor does it affect proposed mitigation to offset those effects.

The action alternatives were also assessed for their potential to result in temporary and permanent changes to the hydrology of aquatic resources. This analysis was done qualitatively by reviewing the project description for construction activities that could alter surface topography or subsurface conditions such that nearby aquatic resources are affected.

The analysis is presented in Impact BIO-51: *Substantial Adverse Effect on State- or Federally Protected Wetlands or Waters (Including, but Not Limited to, Marsh, Vernal Pool, Coastal, etc.) through Direct Removal, Filling, Hydrological Interruption, or Other Means*.

Because the applicant's delineation mapped all aquatic features within the delineation study area, the delineation also reflects all features that would be considered waters of the State. Therefore, the analyses and conclusions for effects under Impact BIO-51 would also apply to waters of the State.

No Action Alternative

Under the No Action Alternative, the applicant would continue to operate the SWP to divert, store, and convey SWP water consistent with applicable laws and contractual obligations. Similarly, current CVP operations would be maintained.

The No Action Alternative takes into account projects, plans, and programs that would be predicted to occur in the foreseeable future if none of the action alternatives were approved and the proposed action's purpose and need were not met. Table 3.5-2 presents the effects on biological resources as a result of plans, policies, and programs that are anticipated to be implemented in lieu of the action alternatives under the No Action Alternative.

Table 3.5-2. Examples of Effects on Terrestrial Biological Resources from the Construction and Operation of Projects in Lieu of the Project

Project Type	Regions [a]	Potential Construction Effects on Terrestrial Biological Resources	Potential Operational Effects on Terrestrial Biological Resources
Increased/ accelerated desalination	Northern coastal, southern coastal	Effects on special-status species, which includes habitat loss and fragmentation, injury, mortality, and disruption of normal behaviors; effects on jurisdictional aquatic resources.	No effects anticipated.
Water recycling	Northern coastal, northern inland, southern coastal, southern inland	Effects on special-status species, which includes habitat loss and fragmentation, injury, mortality, and disruption of normal behaviors; effects on jurisdictional aquatic resources.	No effects anticipated.
Groundwater management	Northern coastal, southern coastal	Effects on special-status species, which includes habitat loss and fragmentation, injury, mortality, and disruption of normal behaviors; effects on jurisdictional aquatic resources.	No effects anticipated.

Project Type	Regions [a]	Potential Construction Effects on Terrestrial Biological Resources	Potential Operational Effects on Terrestrial Biological Resources
Groundwater recovery (brackish water desalination)	Northern inland, southern coastal, southern inland	Effects on special-status species, which includes habitat loss and fragmentation, injury, mortality, and disruption of normal behaviors; effects on jurisdictional aquatic resources.	Pumping activities could result in effects on aquatic habitats for special-status species and jurisdictional aquatic resources by reducing the amount of groundwater supporting these habitats.
Water use efficiency measures	Northern coastal, northern inland, southern coastal, southern inland	No effects anticipated.	No effects anticipated.

[a] See Chapter 2, *Project Description and Alternatives*, Section 2.5, *No Action Alternative*, for a complete definition of the geographic regions.

Effects of the Alternatives on Sensitive Natural Communities

Eight of the 11 natural community types occurring in the study area are identified as special-status natural communities. These communities are considered special status because they include specific vegetation alliances that are recognized by CDFW as being of limited distribution statewide or within a county or region (California Natural Diversity Database [CNDDB] Rank of S1–S3) or because they require focused analysis under federal and state laws and regulations. Descriptions of these communities can be found in Delta Conveyance Project Draft EIR Chapter 13, *Terrestrial Biological Resources*, Section 13.1.2.2, *Natural Community Descriptions* (California Department of Water Resources 2022).

The three remaining natural community types are not discussed under this section. Tidal brackish emergent wetlands would not be affected because the action alternatives would be implemented within freshwater portions of the tidal Delta. The grassland community mapped in the study area generally would not be considered a special-status natural community because it is generally dominated by nonnative species and includes areas of fallow and disturbed fields. It may contain vegetation alliances that are recognized by CDFW as sensitive, but the vegetation mapping available for this analysis does not have the resolution required to identify those alliances, which typically require on-the-ground surveys to identify. Other seasonal wetlands do not contain specific vegetation alliances that are recognized by CDFW as being of limited distribution statewide or within a county or region and so are addressed in other sections of this document, where they are components of sensitive wildlife habitat or are wetlands.

The effects of operations on biological resources are not analyzed in this Draft EIS. Please refer to Delta Conveyance Project Draft EIR Chapter 13, *Terrestrial Biological Resources* (California Department of Water Resources 2022), for an analysis of operations effects under CEQA for each of the impacts discussed below.

Impact BIO-1: Effects of the Project on the Tidal Perennial Aquatic Natural Community

No Action Alternative

The extent of the tidal perennial aquatic community in the study area would not significantly change under the No Action Alternative because direct fill of this community would be limited to discrete areas relative to the extent of this community available in the study area and within the geographic regions analyzed.

A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly modify tidal perennial aquatic habitat in the study area. Periodic levee and channel maintenance activities associated with current strategies would result in localized disturbances to the tidal perennial aquatic natural community.

Many existing and planned projects would include tidal restoration, which increases the quality of tidal perennial aquatic community in the study area. In the longer term, both gradual and catastrophic natural phenomena could affect the mix of open water, tidal wetland, agricultural, and riparian forest natural communities in the study area through continued land subsidence on Delta islands, levee degradation and potential failure from floods or seismic events, and climate change. Based on trends in land use conversions in the Delta during recent years, these natural changes would result in the conversion of additional cultivated land and possibly managed wetlands to tidal wetlands and tidal perennial aquatic.

Water reliability projects listed in Table 3.5-2 could result in effects on tidal perennial aquatic habitat in the northern and southern coastal regions due to the potential construction of desalination plants, which would require the placement of water intakes into tidal waters. This discharge of fill material into tidal waters would not result in a significant reduction of this community relative to the availability of this community in these regions.

All Action Alternatives

Constructing the water-conveyance facilities would permanently and temporarily eliminate areas of tidal perennial aquatic natural community under all action alternatives. Effects would result primarily from constructing the intake structures (Alternatives 1, 2b, 3, 4b, and DWR's Preferred Alternative) and constructing the Southern Complex (Alternatives 1, 2b, 3, and 4b). Affected acreages of tidal perennial aquatic communities that would be permanently or temporarily lost by implementing the action alternatives are summarized in Table 3.5-3 and are shown in Delta Conveyance Project Draft EIR Mapbooks 13-1–13-3[11] (California Department of Water Resources 2022). Alternative 1 would result in the greatest effects and DWR's Preferred Alternative the fewest.

Table 3.5-3. Effects on the Tidal Perennial Aquatic Natural Community by Alternative

Alternative	Permanent Effects (acres)	Long-Term Temporary Effects (acres)	Temporary Effects (acres)	Total Effects (acres affected)
1	36.76	4.73	13.17	54.66
2b	33.61	4.28	12.92	50.81
3	33.15	4.73	5.44	43.32
4b	30.50	4.28	5.20	39.98
5	5.87	1.10	4.16	11.13

[11] Mapbooks for the Draft EIR related to EIS Section 3.5, *Natural Communities, Special-Status Terrestrial Species, and Wetlands and Other Waters,* are available for public viewing at https://cadwr.box.com/s/vuxfqmjhycto2fzkekcdohmu40zl63ir.

Although maintenance activities would take place in existing/developed facilities and would not likely affect the tidal perennial aquatic habitat, some activities may occur adjacent to the tidal perennial aquatic community that could result in inadvertent effects related to repaving of access roads every 15 years and semiannual general and ground maintenance (e.g., mowing, vegetation trimming, herbicide application). These activities also create the potential for runoff of paving material or materials from parked vehicles or staging areas.

Under the CMP, tidal perennial aquatic habitat will be created or acquired and permanently protected to compensate for effects and ensure no significant loss of tidal perennial aquatic habitat functions and values (Appendix C3, *Compensatory Mitigation Plan for Special-Status Species and Aquatic Resources*, Section F3.4.3, *Tidal Habitat Mitigation Framework*, and Attachment C3.1, *Compensatory Mitigation Design Parameters*, Table 3F.1-2, CMP-1—*Tidal Perennial Aquatic Habitat*).

Implementing the CMP would result in temporary effects on the tidal perennial aquatic community from channel margin enhancement and tidal restoration. The CMP and site-specific permitting approvals would ensure that there is no significant loss of habitat or habitat value by adjusting the overall mitigation commitment (Appendix C3, Attachment C3.1, *Compensatory Mitigation Design Parameters*, and Attachment 3F.1, Table 3F.1-2, CMP-0—*General Design Guidelines*).

Compared to the No Action Alternative, construction and maintenance of all action alternatives would result in the disturbance of tidal perennial aquatic habitat, a sensitive natural community. Implementation of the CMP (Appendix C3) would reduce this effect.

Based on the information presented above, the effect of all action alternatives on the tidal perennial aquatic natural community does not appear to be significant.

Impact BIO-2: Effects of the Project on Tidal Freshwater Emergent Wetlands

No Action Alternative

The extent of the tidal freshwater emergent wetlands in the study area would not significantly change under the No Action Alternative because direct fill of this community would be limited to small discrete areas relative to the extent of this community available in the study area and within the geographic regions analyzed.

A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly modify tidal freshwater emergent wetlands in the study area. Periodic levee and channel maintenance activities associated with current strategies would result in localized disturbances to the tidal freshwater emergent wetlands.

Many existing and planned projects would include tidal restoration, which increases the quality of the tidal freshwater emergent wetland community in the study area. In the longer term, both gradual and catastrophic natural phenomena could affect the mix of open water, tidal wetland, agricultural, and riparian forest natural communities in the study area through continued land subsidence on Delta islands, levee degradation and potential failure from floods or seismic events, and climate change. Based on trends in land use conversions in the Delta during recent years, these natural changes would result in the conversion of additional cultivated land and possibly managed wetlands to tidal wetlands and tidal perennial aquatic.

Water reliability projects listed in Table 3.5-2 would not likely result in effects on tidal freshwater emergent wetlands. The northern coastal region, which includes portions of the study area, would not likely have an effect on tidal freshwater emergent wetlands because none of the construction projects would likely take place where these wetlands are located. The only other region that may have tidal freshwater emergent wetlands would be the southern coastal region; however, the extent of these is likely very limited due to a general lack of large, tidally influenced river deltas.

All Action Alternatives

Project construction would permanently and temporarily eliminate areas of tidal freshwater emergent wetlands and associated vegetation types. Permanently affected lands would no longer be available as plant and wildlife habitat. Affected acreages of tidal freshwater emergent wetlands that would be permanently or temporarily lost by implementing the action alternatives are summarized in Table 3.5-4 and are shown in Delta Conveyance Project Draft EIR Mapbooks 13-1–13-3[12] (California Department of Water Resources 2022). In general, Alternatives 1 and 2b would have a greater effect on tidal freshwater emergent wetlands than Alternatives 3 and 4b, and the Bethany Reservoir alternative (DWR's Preferred Alternative). The difference between the acreages affected by the three alignments is because these effects would occur at different locations. Most of the effects would result from geotechnical investigations and constructing roads and power transmission lines.

Table 3.5-4. Effects on the Tidal Freshwater Emergent Wetland Natural Community by Alternative

Alternative	Permanent Effects (acres)	Long-Term Temporary Effects (acres)	Temporary Effects (acres)	Total Effects (acres)
1	0.23	0.00	0.82	1.05
2b	0.05	0.00	0.82	0.87
3, 4b	0.03	0.00	0.37	0.40
5	0.18	0.00	0.39	0.57

Although maintenance activities would take place in existing/developed facilities, some activities may occur adjacent to tidal freshwater emergent wetlands and could result in inadvertent effects related to repaving of access roads every 15 years and semiannual general and ground maintenance (e.g., mowing, vegetation trimming, herbicide application). These activities also create the potential for runoff of paving material or materials from parked vehicles or staging areas.

Under the CMP, tidal freshwater emergent wetland habitat will be created or acquired and permanently protected to compensate for effects and ensure no significant loss of tidal freshwater emergent wetland habitat functions and values (Appendix C3, Section 3F.4.3 and Attachment 3F.1, Table 3F.1-2, CMP-2—*Tidal Freshwater Emergent Wetland*).

Implementing the CMP could result in temporary effects on tidal freshwater emergent wetland from channel margin enhancement and tidal restoration. The CMP and site-specific permitting approvals would ensure that there is no significant loss of habitat or habitat value by adjusting the overall mitigation commitment (Appendix C3, Sections 3F.1, *Introduction*, and 3F.2.4 and Attachment 3F.1, Table 3F.1-2, CMP-0—*General Design Guidelines*).

[12] Mapbooks for the Draft EIR related to EIS Section 3.5, *Natural Communities, Special-Status Terrestrial Species, and Wetlands and Other Waters,* are available for public viewing at https://cadwr.box.com/s/vuxfqmjhycto2fzkekcdohmu40zl63ir.

Compared to the No Action Alternative, construction and maintenance of all action alternatives would result in the disturbance of tidal freshwater emergent wetland, a sensitive natural community. Implementation of the CMP (Appendix C3) and Mitigation Measures BIO-2a: *Avoid or Minimize Impacts on Special-Status Natural Communities and Special-Status Plants*, BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities*, and BIO-2c: *Electrical Power Line Support Placement* would reduce this effect.

Based on the information presented above, including proposed mitigation measures and environmental commitments, the effect of all action alternatives on tidal freshwater emergent wetlands does not appear to be significant.

Impact BIO-3: Effects of the Project on Valley/Foothill Riparian Habitat

No Action Alternative

The extent of the valley/foothill riparian community in the study area would not significantly change under the No Action Alternative when considering the balance of likely sources of loss and programs to protect and create riparian habitat in the Delta. A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly modify valley/foothill riparian habitat in the study area. Periodic levee and channel maintenance activities associated with current strategies would result in localized disturbances to this community.

Many existing and planned projects would include riparian creation and protection, which increase the quality of valley/foothill riparian in the study area. Projects identified in Table 3.5-12 include levee repairs, improvements, and some setbacks, which would result in the permanent loss of riparian in those areas due to current policies not allowing the planting of riparian on levees. In the longer term, both gradual and catastrophic natural phenomena could affect the mix of open water, tidal wetland, agricultural, and riparian forest natural communities in the study area through continued land subsidence on Delta islands, levee degradation and potential failure from floods or seismic events, and climate change.

Water reliability projects listed in Table 3.5-2 could result in effects on valley/foothill riparian in all regions for the construction of water recycling, groundwater management, and groundwater recovery projects, which would include construction of storage basins, conveyance canals, pipelines, pump stations, and associated buildings; however, the amount of habitat removed would be in discrete locations and of minimal size. Water recycling could also result in reduced instream flows where water captured for residential use in upper watersheds does not make it back into streams following treatment, which could result in reduced flows during summer months that could reduce available surface water and groundwater available to riparian vegetation. Groundwater recovery projects could also reduce available groundwater for riparian vegetation if pumping occurs in proximity to these habitats and at a depth that actually affects shallow groundwater available to riparian vegetation. Although there is some potential for effects from these projects, the overall effect on riparian vegetation would not be significant due to the small amount that would likely be moved for construction and because most riparian vegetation in the region is adapted to more seasonal flows.

All Action Alternatives

Constructing water-conveyance facilities would permanently and temporarily eliminate areas of valley/foothill riparian habitat. Permanently affected lands would no longer be available as plant and wildlife habitat. Valley/foothill riparian habitat that would be permanently or temporarily removed by implementing the action alternatives is summarized in Table 3.5-5 and shown in Delta Conveyance Project Draft EIR Mapbooks 13-1–13-3[13] (California Department of Water Resources 2022). These effects would occur primarily from constructing access roads, intakes, levee improvements, power transmission lines, substations, and underground power transmission lines (all action alternatives). Alternative 1 would result in the greatest effects and Alternative 4b the fewest.

Table 3.5-5. Effects on the Valley/Foothill Riparian Natural Community by Alternative

Alternative	Permanent Effects (acres)	Long-Term Temporary Effects (acres)	Temporary Effects (acres)	Total Effects (acres)
1	51.90	2.61	17.49	72.00
2b	47.47	1.63	19.05	68.15
3	13.93	2.79	10.57	27.29
4b	11.88	1.63	10.25	23.76
5	15.41	4.05	9.85	29.31

The maintenance of aboveground water-conveyance facilities for all action alternatives could result in effects on valley/foothill riparian habitat.

Under the CMP, the applicant will create and preserve valley/foothill riparian habitat on Bouldin Island and at the Interstate (I-) 5 ponds and manage these areas in perpetuity (Appendix C3, Section 3F.2.3, *Impacts on Special-Status Species*, and Attachment 3F.1, Table 3F.1-2, CMP-3—*Valley/Foothill Riparian Habitat*).

Implementing the CMP would result in permanent and temporary losses of valley/foothill riparian habitat. The CMP and site-specific permitting approvals would ensure that there is no significant loss of habitat or habitat value by adjusting the overall mitigation commitment (Appendix C3, Sections 3F.1 and 3F.2.4 and Attachment 3F.1, Table 3F.1-2, CMP-0—*General Design Guidelines*).

Compared to the No Action Alternative, construction and maintenance of all action alternatives would result in the removal of valley/foothill riparian habitat, a sensitive natural community. Implementation of the CMP (Appendix C3) and Mitigation Measures BIO-2a: *Avoid or Minimize Impacts on Special-Status Natural Communities and Special-Status Plants*, BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities*, and BIO-2c: *Electrical Power Line Support Placement* would reduce this effect.

Based on the information presented above, including proposed mitigation measures and environmental commitments, the effect of all action alternatives on valley/foothill riparian habitat does not appear to be significant.

[13] Mapbooks for the Draft EIR related to EIS Section 3.5, *Natural Communities, Special-Status Terrestrial Species, and Wetlands and Other Waters,* are available for public viewing at https://cadwr.box.com/s/vuxfqmjhycto2fzkekcdohmu40zl63ir.

Impact BIO-4: Effects of the Project on the Nontidal Perennial Aquatic Natural Community

No Action Alternative

The extent of the nontidal perennial aquatic community in the study area would not significantly change under the No Action Alternative because direct fill of this community would be limited to small discrete areas relative to the extent of this community available in the study area, which consists of conveyance channels, natural channels, and depressions (ponds). A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly modify nontidal perennial aquatic community in the study area.

Existing and planned projects would not likely result in significant effects on or benefits to nontidal perennial aquatic communities because the majority of these features are human-made conveyance channels or basins used for agricultural, water transport, or conservation purposes.

Water reliability projects listed in Table 3.5-2 could result in effects on nontidal perennial aquatic habitat in all regions for the construction of water recycling, groundwater management, and groundwater recovery projects. These potential effects would result from the construction of storage basins, conveyance canals, pipelines, pump stations, and associated buildings; however, the amount of habitat removed would be in discrete locations and of minimal size. Water recycling could also result in reduced instream flows where water captured for residential use in upper watersheds does not make it back into streams following treatment. Groundwater recovery projects could also reduce available groundwater supporting streams, lakes, and ponds if pumping occurs in proximity to these habitats and at a depth that actually affects shallow groundwater supporting these communities. The potential for effects from these projects will vary by region and watershed but could be significant for streams in urbanized areas that are effluent dependent.

All Action Alternatives

Constructing the water-conveyance facilities would permanently and temporarily eliminate areas of nontidal perennial aquatic habitat. Permanently affected lands would no longer be available as plant and wildlife habitat. Nontidal perennial aquatic habitat that would be permanently or temporarily lost by implementation of the action alternatives is summarized in Table 3.5-6 and shown in Delta Conveyance Project Draft EIR Mapbooks 13-1–13-3[14] (California Department of Water Resources 2022). Effects would primarily result from constructing the Southern Complex (Alternatives 1, 2b, 3, and 4b) and the Bethany Complex (DWR's Preferred Alternative) and from constructing shafts and installing power transmission lines (all action alternatives) and improving levees (all action alternatives). DWR's Preferred Alternative would result in the greatest effects and Alternative 4b the fewest.

[14] Mapbooks for the Draft EIR related to EIS Section 3.5, *Natural Communities, Special-Status Terrestrial Species, and Wetlands and Other Waters,* are available for public viewing at https://cadwr.box.com/s/vuxfqmjhycto2fzkekcdohmu40zl63ir.

Table 3.5-6. Effects on the Nontidal Perennial Aquatic Natural Community by Alternative

Alternative	Permanent Effects (acres)	Long-Term Temporary Effects (acres)	Temporary Effects (acres)	Total Effects (acres)
1	0.26	0.29	0.51	1.06
2b	0.22	0.10	0.46	0.78
3	0.21	0.29	0.38	0.88
4b	0.21	0.10	0.29	0.60
5	0.53	0.83	0.32	1.68

The maintenance of aboveground water-conveyance facilities for all action alternatives could result in effects on nontidal perennial aquatic habitat.

Under the CMP, the applicant will create and preserve nontidal perennial aquatic habitat on Bouldin Island and at the I-5 ponds and manage these areas in perpetuity (Appendix C3, Section 3F.2.3 and Attachment C3.1, Table 3F.1-2, CMP-4—*Nontidal Perennial Aquatic Habitat*).

The CMP would result in the conversion of nontidal perennial aquatic communities from grading to create the appropriate topography and soil conditions to establish or restore habitats. The CMP could also affect nontidal perennial aquatic through tidal wetland habitat restoration and channel margin enhancement because potential areas identified generally support this community in the study area. The CMP and site-specific permitting approvals would ensure that there is no significant loss of habitat or habitat value by adjusting the overall commitment (Appendix C3, Sections 3F.1 and 3F.2.4 and Attachment 3F.1, Table 3F.1-2, CMP-0—*General Design Guidelines*).

Compared to the No Action Alternative, construction and maintenance under all action alternatives would result in the removal of nontidal perennial aquatic habitat, a sensitive natural community. Implementing the CMP (Appendix C3) and Mitigation Measures BIO-2a: *Avoid or Minimize Impacts on Special-Status Natural Communities and Special-Status Plants*, BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities*, and BIO-2c: *Electrical Power Line Support Placement* would reduce this effect.

Based on the information presented above, including proposed mitigation measures and environmental commitments, the effect of all action alternatives on the nontidal perennial aquatic natural community does not appear to be significant.

Impact BIO-5: Effects of the Project on Nontidal Freshwater Perennial Emergent Wetland

No Action Alternative

The extent of the nontidal freshwater emergent wetlands in the study area would not significantly change under the No Action Alternative because direct fill of this community would be limited to small discrete areas relative to the extent of this community available in the study area. A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly modify nontidal freshwater perennial emergent wetland habitat in the study area.

Many of the existing and planned projects would include nontidal restoration, which increases the quality of the nontidal freshwater emergent wetland community in the study area. In the longer term, both gradual and catastrophic natural phenomena could affect the mix of open water, tidal wetland, agricultural, and riparian forest natural communities in the study area through continued land subsidence on Delta islands, levee degradation and potential failure from floods or seismic events, and climate change. Based on trends in land use conversions in the Delta during recent years, these natural changes would result in the conversion of additional cultivated land and possibly managed wetlands to nontidal freshwater wetlands.

Water reliability projects listed in Table 3.5-2 could result in effects on nontidal freshwater emergent wetlands habitat in all regions for the construction of water recycling, groundwater management, and groundwater recovery projects. These projects would include the construction of storage basins, conveyance canals, pipelines, pump stations, and associated buildings; however, the amount of habitat removed would be in discrete locations and of minimal size. Groundwater recovery projects could also reduce available groundwater supporting nontidal freshwater perennial emergent wetlands if pumping occurs in proximity to these habitats and at a depth that actually affects shallow groundwater supporting these communities. The potential for effects from these projects will vary by region and watershed but could be significant for areas where wetlands are dependent on groundwater and pumping occurs at shallow depths.

All Action Alternatives

Constructing the water-conveyance facilities would permanently and temporarily eliminate areas of nontidal freshwater perennial emergent wetlands. Permanently affected lands would no longer be available as plant and wildlife habitat. Nontidal freshwater perennial emergent wetlands that would be permanently or temporarily lost by implementing the action alternatives are summarized in Table 3.5-7 and are shown in Delta Conveyance Project Draft EIR Mapbooks 13-1–13-3[15] (California Department of Water Resources 2022). The effects would result primarily from improving levees (Alternatives 1 and 2b) and access roads (all action alternatives). Alternative 1 would result in the greatest effects on habitat and Alternative 4b the fewest.

Table 3.5-7. Effects on Nontidal Freshwater Perennial Emergent Wetland by Alternative

Alternative	Permanent Effects (acres)	Long-Term Temporary Effects (acres)	Temporary Effects (acres)	Total Effects (acres)
1	5.07	0.00	4.55	9.62
2b	3.41	0.00	5.64	9.05
3	0.24	0.00	0.61	0.85
4b	0.02	0.00	0.31	0.33
5	0.30	0.00	0.45	0.75

The maintenance of aboveground water-conveyance facilities for all action alternatives could result in effects on nontidal freshwater perennial emergent wetlands.

Under the CMP, the applicant will create and preserve nontidal freshwater perennial emergent wetland habitat and manage these areas in perpetuity (Appendix C3, Section 3F.3.2.3, *Emergent*

[15] Mapbooks for the Draft EIR related to EIS Section 3.5, *Natural Communities, Special-Status Terrestrial Species, and Wetlands and Other Waters,* are available for public viewing at https://cadwr.box.com/s/vuxfqmjhycto2fzkekcdohmu40zl63ir.

Wetland, Seasonal Wetlands, Valley/Foothill Riparian, and Other Non-Tidal Waters, and Attachment 3F.1, Table 3F.1-2, CMP-5—*Nontidal Freshwater Perennial Emergent Wetland*).

The CMP would result in the conversion of nontidal freshwater perennial emergent wetlands to other communities. The CMP and site-specific permitting approvals would ensure that there is no significant loss of habitat or habitat value by adjusting the overall mitigation commitment (Appendix C3, Sections 3F.1 and 3F.2.4 and Attachment 3F.1, Table 3F.1-2, CMP-0—*General Design Guidelines*).

Compared to the No Action Alternative, all action alternatives would result in the removal of nontidal freshwater perennial wetland, a sensitive natural community. Implementing the CMP (Appendix C3) and Mitigation Measures BIO-2a: *Avoid or Minimize Impacts on Special-Status Natural Communities and Special-Status Plants*, BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities*, and BIO-2c: *Electrical Power Line Support Placement* would reduce this effect.

Based on the information presented above, including proposed mitigation measures and environmental commitments, the effect of all action alternatives on nontidal freshwater perennial emergent wetland does not appear to be significant.

Impact BIO-6: Effects of the Project on Nontidal Brackish Emergent Wetland

No Action Alternative

The extent of the nontidal brackish emergent wetlands in the study area would not significantly change under the No Action Alternative because direct fill of this community would be limited to small discrete areas relative to the extent of this community available in the study area. A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly modify nontidal brackish emergent wetlands in the study area. Periodic levee and channel maintenance activities associated with current strategies could result in localized disturbances to nontidal brackish emergent wetlands.

Many existing and planned projects would involve wetland restoration, which increases the quality of the wetland communities in the study area. In the longer term, both gradual and catastrophic natural phenomena could affect the mix of open water, tidal wetland, agricultural, and riparian forest natural communities in the study area through continued land subsidence on Delta islands, levee degradation and potential failure from floods or seismic events, and climate change. Based on trends in land use conversions in the Delta during recent years, these natural changes would result in the conversion of additional cultivated land and possibly managed wetlands to tidal wetlands.

Water reliability projects listed in Table 3.5-2 could potentially affect nontidal brackish emergent wetlands in the northern and southern coastal regions, where these wetlands are more likely to occur. The distribution of these wetlands is generally limited to areas near brackish water but separate from tidally influenced water. Projects that would most likely affect these wetlands include the construction of desalination facilities and groundwater recovery (brackish water desalination), which could physically remove these wetlands or affect their hydrology. The potential for effects from these projects will vary by region and watershed and could result in localized effects but cumulatively would not be significant.

All Action Alternatives

Constructing the water-conveyance facilities would not result in effects on nontidal brackish emergent wetlands.

No nontidal brackish emergent wetlands were mapped within or adjacent to water-conveyance facilities, and thus there would not likely be any maintenance-related effects on this community.

Channel margin enhancement and tidal restoration under the CMP could affect nontidal brackish emergent wetlands because potential areas identified for restoration include the Cache Slough Complex and lower Yolo Bypass (Appendix C3, Section 3F.4.3.4.2, *Site Selection Criteria and Tools*), which occur adjacent to nontidal brackish emergent wetland. The CMP does not include measures to create or protect nontidal brackish emergent wetlands on Bouldin Island or the I-5 ponds and would not result in effects on this community.

Compared to the No Action Alternative, the action alternatives would have a relatively similar effect on nontidal brackish emergent wetlands when implementing tidal restoration and channel margin enhancement under the CMP. Implementing the CMP (Appendix C3) and Mitigation Measures BIO-2a: *Avoid or Minimize Impacts on Special-Status Natural Communities and Special-Status Plants*, BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities*, and BIO-2c: *Electrical Power Line Support Placement* would reduce this effect and ensure no significant loss of nontidal brackish emergent wetland habitat functions and values.

Based on the information presented above, including proposed mitigation measures and environmental commitments, the effect of all action alternatives on nontidal brackish emergent wetland does not appear to be significant.

Impact BIO-7: Effects of the Project on Alkaline Seasonal Wetland Complex

No Action Alternative

The extent of the alkaline seasonal wetland complex community in the study area would not significantly change under the No Action Alternative because potential effects would be limited to small discrete areas relative to the extent of this community available in the study area. A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly modify the alkaline seasonal wetland complex community in the study area.

Existing and planned projects would not likely result in significant effects on or benefits to alkaline seasonal wetland complex communities because these features largely occur outside of where these actions take place and there are no programs specifically contributing to the conservation of this habitat.

Water reliability projects in Table 3.5-2 could result in effects on the alkaline seasonal wetland complex community from the construction of water recycling, groundwater management, and groundwater recovery projects across all regions. These projects would include the construction of storage basins, conveyance canals, pipelines, pump stations, and associated buildings; however, the amount of habitat removed would be in discrete locations and of minimal size. Effects would be limited to surface disturbances and not likely due to changes in groundwater because these wetlands are dependent on seasonal rainfall and only shallow groundwater in the upper soil horizon, which would not be affected by deeper groundwater pumping.

All Action Alternatives

Constructing the water-conveyance facilities would permanently and temporarily eliminate areas of alkaline seasonal wetland complex. Permanently affected lands would no longer be available as plant and wildlife habitat. Alkaline seasonal wetland complex that would be permanently or temporarily removed by implementing the action alternatives is summarized in Table 3.5-8 and shown in Delta Conveyance Project Draft EIR Mapbooks 13-1–13-3[16] (California Department of Water Resources 2022). Under Alternatives 1, 2b, 3, and 4b, these effects would be associated with the Southern Complex facilities and, under DWR's Preferred Alternative, would be primarily associated with geotechnical investigations. Alternatives 1, 2b, 3, and 4b would have the same effects and would be greater than the effects from DWR's Preferred Alternative.

Table 3.5-8. Effects on Alkaline Seasonal Wetland Complex by Alternative

Alternative	Permanent Effects (acres)	Long-Term Temporary Effects (acres)	Temporary Effects (acres)	Total Effects (acres)
1, 2b, 3, 4b	1.86	0.40	2.50	4.76
5	0.22	0.00	0.54	0.76

The maintenance of aboveground water-conveyance facilities for all action alternatives could result in effects on alkaline seasonal wetland complex when they occur adjacent to facilities.

The CMP would offset the loss of alkaline seasonal wetland complex by the applicant purchasing credits at an agency-approved mitigation bank or at a non-bank site approved by the agencies supporting and implementing the design commitments and guidelines for special-status plants (Appendix C3, Section 3F.3.2.4, *Vernal Pools and Alkaline Wetlands*, and Attachment 3F.1, Table 3F.1-2, CMP-7—*Alkaline Seasonal Wetland Complex*).

Compensatory mitigation would not take place in alkaline seasonal wetlands and would not affect this habitat.

Compared to the No Action Alternative, construction and maintenance under all action alternatives would result in the disturbance of alkaline seasonal wetland complex, a sensitive natural community. Implementation of the CMP and Mitigation Measures BIO-2a: *Avoid or Minimize Impacts on Special-Status Natural Communities and Special-Status Plants*, BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities*, and BIO-2c: *Electrical Power Line Support Placement* would reduce this effect.

Based on the information presented above, including proposed mitigation measures, environmental commitments, and implementation of the CMP, the effect of all action alternatives on alkaline seasonal wetland complex communities does not appear to be significant.

[16] Mapbooks for the Draft EIR related to EIS Section 3.5, *Natural Communities, Special-Status Terrestrial Species, and Wetlands and Other Waters,* are available for public viewing at https://cadwr.box.com/s/vuxfqmjhycto2fzkekcdohmu40zl63ir.

Impact BIO-8: Effects of the Project on Vernal Pool Complex

No Action Alternative

The extent of the vernal pool complex community in the study area would not significantly change under the No Action Alternative because potential effects would be limited to small discrete areas relative to the extent of this community available in the study area. A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly modify the vernal pool complex community in the study area.

Existing and planned projects would not likely result in significant effects on or benefits to vernal pool complexes because these features largely occur outside of where these actions take place and there are only a few programs specifically contributing to the conservation of this habitat.

Water reliability projects in Table 3.5-2 could result in effects on the vernal pool complex community from the construction of water recycling, groundwater management, and groundwater recovery projects across all regions. These projects would include the construction of storage basins, conveyance canals, pipelines, pump stations, and associated buildings; however, the amount of habitat removed would be in discrete locations and of minimal size. Effects would be limited to surface disturbance and not likely due to changes in groundwater because these wetlands are dependent on seasonal rainfall and only shallow groundwater in the upper soil horizon, which would not be affected by deeper groundwater pumping.

All Action Alternatives

Under all action alternatives, constructing the water-conveyance facilities would permanently and temporarily eliminate areas of vernal pool complex. Permanently affected lands would no longer be available as plant and wildlife habitat. Vernal pool complex that would be permanently or temporarily removed by implementing the action alternatives is summarized in Table 3.5-9 and shown in Delta Conveyance Project Draft EIR Mapbooks 13-1–13-3[17] (California Department of Water Resources 2022). Under Alternatives 1, 2b, 3, and 4b, these effects would be associated with the Southern Complex facilities. Alternatives 2b and 4b would have slightly smaller effects than Alternatives 1 and 3 because fewer roads would be constructed. Under DWR's Preferred Alternative, effects would be primarily associated with constructing the Bethany Reservoir aqueduct. DWR's Preferred Alternative would have the greatest effects and Alternatives 2b and 4b (which would have the same effects) the fewest. Environmental Commitment EC-14: *Construction Best Management Practices for Biological Resources* would ensure that temporarily disturbed areas are restored (Appendix C1, *Environmental Commitments and Best Management Practices*).

Table 3.5-9. Effects on the Vernal Pool Complex by Alternative

Alternative	Permanent Effects (acres)	Long-Term Temporary Effects (acres)	Temporary Effects (acres)	Total Effects (acres)
1, 3	9.02	0.00	10.15	19.17
2b, 4b	8.95	0.00	9.90	18.85
5	11.91	11.61	2.56	26.08

[17] Mapbooks for the Draft EIR related to EIS Section 3.5, *Natural Communities, Special-Status Terrestrial Species, and Wetlands and Other Waters,* are available for public viewing at https://cadwr.box.com/s/vuxfqmjhycto2fzkekcdohmu40zl63ir.

The maintenance of aboveground water-conveyance facilities for all action alternatives could result in effects on vernal pool complex when they occur adjacent to facilities.

The CMP would offset the loss of vernal pool complex by the applicant purchasing credits at an agency-approved mitigation bank or at a non-bank site approved by the agencies supporting and implementing the design commitments and guidelines for special-status plants (Appendix C3, Section 3F.3.2.4 and Attachment 3F.1, Table 3F.1-3, CMP-9—*Special-Status Plants*).

Compensatory mitigation on Bouldin Island and at the I-5 ponds would not affect vernal pool complex. However, the CMP may affect vernal pool complex through tidal wetland habitat restoration, channel margin enhancement, and the management of lands under site protection instruments. The CMP and site-specific permitting approvals would ensure that there is no significant loss of habitat or habitat value by adjusting the overall commitment (Appendix C3, Sections 3F.1 and 3F.2.4 and Attachment C3.1, Table C3.1-2, CMP-0—*General Design Guidelines*).

Compared to the No Action Alternative, construction and maintenance under all action alternatives would result in the disturbance of vernal pool complex, a sensitive natural community. Implementation of the CMP (Appendix C3) and Mitigation Measures BIO-2a: *Avoid or Minimize Impacts on Special-Status Natural Communities and Special-Status Plants*, BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities*, and BIO-2c: *Electrical Power Line Support Placement* would reduce this effect.

Based on the information presented above, including proposed mitigation measures, environmental commitments, and implementation of the CMP, the effect of all action alternatives on vernal pool complex communities does not appear to be significant.

Effects of the Action Alternatives on Special-Status Species

Information on the special-status species considered for the analysis can be found in Delta Conveyance Project Draft EIR Appendix 13A, *Special-Status Species with Potential to Occur in the Study Area* (California Department of Water Resources 2022), and information on the species' life history and habitat suitability models are presented in the species accounts in Delta Conveyance Project Draft EIR Appendix 13B, *Species Accounts* (California Department of Water Resources 2022). The special-status species analyzed for effects of the action alternatives are listed in Table 3.5-10.

Table 3.5-10 Special-Status Species Analyzed for Effects of the Action Alternatives

Impact Number	Common Name	Scientific Name
BIO-10	Alkali milk vetch	*Astragalus tener* var. *tener*
BIO-10	Brittlescale	*Atriplex depressa*
BIO-13	Watershield	*Brasenia schreberi*
BIO-12	Bristly sedge	*Carex comosa*
BIO-12	Bolander's water-hemlock	*Cicuta maculata var. bolanderi.*
BIO-10	Recurved larkspur	*Delphinium recurvatum*
BIO-9	Dwarf downingia	*Downingia pusilla*
BIO-11	Jepson's coyote-thistle	*Eryngium jepsonii*
BIO-9	Spiny-sepaled button-celery	*Eryngium spinosepalum*
BIO-11	Diamond-petaled California poppy	*Eschscholzia rhombipetala*
BIO-10	San Joaquin spearscale	*Extriplex joaquinana*

Impact Number	Common Name	Scientific Name
BIO-12	Woolly rose-mallow	*Hibiscus lasiocarpos* var. *occidentalis*
BIO-12	Delta tule pea	*Lathyrus jepsonii* var. *jepsonii*
BIO-9	Legenere	*Legenere limosa*
BIO-11	Heckard’s peppergrass	*Lepidium latipes* var. *heckardii*
BIO-12	Mason’s lilaeopsis	*Lilaeopsis masonii*
BIO-12	Delta mudwort	*Limosella australis*
BIO-11	Shining navarretia	*Navarretia nigelliformis* subsp. *Radians*
BIO-13	Eelgrass pondweed	*Potamogeton zosteriformis*
BIO-10	California alkali grass	*Puccinellia simplex*
BIO-12	Sanford’s arrowhead	*Sagittaria sanfordii*
BIO-12	Marsh skullcap	*Scutellaria galericulata*
BIO-12	Side-flowering skullcap	*Scutellaria lateriflora*
BIO-10	Long-sepaled sand-spurrey	*Spergularia macrotheca* var. *longistyla*
BIO-12	Suisun Marsh aster	*Symphyotrichum lentum*
BIO-11	Saline clover	*Trifolium hydrophilum*
BIO-11	Caper-fruited tropidocarpum	*Tropidocarpum capparideum*
BIO-10	Crownscale	*Atriplex coronata*
BIO-11	Small-flowered morning-glory	*Convolvulus simulans*
BIO-11	Stinkbells	*Fritillaria agrestis*
BIO-9	Hogwallow starfish	*Hesperevax caulescens*
BIO-10	Ferris’ goldfields	*Lasthenia ferrisiae*
BIO-10	Little mousetail	*Myosurus minimus* subsp. *Apus*
BIO-11	Cotula navarretia	*Navarretia cotulifolia*
BIO-9	Delta woolly marbles	*Psilocarphus brevissimus* var. *multiflorus*
BIO-15	Conservancy fairy shrimp	*Branchinecta conservatio*
BIO-14	Vernal pool fairy shrimp	*Branchinecta lynchi*
BIO-14	Midvalley fairy shrimp	*Branchinecta mesovallensis*
BIO-14	California linderiella	*Linderiella occidentalis*
BIO-14	Vernal pool tadpole shrimp	*Lepidurus packardi*
BIO-14	Hairy water flea	*Dumontia oregonensis*
BIO-17	Antioch Dunes anthicid beetle	*Anthicus antiochensis*
BIO-17	Sacramento anthicid beetle	*Anthicus sacramento*
BIO-18	Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*
BIO-19	Delta green ground beetle	*Elaphrus viridis*
BIO-14	Ricksecker’s water scavenger beetle	*Hydrochara rickseckeri*
BIO-20	Curved-foot hygrotis diving beetle	*Hygrotus curvipes*
BIO-15	Molestan blister beetle	*Lytta molesta*
BIO-15	Blennosperma vernal pool andrenid bee	*Andrena blennospermatis*
BIO-21	Crotch bumble bee	*Bombus crotchii*
BIO-21	Western bumble bee	*Bombus occidentalis*
BIO-22	California tiger salamander	*Ambystoma californiense*
BIO-23	Western spadefoot	*Spea hammondii*

Impact Number	Common Name	Scientific Name
BIO-24	California red-legged frog	*Rana draytonii*
BIO-25	Western pond turtle	*Emys marmorata*
BIO-26	Coast horned lizard	*Phrynosoma blainvillii*
BIO-27	California legless lizard	*Anniella pulchra*
BIO-28	California glossy snake	*Arizona elegans occidentalis*
BIO-29	San Joaquin coachwhip	*Masticophis flagellum ruddocki*
BIO-30	Giant garter snake	*Thamnophis gigas*
BIO-31	Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*
BIO-32	California black rail	*Laterallus jamaicensis coturniculus*
BIO-33	Greater sandhill crane	*Antigone canadensis tabida*
BIO-33	Lesser sandhill crane	*Antigone canadensis*
BIO-34	California least tern	*Sterna antillarum browni*
BIO-35	Double-crested cormorant	*Phalacrocorax auritus*
BIO-41	Least bittern	*Ixobrychus exilis*
BIO-35	Great blue heron	*Ardea herodias*
BIO-35	Great egret	*Ardea alba*
BIO-35	Snowy egret	*Egretta thula*
BIO-35	Black-crowned night heron	*Nycticorax*
BIO-36	Osprey	*Pandion haliaetus*
BIO-36	White-tailed kite	*Elanus leucurus*
BIO-37	Golden eagle	*Aquila chrysaetos*
BIO-38	Northern harrier	*Circus hudsonius*
BIO-36	Cooper’s hawk	*Accipiter cooperii*
BIO-39	Swainson’s hawk	*Buteo swainsoni*
BIO-37	Ferruginous hawk	*Buteo regalis*
BIO-40	Burrowing owl	*Athene cunicularia*
BIO-38	Short-eared owl	*Asio flammeus*
BIO-41	Loggerhead shrike	*Lanius ludovicianus*
BIO-42	Least Bell’s vireo	*Vireo bellii pusillus*
BIO-38	California horned lark	*Eremophila alpestris actia*
BIO-41	Bank swallow	*Riparia*
BIO-38	Grasshopper sparrow	*Ammodramus savannarum*
BIO-41	Modesto song sparrow	*Melospiza melodia*
BIO-43	Suisun song sparrow	*Melospiza melodia maxillaris*
BIO-41	Yellow-breasted chat	*Icteria virens*
BIO-41	Yellow-headed blackbird	*Xanthocephalus*
BIO-44	Tricolored blackbird	*Agelaius tricolor*
BIO-43	Saltmarsh common yellowthroat	*Geothlypis trichas sinuosa*
BIO-41	Yellow warbler	*Setophaga petechia*
BIO-45	Pallid bat	*Antrozous pallidus*
BIO-45	Townsend’s big-eared bat	*Corynorhinus townsendii*
BIO-45	Big brown bat	*Eptesicus fuscus*

Impact Number	Common Name	Scientific Name
BIO-45	Silver-haired bat	*Lasionycteris noctivagans*
BIO-45	Western red bat	*Lasiurus blossevillii*
BIO-45	Hoary bat	*Lasiurus cinereus*
BIO-45	California myotis	*Myotis californicus*
BIO-45	Little brown myotis	*Myotis lucifugus*
BIO-45	Western small-footed myotis	*Myotis ciliolabrum*
BIO-45	Yuma myotis	*Myotis yumanensis*
BIO-45	Western pipistrelle	*Pipistrellus hesperus*
BIO-45	Western mastiff bat	*Eumops perotis californicus*
BIO-45	Mexican free-tailed bat	*Tadarida brasiliensis*
BIO-46	San Joaquin kit fox	*Vulpes macrotis mutica*
BIO-47	American badger	*Taxidea taxus*
BIO-48	San Joaquin pocket mouse	*Perognathus inornatus*
BIO-49	Salt marsh harvest mouse	*Reithrodontomys raviventris*
BIO-50	Riparian brush rabbit	*Sylvilagus bachmani riparius*

USACE is coordinating with USFWS and the applicant is coordinating with the CDFW to provide accurate information for compliance with ESA and CESA, respectively. USACE will initiate Section 7 formal consultation when the information is available and appropriate for the process. All information will be updated for the Final EIS.

Impact BIO-9: Effects of the Project on Special-Status Vernal Pool Plants

Special-status vernal pool plants analyzed include dwarf downingia, spiny-sepaled button-celery, legenere, hogwallow starfish, and delta wooly marbles.

No Action Alternative

The extent of the vernal pool special-status plants in the study area would not significantly change under the No Action Alternative because effects on this community would be limited to small discrete areas relative to the extent of this community available in the study area. A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly affect vernal pool special-status plants.

Existing and planned projects would not likely result in significant effects on or benefits to vernal pool special-status plants because these plants largely occur outside of where these actions take place and there are only a few programs specifically contributing to the conservation of this habitat.

Water reliability projects in Table 3.5-2 could result in effects on the vernal pool special-status plants from the construction of water recycling, groundwater management, and groundwater recovery projects across all regions. These projects would include the construction of storage basins, conveyance canals, pipelines, pump stations, and associated buildings; however, the amount of habitat removed would be in discrete locations and of minimal size. Effects would be limited to surface disturbances.

All Action Alternatives

None of the action alternatives would affect known occurrences of special-status vernal pool plants but would affect modeled habitat for these species (Appendix I1, *Natural Communities, Special-Status Terrestrial Species, and Wetlands and Other Waters Supporting Appendix*, Tables I1-9–I1-12). The effects vary by species and alternative due to differences in species models. For dwarf downingia, Alternatives 1, 2a, 3, and DWR's Preferred Alternative would have the same effects, which are primarily the construction of roads. Alternatives 2b and 4b would not affect modeled habitat for dwarf downingia. For spiny-sepaled button-celery, Alternatives 1, 2b, 3, and 4b would have the same effects from the construction of roads and the Southern Forebay and would be greater than DWR's Preferred Alternative. For legenere, Alternatives 1, 2b, 3, and 4b would have the same effects from the construction of roads. Alternatives 2b and 4b would not affect modeled habitat for legenere. For hogwallow starfish and Delta wooly marbles, DWR's Preferred Alternative would have the greatest effects from the construction of the Bethany Complex. Alternatives 2b and 4b would have the fewest effects from the construction of access roads. Environmental Commitments EC-1: *Conduct Environmental Resources Worker Awareness Training* and EC-14: *Construction Best Management Practices for Biological Resources* (Appendix C1) would reduce potential effects by training construction staff on protecting sensitive biological resources, reporting requirements, and the ramifications for not following these measures and by having a biological monitor present to ensure that nondisturbance buffers and associated construction fencing are intact and all other protective measures are being implemented where applicable.

Project maintenance of aboveground water-conveyance facilities for all action alternatives would not occur in vernal pool habitat but could result in effects on special-status vernal pool plants when habitat occurs adjacent to facilities.

The CMP would offset the loss of vernal pool complex by the applicant purchasing credits at an agency-approved mitigation bank or through the use of site protection instruments (Appendix C3, Section 3F.3.2.4 and Attachment C3.1, Table 3F.1-3, CMP-9—*Special-Status Plants*).

Compensatory mitigation on Bouldin Island and at the I-5 ponds would not affect any known occurrences or modeled habitat for special-status vernal pool plants. However, the CMP may affect special-status vernal pool plants through tidal wetland habitat restoration, channel margin enhancement, and the management of lands under site protection instruments. The CMP and site-specific permitting approvals would ensure that there is no significant loss of habitat or habitat value by adjusting the overall commitment (Appendix C3, Sections C3.1 and C3.2.4 and Attachment C3.1, Table 3F.1-2, CMP-0—*General Design Guidelines*).

Compared to the No Action Alternative, the action alternatives would result in effects on special-status vernal pool plants. Implementation of the CMP (Appendix C3) and Mitigation Measures BIO-2a: *Avoid or Minimize Impacts on Special-Status Natural Communities and Special-Status Plants* and BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities* would reduce these effects.

Based on the information presented above, including proposed mitigation measures, environmental commitments, and implementation of the CMP, the effect of all action alternatives on special-status vernal pool plants does not appear to be significant.

Impact BIO-10: Effects of the Project on Special-Status Alkaline Seasonal Wetland Complex Plants

Special-status alkaline seasonal wetland complex species analyzed include alkali milk-vetch, brittlescale, recurved larkspur, San Joaquin spearscale, California alkali grass, long-sepaled sand-spurry, crownscale, Ferris' goldfields, and little mousetail.

No Action Alternative

The extent of the special-status alkaline seasonal wetland complex plants in the study area would not significantly change under the No Action Alternative because effects on this community would be limited to small discrete areas relative to the extent of this community available in the study area. A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly affect special-status alkaline seasonal wetland complex plants.

Existing and planned projects would not likely result in significant effects on or benefits to special-status alkaline seasonal wetland complex plants because these plants largely occur outside of where these actions take place and there are no programs specifically contributing to the conservation of habitat for these species.

Water reliability projects in Table 3.5-2 could result in effects on the special-status alkaline seasonal wetland complex plants from the construction of water recycling, groundwater management, and groundwater recovery projects across all regions. These projects would include the construction of storage basins, conveyance canals, pipelines, pump stations, and associated buildings; however, the amount of habitat removed would be in discrete locations and of minimal size. Effects would be limited to surface disturbances.

All Action Alternatives

Alternatives 1, 2b, 3, and 4b could remove known occupied habitat for recurved larkspur, San Joaquin spearscale, long-styled sand-spurrey, and crownscale. DWR's Preferred Alternative could remove known occupied habitat for long-styled sand-spurrey. These alternatives could affect recurved larkspur, San Joaquin spearscale, and long-styled sand-spurrey through loss of individual plants and occupied habitat. No known occurrences of alkali milk-vetch, brittlescale, California alkali grass, Ferris' goldfields, or little mousetail would be affected.

All action alternatives also intercept modeled habitat for alkali milk-vetch, brittlescale, recurved larkspur, San Joaquin spearscale, long-styled sand-spurrey, California alkali grass, crownscale, Ferris' goldfields, and little mousetail. In general, Alternatives 1, 2b, 3, and 4b would affect more modeled habitat than DWR's Preferred Alternative. The amount of modeled habitat intercepted differs among alternatives and among species.

Environmental Commitments EC-1: *Conduct Environmental Resources Worker Awareness Training* and EC-14: *Construction Best Management Practices for Biological Resources* (Appendix C1) would reduce these potential effects by training construction staff on protecting sensitive biological resources, reporting requirements, and the ramifications for not following these measures and by having a biological monitor present to ensure that nondisturbance buffers and associated construction fencing are intact and all other protective measures are being implemented where applicable.

Project maintenance of aboveground water-conveyance facilities for all action alternatives would not occur in alkali seasonal wetland habitat but could result in effects on special-status alkaline seasonal wetland plants when habitat occurs adjacent to facilities.

The CMP would offset the loss of alkaline seasonal wetland complex by the applicant purchasing credits at an agency-approved mitigation bank or through the use of site protection instruments (Appendix C3, Section 3F.3.2.4 and Attachment C3.1, Table 3F.1-2, CMP-7—*Alkaline Seasonal Wetland Complex*, and Table 3F.1-3, CMP-9—*Special-Status Plants*).

Compensatory mitigation on Bouldin Island and at the I-5 ponds would not affect any known occurrences or modeled habitat for special-status alkaline seasonal wetland plant species. However, implementation of the CMP could affect special-status alkaline seasonal wetland plants through tidal wetland habitat restoration, channel margin enhancement, and the management of lands under site protection instruments. The CMP and site-specific permitting approvals would ensure that there is no significant loss of habitat or habitat value by adjusting the overall commitment (Appendix C3, Sections 3F.1 and 3F.2.4 and Attachment C3.1, Table 3F.1-2, CMP-0—*General Design Guidelines*).

Compared to the No Action Alternative, all action alternatives would result in effects on special-status alkaline wetland plants. Implementation of the CMP and Mitigation Measures BIO-2a: *Avoid or Minimize Impacts on Special-Status Natural Communities and Special-Status Plants* and BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities* would reduce these effects.

Based on the information presented above, including proposed mitigation measures, environmental commitments, and implementation of the CMP, the effect of all action alternatives on special-status alkaline seasonal wetland complex plants does not appear to be significant.

Impact BIO-11: Effects of the Project on Special-Status Grassland Plants

Special-status grassland species analyzed include Jepson’s coyote-thistle, diamond-petaled California poppy, Heckard’s peppergrass, shining navarretia, saline clover, caper-fruited tropidocarpum, small-flowered morning glory, stinkbells, and cotula navarretia.

No Action Alternative

The extent of special-status grassland plants in the study area would not significantly change under the No Action Alternative because effects on this community would be limited to small discrete areas relative to the extent of this community available in the study area. A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly affect special-status grassland plants.

Existing and planned projects and programs would not likely result in significant effects on special-status grassland plants because these plants largely occur outside of where these actions take place; however, the programs do include protections of grasslands.

Water reliability projects in Table 3.5-2 could result in effects on the special-status grassland plants from the construction of water recycling, groundwater management, and groundwater recovery projects across all regions. These projects would include the construction of storage basins, conveyance canals, pipelines, pump stations, and associated buildings. The amount of habitat removed would vary by project but would not result in significant reductions regionally.

All Action Alternatives

No action alternatives would affect known occurrences of Jepson's coyote-thistle, diamond-petaled California poppy, Heckard's peppergrass, shining navarretia, saline clover, caper-fruited tropidocarpum, small-flowered morning-glory, stinkbells, or cotula navarretia.

However, the action alternatives would intersect modeled habitat for all of these species. Locations where the project footprint crosses modeled habitat identify where the highest potential for effects on undocumented occurrences of these species could occur. Potential effects on special-status grassland plants are summarized in Appendix I1, Tables I1-18 through I1-23. Effects on modeled habitat vary by species and by alternative. Environmental Commitments EC-1: *Conduct Environmental Resources Worker Awareness Training* and EC-14: *Construction Best Management Practices for Biological Resources* (Appendix C1) would reduce potential effects by training construction staff on protecting sensitive biological resources, reporting requirements, and the ramifications for not following these measures and by having a biological monitor present to ensure that nondisturbance buffers and associated construction fencing are intact and all other protective measures are being implemented where applicable.

Project maintenance of aboveground water-conveyance facilities for all action alternatives could result in effects on special-status grassland plants.

Through the CMP, the applicant would implement the design commitments and guidelines for restoring suitable habitat for special-status plants (Appendix C3, Attachment C3.1, Table 3F.1-3, CMP-9—*Special-Status Plants*).

The CMP mitigation on Bouldin Island and at the I-5 ponds would not affect known occurrences or modeled habitat for special-status grasslands plants. However, implementation of the CMP could affect special-status grassland plants through tidal wetland habitat restoration, channel margin enhancement, the use of non-bank sites for vernal pool or alkaline wetland creation or enhancement, and the management of lands under site protection instruments. The CMP and site-specific permitting approvals would ensure that there is no significant loss of habitat or habitat value by adjusting the overall commitment (Appendix C3, Sections 3F.1 and 3F.2.4 and Attachment C3.1, Table 3F.1-2, CMP-0—*General Design Guidelines*).

Compared to the No Action Alternative, all action alternatives would result in effects on special-status grasslands plants. Implementation of the CMP and Mitigation Measures BIO-2a: *Avoid or Minimize Impacts on Special-Status Natural Communities and Special-Status Plants* and BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities* would reduce these effects on special-status grassland plants.

Based on the information presented above, including proposed mitigation measures and environmental commitments, the effect of all action alternatives on special-status grassland plants does not appear to be significant.

Impact BIO-12: Effects of the Project on Special-Status Tidal Freshwater Emergent Wetland Plants

Special-status tidal freshwater emergent wetland plants analyzed include bristly sedge, Bolander's water-hemlock, woolly rose-mallow, delta tule pea, Mason's lilaeopsis, delta mudwort, Sanford's arrowhead, marsh skullcap, side-flowering skullcap, and Suisun marsh aster.

No Action Alternative

The extent of the tidal freshwater emergent wetland plants in the study area would not significantly change under the No Action Alternative because potential effects would be limited to small discrete areas relative to the extent of this community available in the study area and within the geographic regions analyzed.

A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly modify tidal freshwater emergent wetland plants in the study area. Periodic levee and channel maintenance activities associated with current strategies would result in localized disturbances to the tidal freshwater emergent wetland plants.

Many existing and planned projects and programs would include tidal restoration, which increases the quality of the tidal freshwater emergent wetland community in the study area. In the longer term, both gradual and catastrophic natural phenomena could affect the mix of open water, tidal wetland, agricultural, and riparian forest natural communities in the study area through continued land subsidence on Delta islands, levee degradation and potential failure from floods or seismic events, and climate change. Based on trends in land use conversions in the Delta during recent years, these natural changes would result in the conversion of additional cultivated land and possibly managed wetlands to tidal wetlands and tidal perennial aquatic.

Water reliability projects listed in Table 3.5-2 would not likely result in effects on tidal freshwater emergent wetland plants. The northern coastal region, which includes portions of the study area, would not likely have an effect on tidal freshwater emergent wetland plants because none of the construction projects would likely take place where these wetlands are located. The only other region that may have tidal freshwater emergent wetland plants would be the southern coastal region; however, the extent of these is likely very limited due to a general lack of large, tidally influenced river deltas.

All Action Alternatives

All action alternatives would potentially have effects on occurrences of special-status tidal freshwater emergent plants and affect modeled habitat. The number of occurrences and potential for affecting undocumented occurrences in areas of modeled habitat varies by species and by alternative (Appendix I1, Tables I1-31 through I1-40). Locations where the project footprint crosses modeled habitat identify where the highest potential for effects on undocumented occurrences of these species could occur. Generally, Alternative 1 would have the greatest effects on modeled habitat and occurrences relative to Alternatives 2b, 3, 4b, and DWR's Preferred Alternative, with DWR's Preferred Alternative generally having the fewest. Environmental Commitments EC-1: *Conduct Environmental Resources Worker Awareness Training* and EC-14: *Construction Best Management Practices for Biological Resources* (Appendix C1) would reduce potential effects by training construction staff on protecting sensitive biological resources, reporting requirements, and the ramifications for not following these measures and by having a biological monitor present to ensure that nondisturbance buffers and associated construction fencing are intact and all other protective measures are being implemented where applicable.

Project maintenance of water-conveyance facilities for all action alternatives could result in effects on special-status tidal freshwater emergent wetland plants.

Under the CMP, the applicant will ensure that tidal freshwater emergent wetland habitat will be created or acquired and permanently protected to compensate for effects and ensure no significant loss of tidal freshwater emergent wetlands and implement the design commitments and guidelines for restoring suitable habitat for special-status plants (Appendix C3, Section 3F.4.3 and Attachment C3.1, Table 3F.1-2, CMP-2—*Tidal Freshwater Emergent Wetland*, and Table 3F.1-3, CMP-9—*Special-Status Plants*).

The CMP could affect modeled habitat and occurrences of special-status tidal freshwater emergent plants. The CMP and site-specific permitting approvals would ensure that there is no significant loss of habitat or habitat value by adjusting the overall mitigation commitment (Appendix C3, Sections 3F.1 and 3F.2.4 and Attachment C3.1, Table 3F.1-2, CMP-0—*General Design Guidelines*).

Compared to the No Action Alternative, all action alternatives would result in effects on special-status tidal freshwater emergent plants. Implementation of the CMP and Mitigation Measures BIO-2a: *Avoid or Minimize Impacts on Special-Status Natural Communities and Special-Status Plants* and BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities* would ensure effects on special-status tidal freshwater emergent plants would be reduced.

Based on the information presented above, including proposed mitigation measures and environmental commitments, the effect of all action alternatives on special-status tidal freshwater emergent wetland plants does not appear to be significant.

Impact BIO-13: Effects of the Project on Special-Status Nontidal Perennial Aquatic Plants

Special-status nontidal perennial aquatic plants analyzed include watershield and eel-grass pondweed.

No Action Alternative

The extent of the nontidal perennial aquatic plants in the study area would not significantly change under the No Action Alternative because potential effects would be limited to small discrete areas relative to the extent of this community available in the study area. A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly modify nontidal wetland plants habitat in the study area.

Many existing and planned projects and programs would include nontidal wetland restoration, which increases the quality of the nontidal perennial aquatic plants in the study area. In the longer term, both gradual and catastrophic natural phenomena could affect the mix of open water, tidal wetland, agricultural, and riparian forest natural communities in the study area through continued land subsidence on Delta islands, levee degradation and potential failure from floods or seismic events, and climate change. Based on trends in land use conversions in the Delta during recent years, these natural changes would result in the conversion of additional cultivated land and possibly managed wetlands to nontidal freshwater wetlands.

Water reliability projects listed in Table 3.5-2 could result in effects on nontidal perennial aquatic plant habitat in all regions for the construction of water recycling, groundwater management, and groundwater recovery projects. These projects would include the construction of storage basins, conveyance canals, pipelines, pump stations, and associated buildings; however, the amount of habitat removed would be in discrete locations and of minimal size. Groundwater recovery projects could also reduce available groundwater supporting nontidal wetland plants if pumping occurs in proximity to these habitats and at a depth that actually affects shallow groundwater supporting these communities. The potential for effects from these projects will vary by region and watershed but could be significant for areas where wetlands are dependent on groundwater and pumping occurs at shallow depths.

All Action Alternatives

Alternatives 1 and 2b would intersect one watershield occurrence at Bouldin Island. Although the occurrence is reported to be extirpated and the likelihood of affecting the species is low, potential habitat is still present, and constructing shaft facilities and reusable tunnel material (RTM) areas could affect the species. The eastern and Bethany Reservoir alignment alternatives (Alternatives 3, 4b, and DWR's Preferred Alternative) would not affect watershield occurrences, and no action alternatives would affect eel-grass pondweed occurrences. Alternative 1 would result in the greatest effects on modeled habitat for these species relative to Alternatives 2b, 3, 4b, and DWR's Preferred Alternative, with DWR's Preferred Alternative having the fewest effects on watershield and Alternative 4b having the fewest effects on eel-grass pondweed. Environmental Commitments EC-1: *Conduct Environmental Resources Worker Awareness Training* and EC-14: *Construction Best Management Practices for Biological Resources* (Appendix C1) would reduce potential effects by training construction staff on protecting sensitive biological resources, reporting requirements, and the ramifications for not following these measures and by having a biological monitor present to ensure that nondisturbance buffers and associated construction fencing are intact and all other protective measures are being implemented where applicable.

Project maintenance of water-conveyance facilities for all action alternatives could result in effects on special-status nontidal perennial aquatic plants.

Under the CMP, the applicant will create and preserve nontidal freshwater perennial emergent wetland and nontidal perennial aquatic habitat and manage these areas in perpetuity and implement the design commitments and guidelines for restoring suitable habitat for special-status plants (Appendix C3, Section 3F.3.2.3 and Attachment C3.1, Table 3F.1-2, CMP-4—*Nontidal Perennial Aquatic Habitat*, and CMP-5—*Nontidal Freshwater Perennial Emergent Wetland*, and Table 3F.1-3, CMP-*9—Special-Status Plants*).

Implementation of the CMP could result in effects on nontidal perennial aquatic plants through restoration activities on Bouldin Island and at the I-5 ponds, through tidal wetland habitat restoration, and through channel margin enhancement. The CMP and site-specific permitting approvals would ensure that there is no significant loss of habitat or habitat value by adjusting the overall mitigation commitment (Appendix C3, Section 3F.2.4 and Attachment C3.1, Table 3F.1-2, CMP-0—*General Design Guidelines*).

Compared to the No Action Alternative, all action alternatives would remove occupied and modeled habitat for two special-status plants, watershield and eel-grass pondweed, and modeled habitat for nontidal perennial aquatic plants. Implementation of the CMP and Mitigation Measures BIO-2a: *Avoid or Minimize Impacts on Special-Status Natural Communities and Special-Status Plants* and BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities* would reduce these effects.

Based on the information presented above, including proposed mitigation measures and environmental commitments, the effect of all action alternatives on special-status nontidal perennial aquatic plants does not appear to be significant.

Impact BIO-14: Effects of the Project on Special-Status Vernal Pool Aquatic Invertebrates

Special-status vernal pool aquatic invertebrates include the federally listed vernal pool fairy shrimp and vernal pool tadpole shrimp, as well as the nonlisted midvalley fairy shrimp, California linderiella, hairy water flea, and Ricksecker's water scavenger beetle.

No Action Alternative

The extent of the vernal pool aquatic invertebrate habitat in the study area would not significantly change under the No Action Alternative because effects on this habitat would be limited to small discrete areas relative to the extent of this habitat available in the study area. A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly affect vernal pool aquatic invertebrates.

Existing and planned projects and programs would not likely result in significant effects on or benefits to vernal pool aquatic invertebrate habitat because these habitats largely occur outside of where these actions take place and there are only a few programs specifically contributing to the conservation of this habitat.

Water reliability projects in Table 3.5-2 could result in effects on vernal pool aquatic invertebrate habitat from the construction of water recycling, groundwater management, and groundwater recovery projects across all regions. These projects would include the construction of storage basins, conveyance canals, pipelines, pump stations, and associated buildings; however, the amount of habitat removed would be in discrete locations and of minimal size. Effects would be limited to surface disturbances.

All Action Alternatives

The construction of Alternatives 1, 2b, 3, and 4b would result in permanent, temporary, and indirect effects on modeled habitat for vernal pool aquatic invertebrates. Construction-related grading and excavation would result in the permanent and temporary loss of vernal pool aquatic invertebrate modeled habitat and the potential for injury and mortality of these species (Appendix I1, Table I1-43). The implementation of Environmental Commitments EC-1: *Conduct Environmental Resources Worker Awareness Training*, EC-2: *Develop and Implement Hazardous Materials Management Plans*, EC-3: *Develop and Implement Spill Prevention, Containment, and Countermeasure Plans*, and EC-14: *Construction Best Management Practices for Biological Resources* would reduce these potential effects by implementing spill prevention and containment plans, by having a biological monitor present, implementing nondisturbance buffers using construction fencing, and restoring temporarily disturbed areas (Appendix C1).

DWR's Preferred Alternative would also have effects on vernal pool aquatic invertebrates in a similar fashion as described for the other action alternatives but would result from construction of the aqueduct (permanent, temporary, and indirect) road improvements along Mountain House Road and the construction of the park-and-ride facility off Hood-Franklin Road, east of I-5 (indirect). The park-and-ride lot would be removed following construction (Appendix I1, Table I1-43).

Alternatives 1, 2b, 3, and 4b would have the same effects on habitat, which are greater than those from DWR's Preferred Alternative.

The maintenance of the Southern Complex on Byron Tract and west of Byron Highway (Alternatives 1, 2b, 3, and 4b) could result in periodic, temporary effects on vernal pool aquatic invertebrates. No maintenance activities at the Bethany Complex (DWR's Preferred Alternative) are anticipated to result in effects on vernal pool aquatic invertebrates.

The CMP would offset the loss of vernal pool aquatic invertebrate habitat by the applicant purchasing credits at a USFWS-approved mitigation bank or at a non-bank site approved by USFWS supporting habitat for vernal pool fairy shrimp and vernal pool tadpole shrimp (Appendix C3, Section 3F.3.3.3, *Vernal Pool Species, California Tiger Salamander, and California Red-legged Frog*, and Attachment C3.1, Table 3F.1-3, CMP-11—*Vernal Pool Fairy Shrimp and Vernal Pool Tadpole Shrimp Habitat*).

Implementation of the CMP could result in effects on vernal pool aquatic invertebrates through tidal wetland habitat restoration, channel margin enhancement, and the use of non-bank sites for vernal pool or alkaline wetland creation or enhancement. The CMP and site-specific permitting approvals would account for any losses of vernal pool aquatic invertebrate habitat from channel margin enhancement by mitigating for any habitat losses (Appendix C3, Sections 3F.1 and 3F.2.4 and Attachment C3.1, Table 3F.1-2, CMP-0—*General Design Guidelines*). The CMP would not affect modeled habitat for vernal pool aquatic invertebrates at the restoration areas at the I-5 ponds and on Bouldin Island because these areas are not within modeled habitat for these species.

Compared to the No Action Alternative, the action alternatives would result in the loss of habitat for vernal pool aquatic invertebrates and other effects on the species. Through the CMP and Mitigation Measures BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities* and BIO-14: *Avoid and Minimize Impacts from Construction on Vernal Pool Aquatic Invertebrates and Critical Habitat for Vernal Pool Fairy Shrimp*, these effects would be reduced.

Based on the information presented above, including proposed mitigation measures, environmental commitments, and implementation of the CMP, the effect of all action alternatives on special-status vernal pool aquatic invertebrates does not appear to be significant.

Impact BIO-15: Effects of the Project on Conservancy Fairy Shrimp

No Action Alternative

The extent of the Conservancy fairy shrimp habitat in the study area would not significantly change under the No Action Alternative because effects on this habitat would be limited to small discrete areas relative to the extent of this habitat available in the study area. A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly affect Conservancy fairy shrimp.

Existing and planned projects and programs would not likely result in significant effects on or benefits to Conservancy fairy shrimp because these habitats largely occur outside of where these actions take place and there are no programs specifically contributing to the conservation of this species.

Water reliability projects in Table 3.5-2 would not result in effects on Conservancy fairy shrimp habitat because the species largely occurs outside of the range of these regions, except for a single occurrence in Ventura County in the Los Padres National Forest, which would not likely be affected by these projects.

All Action Alternatives

The construction of the action alternatives would not result in effects on Conservancy fairy shrimp. The modeled habitat for Conservancy fairy shrimp is more than 6 miles from the nearest project infrastructure, which is more than 8 miles from the nearest CNDDB occurrence (I3, *Species Accounts*, Figure 13B.31-1) (California Department of Fish and Wildlife 2020).

Maintenance activities of all action alternatives would not result in effects on Conservancy fairy shrimp because of the distance of modeled and known occupied habitat from the project infrastructure.

The CMP would not specifically benefit Conservancy fairy shrimp.

Implementation of the CMP could result in effects on Conservancy fairy shrimp through tidal wetland habitat restoration, channel margin enhancement, and the use of non-bank sites for vernal pool or alkaline wetland creation. The CMP and site-specific permitting approvals would account for any losses of Conservancy fairy shrimp habitat (Appendix C3, Section 3F.2.4 and Attachment C3.1, Table 3F.1-2, CMP-0—*General Design Guidelines*). The CMP would not affect modeled habitat for Conservancy fairy shrimp at the restoration areas at the I-5 ponds and on Bouldin Island because these areas are not within modeled habitat for this species.

Compared to the No Action Alternative, the action alternatives would similarly have no effect on Conservancy fairy shrimp.

Based on the information presented above, the effect of all action alternatives on Conservancy fairy shrimp does not appear to be significant.

Impact BIO-16: Effects of the Project on Special-Status Vernal Pool Terrestrial Invertebrates

Special-status vernal pool terrestrial invertebrates analyzed include molestan blister beetle and vernal pool andrenid bee.

No Action Alternative

The extent of the vernal pool terrestrial invertebrate habitat in the study area would not significantly change under the No Action Alternative because effects on this habitat would be limited to small discrete areas relative to the extent of this habitat available in the study area. A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly affect vernal pool terrestrial invertebrates.

Existing and planned projects and programs would not likely result in significant effects on or benefits to vernal pool terrestrial invertebrate habitat because these habitats largely occur outside of where these actions take place and there are only a few programs specifically contributing to the conservation of this habitat.

Water reliability projects in Table 3.5-2 could result in effects on vernal pool terrestrial invertebrate habitat from the construction of water recycling, groundwater management, and groundwater recovery projects across all regions. These projects would include the construction of storage basins, conveyance canals, pipelines, pump stations, and associated buildings; however, the amount of habitat removed would be in discrete locations and of minimal size. Effects would be limited to surface disturbances.

All Action Alternatives

The construction of Alternatives 1, 2b, 3, and 4b would result in the permanent and temporary loss of modeled habitat, including potential indirect effects on habitat for vernal pool terrestrial invertebrates and the potential for injury and mortality of these species. The implementation of Environmental Commitments EC-1: *Conduct Environmental Resources Worker Awareness Training*, EC-2: *Develop and Implement Hazardous Materials Management Plans*, EC-3: *Develop and Implement Spill Prevention, Containment, and Countermeasure Plans*, and EC-14: *Construction Best Management Practices for Biological Resources* would reduce these potential effects by implementing spill prevention and containment plans, by having a biological monitor present, implementing nondisturbance buffers using construction fencing, and restoring temporarily disturbed areas (Appendix C1).

The construction of DWR's Preferred Alternative via the Bethany Reservoir alignment would also result in the permanent and temporary loss of vernal pool terrestrial invertebrate habitat, including indirect effects on habitat as a result of grading and excavation.

DWR's Preferred Alternative would have the greatest effect on these species relative to Alternatives 1, 2b, 3, and 4b, with Alternatives 2b and 4b having the fewest effects on modeled habitat.

The maintenance of Southern Complex on Byron Tract and west of Byron Highway (Alternatives 1, 2b, 3, and 4b) could result in effects on vernal pool terrestrial invertebrates. Maintenance at the Southern Forebay and South Delta Outlet and Control Structure (Alternatives 1, 2b, 3, and 4b) could result in the injury, mortality, and disruption of normal behaviors of vernal pool terrestrial invertebrates and effects on flowering plants occurring immediately adjacent to where these activities are taking place.

No maintenance activities at the Bethany Complex (DWR's Preferred Alternative) are anticipated to result in effects on vernal pool terrestrial invertebrates because there are no aboveground facilities that occur within 250 feet of aquatic habitat.

The CMP would offset the loss of vernal pool terrestrial invertebrate habitat (Appendix C3, Section 3F.3.3.3 and Attachment C3.1, Table 3F.1-3, CMP-11—*Vernal Pool Fairy Shrimp and Vernal Pool Tadpole Shrimp Habitat*) by the applicant purchasing credits at a USFWS-approved mitigation bank or at a non-bank site approved by USFWS supporting habitat for vernal pool fairy shrimp and vernal pool tadpole shrimp, which would also benefit vernal pool terrestrial invertebrates. Although these mitigation areas would be specifically targeting vernal pool fairy shrimp and vernal pool tadpole shrimp, they would be within the range of these vernal pool terrestrial invertebrates and would generally provide suitable conditions for them to occur there.

Implementation of the CMP could result in effects on vernal pool terrestrial invertebrates through tidal wetland habitat restoration, channel margin enhancement, and the use of non-bank sites for vernal pool or alkaline wetland creation or enhancement. The CMP and site-specific permitting approvals would account for any losses of vernal pool habitat (Appendix C3, Sections 3F.1 and 3F.2.4 and Attachment C3.1, Table 3F.1-2, CMP-0—*General Design Guidelines*). The CMP would not affect modeled habitat for vernal pool terrestrial invertebrates at the restoration areas at the I-5 ponds and on Bouldin Island because these areas are not within modeled habitat for these species.

Compared to the No Action Alternative, the action alternatives would result in the loss of habitat for vernal pool terrestrial invertebrates and other effects on the species. Through the CMP and

Mitigation Measures BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities* and BIO-14: *Avoid and Minimize Impacts from Construction on Vernal Pool Aquatic Invertebrates and Critical Habitat for Vernal Pool Fairy Shrimp*, these effects would be reduced.

Based on the information presented above, including proposed mitigation measures, environmental commitments, and implementation of the CMP, the effect of all action alternatives on special-status vernal pool terrestrial invertebrates does not appear to be significant.

Impact BIO-17: Effects of the Project on Sacramento and Antioch Dunes Anthicid Beetles

No Action Alternative

The extent of the Sacramento and Antioch Dunes anthicid beetle habitat in the study area would not significantly change under the No Action Alternative because effects on this habitat would be likely be limited to small discrete areas.

A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly modify Sacramento and Antioch Dunes anthicid beetle habitat in the study area.

Many existing and planned projects and programs would not result in the loss of or protection of Sacramento and Antioch Dunes anthicid beetle habitat.

Water reliability projects listed in Table 3.5-2 would not likely result in effects on Sacramento and Antioch Dunes anthicid beetle habitat.

All Action Alternatives

The construction of all action alternatives are not anticipated to result in effects on habitat or result in the injury or mortality of Sacramento and Antioch Dunes anthicid beetles.

Maintenance activities of the action alternatives are not anticipated to result in effects on Sacramento and Antioch Dunes anthicid beetles or their habitat because no suitable habitat or species records were identified near water-conveyance facilities.

The CMP would not specifically benefit Sacramento and Antioch Dunes anthicid beetles.

Implementation of the CMP could result in effects on Sacramento and Antioch Dunes anthicid beetles because the areas selected for potential channel margin enhancement, which includes the areas along the Sacramento River and its tributaries, could potentially occur in areas where these species are known to occur or where there is potential habitat (Appendix C3, Section 3F.4.3.4.2). The CMP and site-specific permitting approvals would account for any losses of anthicid beetle habitat from channel margin enhancement by mitigating for any habitat losses (Appendix C3, Sections 3F.1 and 3F.2.4 and Attachment C3.1, Table 3F.1-2, CMP-0—*General Design Guidelines*). The CMP would not affect potential habitat for Sacramento and Antioch Dunes anthicid beetles at the restoration areas at the I-5 ponds and on Bouldin Island because these areas are not within areas where there is habitat for these species.

Compared to the No Action Alternative, the action alternatives would similarly have no effect on Sacramento and Antioch Dunes anthicid beetles.

Based on the information presented above, the effect of all action alternatives on Sacramento and Antioch Dunes anthicid beetles does not appear to be significant.

Impact BIO-18: Effects of the Project on Valley Elderberry Longhorn Beetle

No Action Alternative

The extent of the valley elderberry longhorn beetle habitat in the study area would not significantly change under the No Action Alternative when considering the balance of likely sources of loss and programs to protect and create riparian habitat in the Delta. A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly modify valley elderberry longhorn beetle habitat in the study area. Periodic levee and channel maintenance activities associated with current strategies would result in localized disturbances to valley elderberry longhorn beetle habitat.

Many existing and planned projects and programs would include riparian creation and protection, which increase the quality of valley elderberry longhorn beetle habitat in the study area. Projects include levee repairs, improvements, and some setbacks, which would result in the permanent loss of riparian in those areas due to current policies not allowing the planting of riparian on levees. In the longer term, both gradual and catastrophic natural phenomena could affect the mix of open water, tidal wetland, agricultural, and riparian forest natural communities in the study area through continued land subsidence on Delta islands, levee degradation and potential failure from floods or seismic events, and climate change.

Water reliability projects listed in Table 3.5-2 could result in effects on valley elderberry longhorn beetle habitat in the northern inland region only, the only region within the range of the species, for the construction of water recycling, groundwater management, and groundwater recovery projects, which would include construction of storage basins, conveyance canals, pipelines, pump stations, and associated buildings; however, the amount of habitat removed would be in discrete locations and of minimal size. Water recycling could also result in reduced instream flows where water captured for residential use in upper watersheds does not make it back into streams following treatment, which could result in reduced flows during summer months that could reduce available surface water and groundwater available to riparian vegetation. Groundwater recovery projects could also reduce available groundwater for riparian vegetation if pumping occurs in proximity to these habitats and at a depth that actually affects shallow groundwater available to riparian vegetation. Though there is some potential for effects from these projects, the overall effect on riparian vegetation would not be significant due to the small amount that would likely be moved for construction and because most riparian vegetation in the region is adapted to more seasonal flows.

All Action Alternatives

The construction of all the action alternatives would affect modeled riparian habitat for valley elderberry longhorn beetle through the permanent and temporary loss of modeled habitat and habitat fragmentation.

Construction activities associated with all action alternatives could result in the injury, mortality, or the disruption of normal behaviors of valley elderberry longhorn beetle during the removal of occupied shrubs, construction material spills in areas where shrubs occur, or if work is conducted adjacent to habitat during the flight season (March to July), which could disrupt feeding, breeding, and dispersal and cause potential injury or mortality of valley elderberry longhorn beetle.

Implementation of Environmental Commitments EC-1: *Conduct Environmental Resources Worker Awareness Training*, EC-2: *Develop and Implement Hazardous Materials Management Plans*, EC-3: *Develop and Implement Spill Prevention, Containment, and Countermeasure Plans*, and EC-14: *Construction Best Management Practices for Biological Resources* (Appendix C1) would reduce these potential effects by implementing spill prevention and containment plans, by having a biological monitor present, implementing nondisturbance buffers using construction fencing, and restoring temporarily disturbed areas, where applicable.

Alternative 1 would result in the greatest effects on modeled habitat and Alternative 4b would result in the fewest.

The maintenance of aboveground water-conveyance facilities for all action alternatives could result in effects on valley elderberry longhorn beetle. Maintenance activities could affect shrubs that establish or occur adjacent to facilities (e.g., herbicide drift, damage to shrubs) and could result in the injury, mortality, and disruption of normal behaviors (i.e., feeding, breeding, and dispersal) of valley elderberry longhorn beetle larvae, if they are occupying affected shrubs, and adults, if activities occur during the flight season (March to July).

The CMP would offset the loss of riparian habitat by the applicant creating riparian habitat on Bouldin Island and at the I-5 ponds and managing these areas in perpetuity. As stated in Appendix C3, Section 3F.3.3.1, *Freshwater Marsh and Riparian Terrestrial Species*, and Attachment C3.1, Table 3F.1-3, CMP-12—*Valley Elderberry Longhorn Beetle Habitat*, mitigation will follow the guidance in *Framework for Assessing Impacts on Valley Elderberry Longhorn Beetle* (*Desmocerus californicus dimorphus*) (U.S. Fish and Wildlife Service 2017a) or the most recent guidance available at that time, which will create and protect areas where elderberry shrubs can be planted and receive shrubs suitable for transplantation. Channel margin restoration would include riparian plantings on rock benches (Appendix C3, Section 3F.4.3.3.3, *Design Criteria and Concepts*) that may provide opportunities for the establishment of elderberry shrubs and future colonization by valley elderberry longhorn beetle.

The CMP could affect the species through restoration on Bouldin Island and at the I-5 ponds through tidal restoration, through channel margin enhancement, and through management in areas protected under site protection instruments. The CMP and site-specific permitting approvals would account for any losses of valley elderberry habitat from habitat creation by adjusting the overall commitment of riparian habitat creation and elderberry shrub planting and transplanting (Appendix C3, Section 3F.2.4 and Attachment C3.1, Table 3F.1-2, CMP-0—*General Design Guidelines*).

Compared to the No Action Alternative, the action alternatives would result in the loss of habitat for valley elderberry longhorn beetle and other effects on the species. Through the CMP and Mitigation Measures BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities* and BIO-18: *Avoid and Minimize Impacts on Valley Elderberry Longhorn Beetle*, these effects would be reduced.

Based on the information presented above, including proposed mitigation measures, environmental commitments, and implementation of the CMP, the effect of all action alternatives on valley elderberry longhorn beetle does not appear to be significant.

Impact BIO-19: Effects of the Project on Delta Green Ground Beetle

No Action Alternative

The extent of the delta green ground beetle habitat in the study area would not significantly change under the No Action Alternative because effects on this habitat would be limited to small discrete areas relative to the extent of this habitat available in the study area. A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly affect delta green ground beetle.

Existing and planned projects and programs would not likely result in significant effects on or benefits to delta green ground beetle because these habitats largely occur outside of where these actions take place and there are no programs specifically contributing to the conservation of this species.

Water reliability projects in Table 3.5-2 would not result in effects on delta green ground beetle because the species range does not overlap with these regions.

All Action Alternatives

The construction of the action alternatives would not result in effects on delta green ground beetle. The modeled habitat for delta green ground beetle is more than 9 miles from the nearest water conveyance feature, the park-and-ride off SR 12 on Brannan Island, and the nearest CNDDB record is more than 10 miles from this same feature (Appendix I3, Figure 13B.40-1) (California Department of Fish and Wildlife 2020).

The maintenance activities of the action alternatives (all action alternatives) would not result in effects on delta green ground beetle because of the distance of modeled and known occupied habitat from the project infrastructure.

Implementation of the CMP could result in effects on delta green ground beetle through tidal wetland habitat restoration, channel margin enhancement, and the use of non-bank sites for vernal pool or alkaline wetland creation or enhancement. The CMP and site-specific permitting approvals would account for any losses of delta green ground beetle habitat from channel margin enhancement by mitigating for any habitat losses (Appendix C3, Sections 3F.1 and 3F.2.4 and Attachment C3.1, Table 3F.1-2, CMP-0—*General Design Guidelines*). The CMP would not affect modeled habitat for delta green ground beetle at the restoration areas at the I-5 ponds and on Bouldin Island because these areas are not within modeled habitat for this species.

Compared to the No Action Alternative, the action alternatives would similarly have no effect on delta green ground beetle; however, the implementation of the CMP could affect this species. Through the CMP, these effects would be reduced.

Based on the information presented above, including proposed mitigation measures and environmental commitments, the effect of all action alternatives on delta green ground beetle does not appear to be significant.

Impact BIO-20: Effects of the Project on Curved-Foot Hygrotus Diving Beetle

No Action Alternative

The extent of the curved-foot hygrotus diving beetle habitat in the study area would not significantly change under the No Action Alternative because effects on this habitat would be limited to small discrete areas relative to the extent of this habitat available in the study area. A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly affect curved-foot hygrotus diving beetle habitat.

Existing and planned projects and programs would not likely result in significant effects on or benefits to curved-foot hygrotus diving beetle because these habitats largely occur outside of where these actions take place and there are no programs specifically contributing to the conservation of this species.

Water reliability projects in Table 3.5-2 would not likely result in effects on curved-foot hygrotus diving beetle because the species range does not overlap with any of the regions analyzed.

All Action Alternatives

The construction of Alternatives 1, 2b, 3, and 4b would result in the permanent and temporary loss of curved-foot hygrotus diving beetle modeled habitat. The implementation of Environmental Commitment EC-14: *Construction Best Management Practices for Biological Resources* would ensure that temporarily disturbed areas are restored (Appendix C1).

The construction of DWR's Preferred Alternative via the Bethany Reservoir alignment would also result in the permanent and temporary loss of curved-foot hygrotus diving beetle habitat. The implementation of Environmental Commitment EC-14: *Construction Best Management Practices for Biological Resources* would ensure that temporarily disturbed areas are restored (Appendix C1).

Construction activities associated with the Southern Complex (Alternatives 1, 2b, 3, and 4b) and the Bethany Complex (DWR's Preferred Alternative) could result in the injury and mortality and disruption of normal behaviors of curved-foot hygrotus diving beetle if individuals are occupying affected habitat when it is dewatered for grading and excavation or through exposure to construction-related fluids, such as fuels, oils, and cement. Implementation of Environmental Commitments EC-1: *Conduct Environmental Resources Worker Awareness Training*, EC-2: *Develop and Implement Hazardous Materials Management Plans*, EC-3: *Develop and Implement Spill Prevention, Containment, and Countermeasure Plans*, and EC-14: *Construction Best Management Practices for Biological Resources* (Appendix C1) would reduce these potential effects by training construction staff on the needs of protecting sensitive biological resources, reporting requirements, and the ramifications for not following these measures; implementing spill prevention and containment plans that would avoid material spills that could affect the viability of nearby aquatic habitat; by having a biological monitor present that would ensure that nondisturbance buffers and associated construction fencing are intact and all other protective measures are being implemented; and implementing nondisturbance buffers using construction fencing, where applicable.

Alternative 3 would result in the greatest effects on the species, and DWR's Preferred Alternative would result in the fewest.

Maintenance activities under all action alternatives could affect curved-foot hygrotus diving beetle.

The CMP could provide benefits to curved-foot hygrotus diving beetle habitat through the applicant purchasing credits at a USFWS-approved mitigation bank or at a non-bank site approved by USFWS supporting habitat for vernal pool fairy shrimp and vernal pool tadpole shrimp (Appendix C3, Section 3F.3.3.3 and Attachment C3.1, Table 3F.1-3, CMP-11—*Vernal Pool Fairy Shrimp and Vernal Pool Tadpole Shrimp Habitat*), which would also benefit curved-foot hygrotus diving beetle if the mitigation occurs within the range of the species.

The CMP restoration activities at the I-5 ponds, on Bouldin Island, for channel margin enhancement and tidal restoration would not affect modeled habitat for curved-foot hygrotus diving beetle because the restoration activities would be outside of the known range of the species. In the event that non-bank sites are used for vernal pool or alkaline wetland creation or enhancement (Appendix C3, Section 3F.3.2.4), these activities could result in the temporary disturbance of existing habitat and the potential for injury or mortality of curved-foot hygrotus diving beetle if they are within the range of the species and could ultimately provide benefits for the species.

Compared to the No Action Alternative, the action alternatives would result in the loss of habitat for curved-foot hygrotus diving beetle and other effects on the species. Through the CMP and Mitigation Measures BIO-14: *Avoid and Minimize Impacts from Construction on Vernal Pool Aquatic Invertebrates and Critical Habitat for Vernal Pool Fairy Shrimp* and BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities*, these effects would be reduced.

Based on the information presented above, including proposed mitigation measures and environmental commitments, the effect of all action alternatives on curved-foot hygrotus diving beetle does not appear to be significant.

Impact BIO-21: Effects of the Project on Crotch and Western Bumble Bees

No Action Alternative

The extent of the Crotch and western bumble bee habitat in the study area would not significantly change under the No Action Alternative because effects on this habitat would be limited to small discrete areas relative to the extent of this habitat available in the study area. A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly affect Crotch and western bumble bee habitat.

Existing and planned projects and programs would not likely result in significant effects on or benefits to Crotch and western bumble bee habitat because these habitats largely occur outside of where these actions take place; however, the programs do include protections of grasslands that may provide habitat for these species.

Water reliability projects in Table 3.5-2 could result in effects on Crotch and western bumble bee habitat from the construction of water recycling, groundwater management, and groundwater recovery projects across all regions. These projects would include the construction of storage basins, conveyance canals, pipelines, pump stations, and associated buildings; however, the amount of habitat removed would be in discrete locations and of minimal size. Effects would be limited to surface disturbances.

All Action Alternatives

The construction of all the action alternatives would result in the permanent and temporary loss of Crotch and western bumble bee modeled habitat primarily as a result of the levee improvement work, new roads and road improvements, South Delta Outlet and Control Structure (Alternatives 1, 2b, 3, and 4b), and the Bethany Complex (DWR's Preferred Alternative) (Appendix C3). The implementation of Environmental Commitment EC-14: *Construction Best Management Practices for Biological Resources* would ensure that temporarily disturbed areas are restored (Appendix C1).

Construction activities for all action alternatives could result in the injury, mortality, and disruption of normal behaviors of Crotch and western bumble bees. These effects could result from grading, excavation, the use of construction-related vehicles, and exposure of bumble bees to construction-related fluids, such as fuels, oils, and cement. Implementation of Environmental Commitments EC-1: *Conduct Environmental Resources Worker Awareness Training*, EC-2: *Develop and Implement Hazardous Materials Management Plans*, EC-3: *Develop and Implement Spill Prevention, Containment, and Countermeasure Plans*, and EC-14: *Construction Best Management Practices for Biological Resources* (Appendix C1) would reduce these potential effects by training construction staff on the needs of protecting sensitive biological resources, reporting requirements, and the ramifications for not following these measures; by implementing spill prevention and containment plans that would avoid material spills that could affect bees and their habitat; and by having a biological monitor present that would ensure that nondisturbance buffers and associated construction fencing are intact and all other protective measures are being implemented, where applicable.

Alternative 1 would result in the greatest effects on modeled habitat for bumble bees, and DWR's Preferred Alternative would result in the fewest.

The maintenance of aboveground water-conveyance facilities for all action alternatives could result in effects on Crotch and western bumble bee.

The CMP would provide benefits to western and Crotch bumble bee habitat by the applicant creating and protecting grasslands on Bouldin Island that will be planted with species suitable as foraging habitat for Crotch and western bumble bee, and the creation and enhancement of seasonal wetlands on Bouldin will likely support flowering plants along their margins during the spring and the deeper portions during the summer as they dry down (Appendix C3). The protection of upland grasslands as part of vernal pool fairy shrimp, vernal pool tadpole shrimp, California red-legged frog, and California tiger salamander mitigation through the purchasing of conservation credits at a USFWS- and CDFW-approved conservation bank (Appendix C3, Section 3F.3.3.3) could also support habitat for bumble bees. Although these mitigation areas would be specifically targeting suitable habitat for vernal pool fairy shrimp, vernal pool tadpole shrimp, California red-legged frog, and California tiger salamander, they would occur within the range of Crotch and western bumble bee and would generally provide suitable habitat for the species.

The CMP could affect Crotch and western bumble bee through the creation and enhancement of habitat on Bouldin Island, at the I-5 ponds, from tidal restoration, from channel margin enhancement, the use of non-bank sites for vernal pool or alkaline wetland creation or enhancement, and management in areas protected under site protection instruments. The CMP and site-specific permitting approvals would account for any losses of bumble bee habitat from restoration activities by adjusting the overall commitment of grassland creation and protection (Appendix C3, Section 3F.2.4 and Attachment C3.1, Table 3F.1-2, CMP-0—*General Design Guidelines*).

Compared to the No Action Alternative, construction and maintenance of all action alternatives would result in the removal of habitat for Crotch and western bumble bee and the potential for injury, mortality, and the disruption of normal behaviors. Implementation of the CMP and Mitigation Measures BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities* and BIO-21: *Avoid and Minimize Impacts on Bumble Bees* would reduce these effects.

Based on the information presented above, including proposed mitigation measures and environmental commitments, the effect of all action alternatives on Crotch and western bumble bee does not appear to be significant.

Impact BIO-22: Effects of the Project on California Tiger Salamander

No Action Alternative

The extent of the California tiger salamander habitat in the study area would not significantly change under the No Action Alternative because effects on this habitat would be limited to small discrete areas relative to the extent of this habitat available in the study area. A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly affect California tiger salamander habitat.

Existing and planned projects and programs would not likely result in significant effects on or benefits to California tiger salamander habitat because this habitat largely occurs outside of where these actions take place and there are no programs specifically contributing to the conservation of this habitat.

Water reliability projects in Table 3.5-2 could result in effects on California tiger salamander habitat from the construction of water recycling, groundwater management, and groundwater recovery projects in the northern coastal and northern inland regions. These projects would include the construction of storage basins, conveyance canals, pipelines, pump stations, and associated buildings; however, the amount of habitat removed would be in discrete locations and of minimal size. Effects would be limited to surface disturbances.

All Action Alternatives

The construction of the central and eastern alignment alternatives (Alternatives 1, 2b, 3, and 4b) would result in the permanent and temporary loss of California tiger salamander modeled habitat, including potential indirect effects on habitat. The construction of DWR's Preferred Alternative via the Bethany Reservoir alignment would also result in the permanent and temporary loss of California tiger salamander modeled habitat, including potential indirect effects on habitat as result of grading and excavation. The implementation of Environmental Commitment EC-14: *Construction Best Management Practices for Biological Resources* would ensure that temporarily disturbed areas are restored (Appendix C1).

Construction activities associated with the Southern Complex (Alternatives 1, 2b, 3, and 4b) and the Bethany Complex (DWR's Preferred Alternative) could result in the injury and/or mortality of California tiger salamander if they are moving on the surface or occupying small mammal burrows or soil crevices during activities such as grading, excavation, soil compaction, and the use of construction-related vehicles. Implementation of Environmental Commitments EC-1: *Conduct Environmental Resources Worker Awareness Training*, EC-2: *Develop and Implement Hazardous Materials Management Plans*, EC-3: *Develop and Implement Spill Prevention, Containment, and*

Countermeasure Plans, and EC-14: *Construction Best Management Practices for Biological Resources* (Appendix C1) would reduce these potential effects by implementing spill prevention and containment plans, by having a biological monitor present, by implementing nondisturbance buffers using construction fencing, where applicable, and by limiting construction vehicle traffic to a maximum speed limit of 15 miles per hour on unpaved nonpublic construction access roads and nighttime speed limits of 10 miles per hour on these roads when they occur adjacent to suitable habitat for California tiger salamander.

Alternatives 1, 2b, 3, and 4b (having the same effect acreage) would have greater effects on California tiger salamander relative to DWR's Preferred Alternative.

Maintenance effects could result in effects on California tiger salamander under all of the action alternatives.

The CMP would offset the loss of California tiger salamander habitat by the applicant purchasing conservation credits at a USFWS- and CDFW-approved mitigation bank or though other site protection instruments (Appendix C3, Sections 3F.3.3.3 and 3F.4.2.1.2, *Targeted Species*, and Attachment C3.1, Table 3F.1-3, CMP-13—*California Tiger Salamander Habitat*). Mitigation sites will be prioritized for the Concord/Livermore Recovery Unit, which is identified in *Recovery Plan for the Central California Distinct Population Segment of the California Tiger Salamander* (Ambystoma californiense) (U.S. Fish and Wildlife Service 2017b).

Implementation of the CMP could result in effects on California tiger salamander through tidal wetland habitat restoration, channel margin enhancement, and the use of non-bank sites for vernal pool or alkaline wetland creation or enhancement. The CMP and site-specific permitting approvals would account for any losses of California tiger salamander habitat from restoration activities by adjusting the overall commitment of grassland creation and protection (Appendix C3, Section 3F.2.4 and Attachment C3.1, Table 3F.1-2, CMP-0—*General Design Guidelines*). The CMP would not affect modeled habitat for California tiger salamander at the restoration areas at the I-5 ponds and on Bouldin Island because these areas are not within modeled habitat for this species.

Compared to the No Action Alternative, the action alternatives would result in effects on California tiger salamander. Through the CMP (Appendix C3) and Mitigation Measures AES-4b: *Minimize Fugitive Light from Portable Sources Used for Construction,* BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities*, BIO-22a: *Avoid and Minimize Impacts on California Tiger Salamander,* and BIO-22b: *Avoid and Minimize Operational Traffic Impacts on Wildlife*, these effects would be reduced.

Based on the information presented above, including proposed mitigation measures, environmental commitments, and implementation of the CMP, the effect of all action alternatives on California tiger salamander does not appear to be significant.

Impact BIO-23: Effects of the Project on Western Spadefoot Toad

No Action Alternative

The extent of the western spadefoot toad habitat in the study area would not significantly change under the No Action Alternative because effects on this habitat would be limited to small discrete areas relative to the extent of this habitat available in the study area. A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly affect western spadefoot toad habitat.

Existing and planned projects and programs would not likely result in significant effects on or benefits to western spadefoot toad habitat because this habitat largely occurs outside of where these actions take place and there are no programs specifically contributing to the conservation of this habitat.

Water reliability projects in Table 3.5-2 could result in effects on western spadefoot toad habitat from the construction of water recycling, groundwater management, and groundwater recovery projects across all regions. These projects would include the construction of storage basins, conveyance canals, pipelines, pump stations, and associated buildings; however, the amount of habitat removed would be in discrete locations and of minimal size. Effects would be limited to surface disturbances.

All Action Alternatives

The construction of Alternatives 1, 2b, 3, 4b, and DWR's Preferred Alternative would result in the permanent and temporary loss and indirect effects on modeled western spadefoot toad habitat. The implementation of Environmental Commitment EC-14: *Construction Best Management Practices for Biological Resources* would ensure that temporarily disturbed areas are restored (Appendix C1).

Construction activities associated with the Southern Complex (Alternatives 1, 2b, 3, and 4b) and the Bethany Complex (DWR's Preferred Alternative) could result in the injury and mortality of western spadefoot toad if they are moving on the surface or occupying underground refugia during activities such as grading, excavation, soil compaction, and the use of construction-related vehicles. Implementation of Environmental Commitments EC-1: *Conduct Environmental Resources Worker Awareness Training*, EC-2: *Develop and Implement Hazardous Materials Management Plans*, EC-3: *Develop and Implement Spill Prevention, Containment, and Countermeasure Plans*, and EC-14: *Construction Best Management Practices for Biological Resources* (Appendix C1) would reduce these potential effects by training construction staff on the needs of protecting sensitive biological resources, reporting requirements, and the ramifications for not following these measures; by implementing spill prevention and containment plans that would avoid material spills that could affect the viability of nearby aquatic and upland habitat; by having a biological monitor present that would ensure that nondisturbance buffers and associated construction fencing are intact and all other protective measures are being implemented where applicable; and by limiting construction vehicle traffic to a maximum speed limit of 15 miles per hour on unpaved nonpublic construction access roads.

Alternative 1 would result in the greatest effect on modeled habitat, and DWR's Preferred Alternative would have the fewest effects.

Maintenance activities could result in effects on western spadefoot toad.

The CMP would offset the loss of western spadefoot toad habitat through the applicant purchasing mitigation credits for vernal pool fairy shrimp, vernal pool tadpole shrimp, California tiger salamander, and California red-legged frog (Appendix C3, Sections 3F.3.3.3 and 3F.4.2.1.2 and Attachment C3.1, Table 3F.1-3, CMP-11—*Vernal Pool Fairy Shrimp and Vernal Pool Tadpole Shrimp Habitat,* CMP-13—*California Tiger Salamander Habitat,* and CMP-14—*California Red-Legged Frog Habitat*), which would protect habitat within the range of and also suitable for western spadefoot toad.

The CMP could affect western spadefoot toad through restoration activities at the I-5 ponds, on Bouldin Island, from tidal restoration, from channel margin enhancement, from the use of non-bank sites for vernal pool or alkaline wetland creation or enhancement, and also from the management of lands under site protection instruments. The CMP and site-specific permitting approvals would ensure that there is no significant loss of habitat or habitat value by adjusting the overall commitment (Appendix C3, Section 3F.2.4 and Attachment C3.1, Table 3F.1-2, CMP-0—*General Design Guidelines*).

Compared to the No Action Alternative, the action alternatives would result in effects on western spadefoot toad. Through the CMP (Appendix C3) and Mitigation Measures AES-4b: *Minimize Fugitive Light from Portable Sources Used for Construction*, BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities*, BIO-22b: *Avoid and Minimize Operational Traffic Impacts on Wildlife*, and BIO-23: *Avoid and Minimize Impacts on Western Spadefoot Toad*, these effects would be reduced.

Based on the information presented above, including proposed mitigation measures, environmental commitments, and implementation of the CMP, the effect of all action alternatives on western spadefoot toad does not appear to be significant.

Impact BIO-24: Effects of the Project on California Red-Legged Frog

No Action Alternative

The extent of the California red-legged frog habitat in the study area would not significantly change under the No Action Alternative because effects on this habitat would be limited to small discrete areas relative to the extent of this habitat available in the study area. A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly affect California red-legged frog habitat.

Existing and planned projects and programs would not likely result in significant effects on or benefits to California red-legged frog habitat because this habitat largely occurs outside of where these actions take place and there are no programs specifically contributing to the conservation of this habitat.

Water reliability projects listed in Table 3.5-2 could result in effects on California red-legged frog habitat in all regions for the construction of water recycling, groundwater management, and groundwater recovery projects. These potential effects would result from the construction of storage basins, conveyance canals, pipelines, pump stations, and associated buildings; however, the amount of habitat removed would be in discrete locations and of minimal size. Water recycling could also result in reduced instream flows where water captured for residential use in upper watersheds does not make it back into streams following treatment. Groundwater recovery projects could also reduce available groundwater supporting streams and ponds if pumping occurs in proximity to these habitats and at a depth that actually affects shallow groundwater supporting these habitats. The potential for effects on California red-legged frog from these projects will vary by region and watershed but could be significant for streams in urbanized areas that are effluent dependent.

All Action Alternatives

The construction of Alternatives 1, 2b, 3, and 4b would result in the permanent and temporary loss of modeled California red-legged frog habitat as a result of grading and excavation (Appendix I1,

Table I1-54). The implementation of Environmental Commitment EC-14: *Construction Best Management Practices for Biological Resources* would ensure that temporarily disturbed areas are restored (Appendix C1).

The construction of Alternatives 1, 2b, 3, and 4b would result in the fragmentation of modeled habitat for California red-legged frog and create barriers to the movement of the species from areas east of Byron Highway to areas to the west. The fragmentation of habitat and barriers to movement would reduce the quality of the remaining habitat and reduce genetic exchange between areas of occupied habitat.

The construction of Alternatives 5 would result in the permanent and temporary loss of modeled California red-legged frog habitat as a result of grading and excavation (Appendix I1, Table I1-54). The implementation of Environmental Commitment EC-14: *Construction Best Management Practices for Biological Resources* would ensure that temporarily disturbed areas are restored (Appendix C1).

The construction of DWR's Preferred Alternative would result in the fragmentation of modeled dispersal habitat for California red-legged frog and create barriers to the movement of the species from the presence of the aqueduct, the widening of Mountain House Road, and the new access road to the Bethany Reservoir discharge structure (Appendix I3, Figure 13B.49-1). Both roads do not represent complete barriers but do increase the potential for road mortality and the presence of more unsuitable habitat.

DWR's Preferred Alternative would also result in permanent and temporary effects on modeled upland and aquatic habitat that is located within critical habitat for California red-legged frog (unit CCS-2B) primarily as a result of constructing the access road to the Bethany Reservoir discharge structure and the aqueduct (Appendix I1, Table I1-55).

Construction activities associated with the Southern Complex (Alternatives 1, 2b, 3, and 4b) and the Bethany Complex (DWR's Preferred Alternative) could result in the injury and mortality of California red-legged frog if they are moving on the surface or occupying small mammal burrows or soil crevices during activities such as grading, excavation, soil compaction, and the use of construction-related vehicles. Implementation of Environmental Commitments EC-1: *Conduct Environmental Resources Worker Awareness Training*, EC-2: *Develop and Implement Hazardous Materials Management Plans*, EC-3: *Develop and Implement Spill Prevention, Containment, and Countermeasure Plans*, and EC-14: *Construction Best Management Practices for Biological Resources* (Appendix C1) would reduce these potential effects by training construction staff on the needs of protecting sensitive biological resources, reporting requirements, and the ramifications for not following these measures; by implementing spill prevention and containment plans that would avoid material spills that could affect the viability of nearby aquatic and upland habitat; by having a biological monitor present that would ensure that nondisturbance buffers and associated construction fencing are intact and all other protective measures are being implemented where applicable; and by limiting construction vehicle traffic to a maximum speed limit of 15 miles per hour on unpaved nonpublic construction access roads and limiting nighttime speed limits to 10 miles per hour on these roads when they occur adjacent to suitable habitat for California red-legged frog.

Alternatives 1, 2b, 3, and 4b (having the same effect acreage) would have greater effects on California red-legged frog relative to DWR's Preferred Alternative.

Maintenance effects could result in effects on California red-legged frog under all of the action alternatives.

The CMP would offset the loss of California red-legged frog habitat by the applicant purchasing conservation credits at a USFWS- and CDFW-approved mitigation bank or though other site protection instruments (Appendix C3, Sections 3F.3.3.3 and 3F.4.2.1.2 and Attachment C3.1, Table 3F.1-3, CMP-14—*California Red-Legged Frog Habitat*). California red-legged frog aquatic breeding and upland habitat will be prioritized for protection within the East San Francisco Bay core recovery area as described in the *Recovery Plan for the California Red-Legged Frog* (U.S. Fish and Wildlife Service 2002:51), at a location subject to USFWS approval. The creation and enhancement of wetlands and other waters as well as habitat for special-status species under the CMP would not affect modeled habitat for California red-legged frog because the restoration activities at the I-5 ponds and on Bouldin Island are outside of the known range of the species.

Implementation of the CMP could result in effects on California red-legged frog in the event that non-bank sites are used for vernal pool or alkaline wetland creation or enhancement. The CMP and site-specific permitting approvals would account for any losses of California red-legged frog from restoration activities by adjusting the overall commitment of grassland creation and protection (Appendix C3, Section 3F.2.4 and Attachment C3.1, Table 3F.1-2, CMP-0—*General Design Guidelines*).

Compared to the No Action Alternative, the action alternatives would result in effects on California red-legged frog. Through the CMP (Appendix C3) and Mitigation Measures AES-4b: *Minimize Fugitive Light from Portable Sources Used for Construction*, BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities*, BIO-22b: *Avoid and Minimize Operational Traffic Impacts on Wildlife*, BIO-24a: *Avoid and Minimize Impacts on California Red-Legged Frog*, and BIO-24b: *Compensate for Impacts on California Red-Legged Frog Habitat Connectivity*, these effects would be reduced.

Based on the information presented above, including proposed mitigation measures, environmental commitments, and implementation of the CMP, the effect of all action alternatives on California red-legged frog does not appear to be significant.

Impact BIO-25: Effects of the Project on Western Pond Turtle

No Action Alternative

The extent of the western pond turtle habitat in the study area would not significantly change under the No Action Alternative because direct fill of this habitat would be limited to small discrete areas relative to the extent of this habitat available in the study area, which consists of tidal and nontidal aquatic habitat, emergent wetlands, ponds, and other bodies of water. A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly modify western pond turtle habitat in the study area.

Many existing and planned projects and programs would include tidal restoration, which increases the quality of western pond turtle habitat in the study area. In the longer term, both gradual and catastrophic natural phenomena could affect the mix of open water, tidal wetland, agricultural, and riparian forest natural communities in the study area through continued land subsidence on Delta islands, levee degradation and potential failure from floods or seismic events, and climate change. Based on trends in land use conversions in the Delta during recent years, these natural changes would result in the conversion of additional cultivated land and possibly managed wetlands to tidal wetlands and tidal perennial aquatic.

Water reliability projects listed in Table 3.5-2 could result in effects on western pond turtle habitat in all regions for the construction of water recycling, groundwater management, and groundwater recovery projects. These potential effects would result from the construction of storage basins, conveyance canals, pipelines, pump stations, and associated buildings; however, the amount of habitat removed would be in discrete locations and of minimal size. Water recycling could also result in reduced instream flows where water captured for residential use in upper watersheds does not make it back into streams following treatment. Groundwater recovery projects could also reduce available groundwater supporting streams, lakes, and ponds if pumping occurs in proximity to these habitats and at a depth that actually affects shallow groundwater supporting these habitats. The potential for effects on western pond turtle from these projects will vary by region and watershed but could be significant for streams in urbanized areas that are effluent dependent.

All Action Alternatives

The construction of all the action alternatives would result in the permanent and temporary loss of western pond turtle modeled habitat from grading and excavation related to the action alternatives (Appendix I1, Table I1-56). The implementation of Environmental Commitment EC-14: *Construction Best Management Practices for Biological Resources* would ensure that temporarily disturbed areas are restored (Appendix C1).

Construction activities associated with the action alternatives could result in the injury and mortality of western pond turtle if they are occupying aquatic or upland habitat in work areas during activities, such as grading, excavation, vegetation removal, and the use of construction-related vehicles. Implementation of Environmental Commitments EC-1: *Conduct Environmental Resources Worker Awareness Training*, EC-2: *Develop and Implement Hazardous Materials Management Plans*, EC-3: *Develop and Implement Spill Prevention, Containment, and Countermeasure Plans*, and EC-14: *Construction Best Management Practices for Biological Resources* (Appendix C1) would reduce these potential effects by training construction staff on the needs of protecting sensitive biological resources, reporting requirements, and the ramifications for not following these measures; by implementing spill prevention and containment plans that would avoid material spills that could affect the viability of nearby aquatic and upland habitat; and by having a biological monitor present that would ensure that nondisturbance buffers and associated construction fencing are intact and all other protective measures are being 3.5-48implemented where applicable.

Alternative 1 would result in the greatest effects on modeled western pond turtle habitat, and DWR's Preferred Alternative would result in the fewest.

The maintenance of aboveground water-conveyance facilities for all action alternatives could result in effects on western pond turtle.

The CMP would offset the loss of western pond turtle habitat through the applicant's creation and protection of suitable aquatic habitat, which would include freshwater emergent wetland and open water habitat and upland habitat, which would include grassland and riparian, on Bouldin Island and at the I-5 ponds (Appendix C3, Sections 3F.4.1.3, *Bouldin Island Mitigation Sites*, and 3F.4.1.4, *DWR I-5 Ponds*). Future channel margin enhancement and tidal wetland habitat (Appendix C3, Section 3F.4.3) would also provide habitat for western pond turtle.

The CMP could affect western pond turtle through restoration activities at the I-5 ponds, on Bouldin Island, from tidal restoration, from channel margin enhancement, and from the management of lands under site protection instruments. The CMP and site-specific permitting approvals would ensure that there is no significant loss of habitat or habitat value by adjusting the overall commitment (Appendix C3, Section 3F.2.4 and Attachment C3.1, Table 3F.1-2, CMP-0—*General Design Guidelines*).

The CMP would also have the potential to increase western pond turtle exposure to selenium, methylmercury, and cyanobacterial harmful algal blooms; however, as discussed in detail in Delta Conveyance Project Draft EIR Chapter 13, *Terrestrial Biological Resources* (California Department of Water Resources 2022), these potential effects would be reduced through water quality monitoring plans or would not be expected to result in adverse effects on the species.

Compared to the No Action Alternative, the action alternatives would result in effects on western pond turtle. Through the CMP (Appendix C3) and Mitigation Measures BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities*, BIO-22b: *Avoid and Minimize Operational Traffic Impacts on Wildlife*, and BIO-25: *Avoid and Minimize Impacts on Western Pond Turtle*, these effects would be reduced.

Based on the information presented above, including proposed mitigation measures, environmental commitments, and implementation of the CMP, the effect of all action alternatives on western pond turtle does not appear to be significant.

Impact BIO-26: Effects of the Project on Coast Horned Lizard

No Action Alternative

The extent of coast horned lizard habitat in the study area would not significantly change under the No Action Alternative because effects on this habitat would be limited to small discrete areas relative to the extent of this habitat available in the study area. A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly affect coast horned lizard habitat.

Existing and planned projects and programs would not likely result in significant effects on or benefits to coast horned lizard because their potential habitat is largely outside of where these actions take place; however, the programs do include protections of grasslands that may provide habitat for this species.

Water reliability projects in Table 3.5-2 could result in effects on coast horned lizard habitat from the construction of water recycling, groundwater management, and groundwater recovery projects across all regions. These projects would include the construction of storage basins, conveyance canals, pipelines, pump stations, and associated buildings; however, the amount of habitat removed would be in discrete locations and of minimal size. Effects would be limited to surface disturbances.

All Action Alternatives

The construction of all the action alternatives would result in the permanent and temporary loss of coast horned lizard modeled habitat. The implementation of Environmental Commitment EC-14: *Construction Best Management Practices for Biological Resources* would ensure that temporarily disturbed areas are restored (Appendix C1).

Construction activities for all action alternatives could result in the injury, mortality, and disruption of feeding, breeding, and dispersal of coast horned lizard. Implementation of Environmental Commitments EC-1: *Conduct Environmental Resources Worker Awareness Training*, EC-2: *Develop and Implement Hazardous Materials Management Plans*, EC-3: *Develop and Implement Spill Prevention, Containment, and Countermeasure Plans*, and EC-14: *Construction Best Management Practices for Biological Resources* (Appendix C1) would reduce these potential effects by training construction staff on the needs of protecting sensitive biological resources, reporting requirements, and the ramifications for not following these measures; by implementing spill prevention and containment plans that would avoid material spills that could affect the viability of nearby habitat; and by having a biological monitor present that would ensure that nondisturbance buffers and associated construction fencing are intact and all other protective measures are being implemented.

Alternative 1 would result in the greatest effects on modeled coast horned lizard habitat and DWR's Preferred Alternative the fewest.

Maintenance activities under all action alternatives could result in effects on coast horned lizard.

The CMP would offset the loss of coast horned lizard habitat by the applicant creating and protecting grasslands on Bouldin Island (Appendix C3, Section 3F.3.3.2, *Grassland Species and Agricultural Lands*) and through the protection of upland grasslands as part of California red-legged frog and California tiger salamander mitigation, which would involve purchasing conservation credits at a USFWS- and CDFW-approved conservation bank (Appendix C3, Section 3F.3.3.3, *Vernal Pool Species, California Tiger Salamander, and California Red-Legged Frog*, and Attachment C3.1, Table 3F.1-3), which could contain suitable habitat for coast horned lizard. Although these mitigation areas would be specifically targeting suitable habitat for California red-legged frog and California tiger salamander, they would mostly likely occur within the range of coast horned lizard and could generally provide suitable upland habitat for the species.

The CMP could affect coast horned lizard through restoration activities at the I-5 ponds, on Bouldin Island, from tidal restoration, from channel margin enhancement, in the event that non-bank sites are used for vernal pool or alkaline wetland creation or enhancement, and from the management of lands under site protection instruments. The CMP and site-specific permitting approvals would ensure that there is no significant loss of habitat or habitat value by adjusting the overall commitment (Appendix C3, Section 3F3.2.4, *Vernal Pools and Alkaline Wetlands,* and Attachment C3.1, Table 3F.1-2, CMP-0—*General Design Guidelines*).

Compared to the No Action Alternative, the action alternatives would result in effects on coast horned lizard. Through the CMP (Appendix C3) and Mitigation Measures BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities*, BIO-22b: *Avoid and Minimize Operational Traffic Impacts on Wildlife*, and BIO-26: *Avoid and Minimize Impacts on Special-Status Reptiles*, effects would be reduced.

Based on the information presented above, including proposed mitigation measures, environmental commitments, and implementation of the CMP, the effect of all action alternatives on coast horned lizard does not appear to be significant.

Impact BIO-27: Effects of the Project on Northern California Legless Lizard

No Action Alternative

The extent of Northern California legless lizard habitat in the study area would not significantly change under the No Action Alternative because effects on this habitat would be limited to small discrete areas relative to the extent of this habitat available in the study area. A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly affect Northern California legless lizard habitat.

Existing and planned projects and programs would not likely result in significant effects on or benefits to Northern California legless lizard because their potential habitat is largely outside of where these actions take place; however, the programs do include protections of grasslands that may provide habitat for this species.

Water reliability projects in Table 3.5-2 could result in effects on Northern California legless lizard habitat from the construction of water recycling, groundwater management, and groundwater recovery projects across all regions. These projects would include the construction of storage basins, conveyance canals, pipelines, pump stations, and associated buildings; however, the amount of habitat removed would be in discrete locations and of minimal size. Effects would be limited to surface disturbances.

All Action Alternatives

The construction of all the action alternatives would result in the permanent and temporary loss of Northern California legless lizard modeled habitat. The implementation of Environmental Commitment EC-14: *Construction Best Management Practices for Biological Resources* would ensure that temporarily disturbed areas are restored (Appendix C1).

Construction activities for all action alternatives could result in the injury, mortality, and disruption of feeding, breeding, and dispersal of Northern California legless lizard. Implementation of Environmental Commitments EC-1: *Conduct Environmental Resources Worker Awareness Training*, EC-2: *Develop and Implement Hazardous Materials Management Plans*, EC-3: *Develop and Implement Spill Prevention, Containment, and Countermeasure Plans*, and EC-14: *Construction Best Management Practices for Biological Resources* (Appendix C1) would reduce these potential effects by training construction staff on the needs of protecting sensitive biological resources, reporting requirements, and the ramifications for not following these measures; by implementing spill prevention and containment plans that would avoid material spills that could affect the viability of nearby habitat; and by having a biological monitor present that would ensure that nondisturbance buffers and associated construction fencing are intact and all other protective measures are being implemented where applicable.

Alternative 1 would result in the greatest effects on modeled habitat for Northern California legless lizard, and DWR's Preferred Alternative would result in the fewest.

The maintenance of aboveground water-conveyance facilities for all action alternatives could result in effects on Northern California legless lizard.

The CMP would offset the loss of Northern California legless lizard habitat by the applicant creating and protecting grasslands on Bouldin Island (Appendix C3, Section 3F.3.3.2) and through the protection of upland grasslands as part of California red-legged frog and California tiger salamander mitigation, which would involve purchasing conservation credits at a USFWS- and CDFW-approved conservation bank (Appendix C3), which could contain suitable habitat for Northern California legless lizard. Although these mitigation areas would be specifically targeting suitable habitat for California red-legged frog and California tiger salamander, they would mostly likely occur within the range of Northern California legless lizard and could generally provide suitable upland habitat for the species.

The CMP could affect Northern California legless lizard through restoration activities at the I-5 ponds, on Bouldin Island, from tidal restoration, from channel margin enhancement, and from the management of lands under site protection instruments. The CMP and site-specific permitting approvals would ensure that there is no significant loss of habitat or habitat value by adjusting the overall commitment (Appendix C3, Section 3F.2.4 and Attachment C3.1, Table 3F.1-2, CMP-0—*General Design Guidelines*).

Compared to the No Action Alternative, the action alternatives would result in effects on Northern California legless lizard. Through the CMP (Appendix C3) and Mitigation Measures BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities*, BIO-22b: *Avoid and Minimize Operational Traffic Impacts on Wildlife*, and BIO-26: *Avoid and Minimize Impacts on Special-Status Reptiles*, these effects would be reduced.

Based on the information presented above, including proposed mitigation measures, environmental commitments, and implementation of the CMP, the effect of all action alternatives on Northern California legless lizard does not appear to be significant.

Impact BIO-28: Effects of the Project on California Glossy Snake

No Action Alternative

The extent of California glossy snake habitat in the study area would not significantly change under the No Action Alternative because effects on this habitat would be limited to small discrete areas relative to the extent of this habitat available in the study area, which in itself is small. A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly affect Northern California glossy snake habitat.

Existing and planned projects and programs would not likely result in significant effects on or benefits to Northern California glossy snake because their potential habitat is largely outside of where these actions take place.

Water reliability projects in Table 3.5-2 could result in effects on California glossy snake habitat from the construction of water recycling, groundwater management, and groundwater recovery projects across all regions. These projects would include the construction of storage basins, conveyance canals, pipelines, pump stations, and associated buildings; however, the amount of habitat removed would be in discrete locations and of minimal size. Effects would be limited to surface disturbances.

All Action Alternatives

Alternatives 1, 2b, 3, and 4b would not affect modeled habitat for California glossy snake. DWR's Preferred Alternative would result in permanent effects on modeled habitat from the construction of a power line from Christensen Road to the Bethany Reservoir discharge structure (Appendix I1, Table I1-59). The implementation of Environmental Commitment EC-14: *Construction Best*

Management Practices for Biological Resources would ensure that temporarily disturbed areas are restored (Appendix C1).

The construction of the supervisory control and data acquisition (SCADA) line to the Banks Pumping Plant under Alternatives 1, 2b, 3, and 4b is within 0.3 mile of modeled habitat, and, although unlikely, it could possibly affect California glossy snake if individuals are in this area during construction. DWR's Preferred Alternative could result in the potential injury, mortality, and disruption of normal behaviors of California glossy snakes if they are occupying modeled habitat adjacent to Bethany Reservoir discharge structure and the associated access road and power transmission line. Implementation of Environmental Commitments EC-1: *Conduct Environmental Resources Worker Awareness Training*, EC-2: *Develop and Implement Hazardous Materials Management Plans*, EC-3: *Develop and Implement Spill Prevention, Containment, and Countermeasure Plans*, and EC-14: *Construction Best Management Practices for Biological Resources* (Appendix C1) would reduce these potential effects by implementing spill prevention and containment plans, by training construction staff on the needs of protecting sensitive biological resources, reporting requirements, and the ramifications for not following these measures; by implementing spill prevention and containment plans that would avoid material spills that could affect the viability of nearby habitat; and by having a biological monitor present that would ensure that nondisturbance buffers and associated construction fencing are intact and all other protective measures are being implemented.

Maintenance under DWR's Preferred Alternative could result in effects on California glossy snake. Alternatives 1, 2b, 3, and 4b would not likely have maintenance effects on the species.

The CMP would not specifically mitigate for California glossy snake habitat; however, the applicant's protection of upland habitat associated with California red-legged frog and California tiger salamander mitigation (Appendix C3, Section 3F.3.3.3, *Vernal Pool Species, California Tiger Salamander, and California Red-Legged Frog*, and Attachment C3.1, Table 3F.1-3) could contain suitable habitat for California glossy snake. Although these mitigation areas would be specifically targeting suitable habitat for California red-legged frog and California tiger salamander, they would most likely occur within the range of California glossy snake and could generally provide suitable upland habitat for the species.

The CMP would not affect California glossy snake because the restoration activities at the I-5 ponds and on Bouldin Island, as well as other potential conservation activities, are outside of the known range of the species or would occur in areas not suitable for California gloss snake and therefore would not affect the species.

Compared to the No Action Alternative, the action alternatives would result in effects on California glossy snake. Through the CMP (Appendix C3) and Mitigation Measures BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities*, BIO-22b: *Avoid and Minimize Operational Traffic Impacts on Wildlife*, and BIO-26: *Avoid and Minimize Impacts on Special-Status Reptiles*, these effects would be reduced.

Based on the information presented above, including proposed mitigation measures, environmental commitments, and the applicant's protection of upland habitat through implementation of the CMP, the effect of all action alternatives on California glossy snake does not appear to be significant.

Impact BIO-29: Effects of the Project on San Joaquin Coachwhip

No Action Alternative

The extent of San Joaquin coachwhip habitat in the study area would not significantly change under the No Action Alternative because effects on this habitat would be limited to small discrete areas relative to the extent of this habitat available in the study area. A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly affect San Joaquin coachwhip habitat.

Existing and planned projects and programs would not likely result in significant effects on or benefits to San Joaquin coachwhip because their potential habitat is largely outside of where these actions take place; however, the programs do include protections of grasslands that may provide habitat for this species.

Water reliability projects in Table 3.5-2 could result in effects on San Joaquin coachwhip from the construction of water recycling, groundwater management, and groundwater recovery projects across the northern and southern inland regions. These projects would include the construction of storage basins, conveyance canals, pipelines, pump stations, and associated buildings; however, the amount of habitat removed would be in discrete locations and of minimal size. Effects would be limited to surface disturbances.

All Action Alternatives

The construction of the Southern Complex (Alternatives 1, 2b, 3, and 4b) and the Bethany Complex (DWR's Preferred Alternative) would result in the permanent and temporary loss of San Joaquin coachwhip modeled habitat. Construction-related grading and excavation would result in the permanent and temporary loss of San Joaquin coachwhip habitat (Appendix I1, Table I1-60). The implementation of Environmental Commitment EC-14: *Construction Best Management Practices for Biological Resources* would ensure that temporarily disturbed areas are restored (Appendix C1).

Construction activities associated with the Southern Complex (Alternatives 1, 2b, 3, and 4b) and the Bethany Complex (Alternatives 5) could result in the injury, mortality, and disruption of normal behaviors of San Joaquin coachwhip. Implementation of Environmental Commitments EC-1: *Conduct Environmental Resources Worker Awareness Training*, EC-2: *Develop and Implement Hazardous Materials Management Plans,* EC-3: *Develop and Implement Spill Prevention, Containment, and Countermeasure Plans*, and EC-14: *Construction Best Management Practices for Biological Resources* (Appendix C1) would reduce these potential effects by implementing spill prevention and containment plans, by training construction staff on the needs of protecting sensitive biological resources, reporting requirements, and the ramifications for not following these measures; by implementing spill prevention and containment plans that would avoid material spills that could affect the viability of nearby habitat; and by having a biological monitor present that would ensure that nondisturbance buffers and associated construction fencing are intact and all other protective measures are being implemented.

Alternatives 1, 2b, 3, and 4b, which have the same effects acreages, would result in greater effects on modeled habitat for San Joaquin coachwhip relative to DWR's Preferred Alternative.

Maintenance activities associated with all action alternatives could result in effects on San Joaquin coachwhip.

The CMP would not specifically mitigate for San Joaquin coachwhip habitat; however, the applicant's protection of upland habitat associated with California red-legged frog and California tiger salamander mitigation (Appendix C3, Section 3F.3.3.3 and Attachment C3.1, Table 3F.1-3) would overlap with the range of the species and could contain suitable habitat for San Joaquin coachwhip.

The CMP would not affect San Joaquin coachwhip because the restoration activities at the I-5 ponds and on Bouldin Island, as well as other potential conservation activities, are outside of the known range of the species.

Compared to the No Action Alternative, the action alternatives would result in effects on San Joaquin coachwhip. Through the CMP (Appendix C3) and Mitigation Measures BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities*, BIO-22b: *Avoid and Minimize Operational Traffic Impacts on Wildlife*, and BIO-26: *Avoid and Minimize Impacts on Special-Status Reptiles*, these effects would be reduced.

Based on the information presented above, including proposed mitigation measures, environmental commitments, and implementation of the CMP, the effect of all action alternatives on San Joaquin coachwhip does not appear to be significant.

Impact BIO-30: Effects of the Project on Giant Garter Snake

No Action Alternative

The gradual conversion of cultivated land under existing and planned projects and programs could affect giant garter snake through the loss or conversion of agricultural ditch habitat; however, many of these programs also include the expansion of emergent marsh, which would provide higher quality habitat that under many programs would be targeted to benefit giant garter snake. In the longer term, both gradual and catastrophic natural phenomena could result in additional conversions of agricultural areas in the study area through continued land subsidence on Delta islands, levee degradation and potential failure from floods or seismic events, and climate change.

Water reliability projects listed in Table 3.5-2 would not likely affect giant garter snake because the regions identified where these actions take place (Appendix E, *No Action Alternative and Cumulative Projects*) occur outside of the range of the species.

All Action Alternatives

The construction of all the action alternatives would result in the permanent and temporary loss of giant garter snake modeled habitat as a result of construction-related grading, excavation, and filling of aquatic habitat (Appendix I1, Table I1-61). The implementation of Environmental Commitment EC-14: *Construction Best Management Practices for Biological Resources* would ensure that temporarily disturbed areas are restored (Appendix C1).

Construction activities associated with all action alternatives could result in the injury, mortality, and disruption of normal behaviors of giant garter snake. Implementation of Environmental Commitments EC-1: *Conduct Environmental Resources Worker Awareness Training*, EC-2: *Develop and Implement Hazardous Materials Management Plans*, EC-3: *Develop and Implement Spill Prevention, Containment, and Countermeasure Plans*, and EC-14: *Construction Best Management Practices for Biological Resources* (Appendix C1) would reduce these potential effects by implementing spill prevention and containment plans, by training construction staff on the needs of protecting sensitive biological resources, reporting requirements, and the ramifications for not following these measures; by implementing spill prevention and containment plans that would avoid material spills that could affect the viability of nearby aquatic and upland habitat; and by having a biological monitor present that would ensure that nondisturbance buffers and associated construction fencing are intact and all other protective measures are being implemented where applicable.

Alternative 1 would result in the greatest effects on modeled giant garter snake habitat, and DWR's Preferred Alternative would result in the fewest.

The maintenance activities of all action alternatives could result in the injury, mortality, and disruption of normal behaviors of giant garter snake if these activities occur adjacent to aquatic or upland habitat.

The CMP would offset the loss of giant garter snake habitat by the applicant creating and protecting giant garter snake aquatic and upland habitat (Appendix C3, Section 3F.4.1.4.3, *Site Design and Development*, and Attachment C3.1, Table 3F.1-3, CMP-15—*Giant Garter Snake Habitat*). The CMP would ensure that wetland habitat is designed specifically for giant garter snake needs, including aquatic habitat with appropriate ponding and emergent vegetation, and suitable upland habitat. Future channel margin enhancement and tidal wetland habitat (Appendix C3, Section 3F.4.3) would also provide potential habitat for giant garter snake.

The CMP could affect giant garter snake through restoration activities at the I-5 ponds, on Bouldin Island, from tidal restoration, from channel margin enhancement, and from the management of lands under site protection instruments. The CMP and site-specific permitting approvals would ensure that there is no significant loss of habitat or habitat value by adjusting the overall commitment (Appendix C3, Section 3F.2.4 and Attachment C3.1, Table 3F.1-2, CMP-0—*General Design Guidelines*).

The CMP would also have the potential to increase giant garter snake exposure to selenium, methylmercury, and cyanobacterial harmful algal blooms; however, as discussed in detail in Delta Conveyance Project Draft EIR Chapter 13, *Terrestrial Biological Resources* (California Department of Water Resources 2022), these potential effects would be reduced through water quality monitoring plans or would not be expected to result in adverse effects on the species.

Compared to the No Action Alternative, the action alternatives would result in effects on giant garter snake. Through the CMP (Appendix C3) and Mitigation Measures BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities*, BIO-22b: *Avoid and Minimize Operational Traffic Impacts on Wildlife*, and BIO-30: *Avoid and Minimize Impacts on Giant Garter Snake*, these effects would be reduced.

Based on the information presented above, including proposed mitigation measures, environmental commitments, and implementation of the CMP, the effect of all action alternatives on giant garter snake does not appear to be significant.

Impact BIO-31: Effects of the Project on Western Yellow-Billed Cuckoo

No Action Alternative

The extent of the western yellow-billed cuckoo habitat in the study area would not significantly change under the No Action Alternative when considering the balance of likely sources of loss and programs to protect and create riparian habitat in the Delta. A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly modify valley/foothill riparian habitat in the study area. Periodic levee and channel maintenance activities associated with current strategies would result in localized disturbances to this western yellow-billed cuckoo habitat.

Many existing and planned projects and programs would include riparian creation and protection, which increase the quality of western yellow-billed cuckoo habitat in the study area. Projects include levee repairs, improvements, and some setbacks, which would result in the permanent loss of riparian in those areas due to current policies not allowing the planting of riparian on levees. In the longer term, both gradual and catastrophic natural phenomena could affect the mix of open water, tidal wetland, agricultural, and riparian forest natural communities in the study area through continued land subsidence on Delta islands, levee degradation and potential failure from floods or seismic events, and climate change.

Water reliability projects listed in Table 3.5-2 could result in effects on western yellow-billed cuckoo in all regions for the construction of water recycling, groundwater management, and groundwater recovery projects, which would include construction of storage basins, conveyance canals, pipelines, pump stations, and associated buildings; however, the amount of habitat removed would be in discrete locations and of minimal size. Water recycling could also result in reduced instream flows where water captured for residential use in upper watersheds does not make it back into streams following treatment, which could result in reduced flows during summer months that could reduce available surface water and groundwater available to riparian vegetation. Groundwater recovery projects could also reduce available groundwater for riparian vegetation if pumping occurs in proximity to these habitats and at a depth that actually affects shallow groundwater available to riparian vegetation. Although there is some potential for effect from these projects, the overall effect on riparian vegetation would not be significant due to the small amount that would likely be moved for construction and because most riparian vegetation in the region is adapted to more seasonal flows.

All Action Alternatives

The construction of all the action alternatives would result in the permanent and temporary loss of western yellow-billed cuckoo migratory habitat (Appendix I1, Table I1-62), including potential indirect effects on habitat. The loss of habitat would primarily occur as a result of levee improvements, new roads and road improvements, and construction of the intakes.

Alternative 1 would result in the greatest effects on modeled western yellow-billed cuckoo habitat, and Alternative 4b would result in the fewest.

Construction activities under all action alternatives could result in the disruption of normal behaviors and reduce the functions of migratory habitat for cuckoos. Implementation of Environmental Commitments EC-1: *Conduct Environmental Resources Worker Awareness Training*, EC-2: *Develop and Implement Hazardous Materials Management Plans*, EC-3: *Develop and Implement Spill Prevention, Containment, and Countermeasure Plans*, EC-11: *Fugitive Dust Control*, and EC-14: *Construction Best Management Practices for Biological Resources* (Appendix C1) would reduce these potential effects by training construction staff on the needs of protecting the species, reporting requirements, and the ramifications for not following these measures; implementing spill prevention and containment plans that would avoid material spills that could affect suitable habitat; reducing the potential for discharge of construction-related dust; ensuring that temporarily disturbed areas are restored; and having a biological monitor present that would ensure that nondisturbance buffers are intact and all other protective measures are being implemented, where applicable

Maintenance activities under all action alternatives could result in effects on western yellow-billed cuckoo.

The CMP would offset the loss of migratory habitat (Appendix C3, Sections 3F.3.2.3 and 3F.3.3.1 and Attachment C3.1, Table 3F.1-3, CMP-16—*Western Yellow-Billed Cuckoo Habitat*) by creating riparian habitat on Bouldin Island and at the I-5 ponds and managing these areas in perpetuity.

The CMP could affect western yellow-billed cuckoo through restoration activities at the I-5 ponds and on Bouldin Island and from the management of land under site protection instruments. The CMP and site-specific permitting approvals would account for any losses of western yellow-billed cuckoo migratory habitat from habitat creation by adjusting the overall commitment of riparian creation (Appendix C3, Sections 3F.1 and 3F.2.4 and Attachment C3.1, Table 3F.1-2, CMP-0—*General Design Guidelines*).

The CMP would also have the potential to increase western yellow-billed cuckoo exposure to selenium, methylmercury, and cyanobacterial harmful algal blooms; however, as discussed in detail in Delta Conveyance Project Draft EIR Chapter 13, *Terrestrial Biological Resources* (California Department of Water Resources 2022), these potential effects would be reduced through water quality monitoring plans or would not be expected to result in adverse effects on the species.

Compared to the No Action Alternative, the action alternatives would result in effects on western yellow-billed cuckoo. Through the CMP (Appendix C3) and Mitigation Measures AES-4b: *Minimize Fugitive Light from Portable Sources Used for Construction*, AES-4c: *Install Visual Barriers along Access Routes, Where Necessary, to Prevent Light Spill from Truck Headlights toward Residences*, NOI-1: *Develop and Implement Noise Control Plan Including Site-Specific Measures*, BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities*, BIO-2c: *Electrical Power Line Support Placement*, and BIO-31: *Avoid and Minimize Impacts on Western Yellow-Billed Cuckoo*, these effects would be reduced.

Based on the information presented above, including proposed mitigation measures, environmental commitments, and implementation of the CMP, the effect of all action alternatives on western yellow-billed cuckoo does not appear to be significant.

Impact BIO-32: Effects of the Project on California Black Rail

No Action Alternative

The extent of the California black rail habitat in the study area would not significantly change under the No Action Alternative because direct fill of this habitat would be limited to small discrete areas relative to the extent of this habitat available in the study area. A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly modify California black rail habitat in the study area.

Many existing and planned projects and programs would include wetland restoration, which increases the extent and quality of the wetlands in the study area. In the longer term, both gradual and catastrophic natural phenomena could affect the mix of open water, tidal wetland, agricultural, and riparian forest natural communities in the study area through continued land subsidence on Delta islands, levee degradation and potential failure from floods or seismic events, and climate change. Based on trends in land use conversions in the Delta during recent years, these natural changes would result in the conversion of additional cultivated land and possibly managed wetlands to nontidal freshwater wetlands.

Water reliability projects listed in Table 3.5-2 could result in effects on California black rail habitat in all regions for the construction of water recycling, groundwater management, and groundwater recovery projects. These projects would include the construction of storage basins, conveyance canals, pipelines, pump stations, and associated buildings; however, the amount of habitat removed would be in discrete locations and of minimal size. Groundwater recovery projects could also reduce available groundwater supporting California black rail habitat if pumping occurs in proximity to this habitat and at a depth that actually affects shallow groundwater supporting this habitat. The potential for effects from these projects will vary by region and watershed but could be significant for areas where wetlands are dependent on groundwater and pumping occurs at shallow depths.

All Action Alternatives

The construction of all the action alternatives would result in effects on modeled habitat for California black rail (Appendix I1, Table I1-63), including potential indirect effects on habitat. The loss of modeled habitat would primarily occur as a result of levee improvements and new roads and road improvements.

DWR's Preferred Alternative would result in the greatest effects on modeled California black rail habitat, and Alternative 2b would result in the fewest.

Construction activities associated with all action alternatives could result in the disruption of normal behaviors, injury, and mortality during construction. Implementation of Environmental Commitments EC-1: *Conduct Environmental Resources Worker Awareness Training*, EC-2: *Develop and Implement Hazardous Materials Management Plans*, EC-3: *Develop and Implement Spill Prevention, Containment, and Countermeasure Plans*, EC-11: *Fugitive Dust Control*, and EC-14: *Construction Best Management Practices for Biological Resources* (Appendix C1) would reduce these potential effects by training construction staff on the needs of protecting the species, reporting requirements, and the ramifications for not following these measures; implementing spill prevention and containment plans that would avoid material spills that could affect suitable habitat; reducing the potential for discharge of construction-related dust; ensuring that temporarily disturbed areas are restored; and by having a biological monitor present that would ensure that nondisturbance buffers are intact and all other protective measures are being implemented, where applicable.

Maintenance under all action alternatives could result in effects on California black rail.

The CMP would offset the loss of California black rail habitat (Appendix C3, Sections F3.3.2.3 and F3.3.4.3 and Attachment C3.1, Table 3F.1-3, CMP-17—*California Black Rail Habitat*) by creating or restoring tidal emergent wetland habitat and riparian habitat and managing these areas in perpetuity.

The CMP could affect California black rail through restoration activities at the I-5 ponds, on Bouldin Island, from tidal restoration, from channel margin enhancement, and from the management of lands under site protection instruments. The CMP and site-specific permitting approvals would account for any losses of California black rail habitat from habitat creation by adjusting the overall commitment of tidal emergent wetland creation or restoration (Appendix C3, Sections F3.1 and F3.2.4 and Attachment C3.1, Table 3F.1-2, CMP-0—*General Design Guidelines*).

The CMP would also have the potential to increase California black rail exposure to selenium, methylmercury, and cyanobacterial harmful algal blooms; however, as discussed in detail in Delta Conveyance Project Draft EIR Chapter 13, *Terrestrial Biological Resources* (California Department of Water Resources 2022), these potential effects would be reduced through water quality monitoring plans or would not be expected to result in adverse effects on the species.

Compared to the No Action Alternative, the action alternatives would result in effects on California black rail. Through the CMP (Appendix C3) and Mitigation Measures AES-4b: *Minimize Fugitive Light from Portable Sources Used for Construction*, AES-4c: *Install Visual Barriers along Access Routes, Where Necessary, to Prevent Light Spill from Truck Headlights toward Residences*, NOI-1: *Develop and Implement Noise Control Plan Including Site-Specific Measures*, BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities*, BIO-2c: *Electrical Power Line Support Placement*, and BIO-32: *Conduct Preconstruction Surveys and Implement Protective Measures to Avoid Disturbance of California Black Rail*, these effects would be reduced.

Based on the information presented above, including proposed mitigation measures, environmental commitments, and implementation of the CMP, the effect of all action alternatives on California black rail does not appear to be significant.

Impact BIO-33: Effects of the Project on Greater Sandhill Crane and Lesser Sandhill Crane

No Action Alternative

The extent of the sandhill crane habitat in the study area would not significantly change under the No Action Alternative because direct fill of this habitat would be limited to small discrete areas relative to the extent of this habitat available in the study area. A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly modify crane habitat in the study area.

Many existing and planned projects and programs would include wetland restoration and specific programs for sandhill crane, which increase the extent and quality of habitat in the study area. In the longer term, both gradual and catastrophic natural phenomena could affect the mix of open water, tidal wetland, agricultural, and riparian forest natural communities in the study area through continued land subsidence on Delta islands, levee degradation and potential failure from floods or seismic events, and climate change. Based on trends in land use conversions in the Delta during recent years, these natural changes would result in the conversion of additional cultivated land and possibly managed wetlands to nontidal freshwater wetlands.

Water reliability projects listed in Table 3.5-2 could result in effects on sandhill cranes in the southern inland region for the construction of water recycling, groundwater management, and groundwater recovery projects. These projects would include the construction of storage basins, conveyance canals, pipelines, pump stations, and associated buildings; however, the amount of habitat removed would be in discrete locations and of minimal size. Groundwater recovery projects could also reduce available groundwater supporting sandhill crane wintering habitat if pumping occurs in proximity to these habitats and at a depth that actually affects shallow groundwater supporting these habitats. The potential for effects from these projects will vary by locality but most habitat in the southern inland occurs on wildlife refuges that are specifically managed for waterfowl and cranes.

All Action Alternatives

The construction of all action alternatives would affect known roost sites and modeled foraging habitat for greater and lesser sandhill crane (Appendix I1, Tables I1-64 and I1-65), including indirect effects on habitat.

Alternative 1 would result in the greatest effect on modeled habitat for greater sandhill cranes, and Alternative 2b would result in the greatest effect on modeled habitat for lesser sandhill cranes. Alternative 4b would have the least effect on modeled habitat for both greater sandhill cranes and lesser sandhill cranes.

Construction activities associated with all action alternatives could result in the disturbance of roosting and foraging behaviors. Sandhill cranes show strong site fidelity to their roost sites and associated foraging habitat (Ivey et al. 2014:2); however, the permanent and temporary loss of habitat and potential disturbance of roosting and foraging behaviors caused by the action alternatives are not expected to lead to take of greater sandhill crane or injury or mortality of lesser sandhill cranes.

Construction activities are not expected to injure or kill sandhill crane individuals. If a bird is present in a region where construction activities are occurring, the birds would be expected to avoid the slow-moving or stationary equipment and move to other areas. Construction activities could also affect cranes through noise and visual disturbance.

Implementation of Environmental Commitments EC-1: *Conduct Environmental Resources Worker Awareness Training*, EC-2: *Develop and Implement Hazardous Materials Management Plans*, EC-3: *Develop and Implement Spill Prevention, Containment, and Countermeasure Plans*, and EC-14: *Construction Best Management Practices for Biological Resources* (Appendix C1) would reduce these potential effects by training construction staff on the needs of protecting the species, reporting requirements, and the ramifications for not following these measures; implementing spill prevention and containment plans that would avoid material spills that could affect suitable habitat; ensuring that temporarily disturbed areas are restored; implementing work windows for in-water pile installation test methods; and by having a biological monitor present that would ensure that nondisturbance buffers are intact and all other protective measures are being implemented, where applicable.

Maintenance of all action alternatives could result in effects on sandhill cranes.

The CMP would offset the loss of greater sandhill crane and lesser sandhill crane roosting habitat by creating roosting habitat on Bouldin Island or in suitable lands that provide connectivity between Stone Lakes National Wildlife Refuge and Cosumnes River Preserve and managing these areas in perpetuity (Appendix C3, Attachment C3.1, Table 3F.1-3, CMP-18a—*Sandhill Crane Roosting Habitat*). The CMP would also offset the loss of greater and lesser sandhill crane foraging habitat by protecting high- to very high-value foraging habitat for greater sandhill crane, with at least 80% maintained in very high-value types (corn and rice) in any given year. This foraging habitat would be within 2 miles of known roost sites for both subspecies and would be managed in perpetuity (Appendix C3, Attachment C3.1, Table 3F.1-3, CMP-18b—*Sandhill Crane Foraging Habitat*). Foraging habitat protected for Swainson's hawk (Appendix C3, Attachment C3.1, Table 3F.1-3, CMP-19b—*Swainson's Hawk Foraging Habitat*) would also benefit lesser sandhill crane.

The CMP could affect greater and lesser sandhill cranes through restoration activities at the I-5 ponds and on Bouldin Island and from the management of lands under site protection instruments. The CMP and site-specific permitting approvals would account for any losses of sandhill crane habitat from habitat creation by adjusting the overall commitment of emergent wetland creation or restoration and grassland and cultivated lands protection (Appendix C3, Sections 3F.1 and 3F.2.4 and Attachment C3.1, Table 3F.1-2, CMP-0—*General Design Guidelines*).

The CMP would also have the potential to increase sandhill crane exposure to selenium, methylmercury, and cyanobacterial harmful algal blooms; however, as discussed in detail in Delta Conveyance Project Draft EIR Chapter 13, *Terrestrial Biological Resources* (California Department of Water Resources 2022), these potential effects would be reduced through water quality monitoring plans or would not be expected to result in adverse effects on the species.

Compared to the No Action Alternative, the action alternatives would result in effects on sandhill cranes. Through the CMP (Appendix C3) and Mitigation Measures AES-4b: *Minimize Fugitive Light from Portable Sources Used for Construction*, AES-4c: *Install Visual Barriers along Access Routes, Where Necessary, to Prevent Light Spill from Truck Headlights toward Residences*, NOI-1: *Develop and Implement Noise Control Plan Including Site-Specific Measures*, BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities*, BIO-2c: *Electrical Power Line Support Placement*, and BIO-33: *Avoid and Minimize Disturbance of Sandhill Cranes*, these effects would be reduced.

Based on the information presented above, including proposed mitigation measures, environmental commitments, and implementation of the CMP, the effect of all action alternatives on greater sandhill crane and lesser sandhill crane does not appear to be significant.

Impact BIO-34: Effects of the Project on California Least Tern

No Action Alternative

The extent of California least tern habitat in the study area would not significantly change under the No Action Alternative because direct fill of this habitat would be limited to discrete areas relative to the extent of this habitat available in the study area and within the geographic regions analyzed.

A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly modify California least tern foraging habitat in the study area. Periodic levee and channel maintenance activities associated with current strategies would result in localized disturbances to California least tern habitat.

Many existing and planned projects and programs would include tidal restoration, which increases the quality of California least tern habitat in the study area. In the longer term, both gradual and catastrophic natural phenomena could affect the mix of open water, tidal wetland, agricultural, and riparian forest natural communities in the study area through continued land subsidence on Delta islands, levee degradation and potential failure from floods or seismic events, and climate change. Based on trends in land use conversions in the Delta during recent years, these natural changes would result in the conversion of additional cultivated land and possibly managed wetlands to tidal wetlands and tidal perennial aquatic.

Water reliability projects listed in Table 3.5-2 could result in effects on California least tern habitat in the northern and southern coastal regions due to the potential construction of desalination plants, which would require the placement of water intakes into tidal waters and could affect the shoreline and potential nesting habitat. Any potential effects on nesting habitat would be discrete and selected sites would likely screen out areas of known breeding colonies, considering its status. This discharge of fill material into habitat would not alter it, but pumping of water could regionally effect tern foraging habitat through the entrainment of larval fish; however, considering the availability of foraging habitat, this effect across the species range would not be significant.

All Action Alternatives

The construction of all the action alternatives would affect modeled foraging habitat for California least tern (Appendix I1, Table I1-66), including indirect effects on habitat. The loss of habitat would primarily occur from the construction of the intakes (all action alternatives) and from the construction of the Southern Forebay (Alternatives 1, 2b, 3, and 4b).

Alternative 1 would result in the greatest effects on modeled California least tern habitat and DWR's Preferred Alternative the fewest.

Construction activities are not expected to injure or kill California least tern individuals. In addition to the low probability that these areas would be used for foraging by California least tern, the tern is not limited by foraging habitat in the study area. Implementation of Environmental Commitments EC-1: *Conduct Environmental Resources Worker Awareness Training*, EC-2: *Develop and Implement Hazardous Materials Management Plans*, EC-3: *Develop and Implement Spill Prevention, Containment, and Countermeasure Plans*, EC-11: *Fugitive Dust Control*, and EC-14: *Construction Best Management Practices for Biological Resources* (Appendix C1) would reduce these potential effects by training construction staff on the needs of protecting the species, reporting requirements, and the ramifications for not following these measures; implementing spill prevention and containment plans that would avoid material spills that could affect suitable habitat; reducing the potential for discharge of construction-related dust; ensuring that temporarily disturbed areas are restored; and by having a biological monitor present that would ensure that nondisturbance buffers are intact and all other protective measures are being implemented, where applicable.

Maintenance-related actions are not expected to injure or kill California least tern individuals because the potential for birds to occur is very low.

The CMP does not include specific compensatory mitigation for California least tern. However, the proposed tidal restoration activities (Appendix C3, Section 3F.4.3.2.2, *Tidal Perennial Aquatic*, and Attachment C3.1, Table 3F.1-2, CMP-1—*Tidal Perennial Aquatic Habitat*) could provide benefits to California least tern, as tidal perennial aquatic habitat would be created or acquired and permanently protected to compensate for project effects and ensure no significant loss of tidal perennial aquatic habitat functions and values, some of which may be suitable foraging habitat for the species.

California least tern is not expected to use the habitat creation and enhancement sites on Bouldin Island and at the I-5 ponds because they do not provide tidal perennial aquatic habitat. However, the species may forage in aquatic habitat adjacent to tidal habitat creation sites. The CMP and site-specific permitting approvals would account for any losses of tidal perennial aquatic habitat by adjusting the overall commitment of restoration (Appendix C3, Sections 3F.1 and 3F.2.4 and Attachment C3.1, Table 3F.1-2, CMP-0—*General Design Guidelines*).

The CMP would also have the potential to increase California least tern exposure to selenium, methylmercury, and cyanobacterial harmful algal blooms; however, as discussed in detail in Delta Conveyance Project Draft EIR Chapter 13, *Terrestrial Biological Resources* (California Department of Water Resources 2022), these potential effects would be reduced through water quality monitoring plans or would not be expected to result in adverse effects on the species.

Compared to the No Action Alternative, the action alternatives would result in effects on California least tern. Through the CMP (Appendix C3) and Mitigation Measures AES-4b: *Minimize Fugitive Light from Portable Sources Used for Construction*, AES-4c: *Install Visual Barriers along Access Routes, Where Necessary, to Prevent Light Spill from Truck Headlights toward Residences*, NOI-1: *Develop and Implement Noise Control Plan Including Site-Specific Measures*, BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities*, BIO-2c: *Electrical Power Line Support Placement*, and BIO-34: *Avoid California Least Tern Nesting Colonies and Minimize Indirect Effects on Colonies*, effects would be reduced.

Based on the information presented above, including proposed mitigation measures, environmental commitments, and the tidal restoration that would occur with implementation of the CMP, the effect of all action alternatives on California least tern does not appear to be significant.

Impact BIO-35: Effects of the Project on Cormorants, Herons, and Egrets

Species analyzed include double-crested cormorant, great blue heron, great egret, snowy egret, and black-crowned night heron.

No Action Alternative

The extent of the valley/foothill riparian community that would support rookeries for cormorants, herons, and egrets in the study area would not significantly change under the No Action Alternative when considering the balance of likely sources of loss and programs to protect and create riparian habitat in the Delta. A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly modify valley/foothill riparian habitat in the study area. Periodic levee and channel maintenance activities associated with current strategies would result in localized disturbances to this community.

Many existing and planned projects and programs would include riparian creation and protection, which increases the quality of valley/foothill riparian and habitat for rookeries in the study area. Projects in the area include levee repairs, improvements, and some setbacks, which would result in the permanent loss of riparian in those areas due to current policies not allowing the planting of riparian on levees. In the longer term, both gradual and catastrophic natural phenomena could affect the mix of open water, tidal wetland, agricultural, and riparian forest natural communities in the study area through continued land subsidence on Delta islands, levee degradation and potential failure from floods or seismic events, and climate change.

Water reliability projects listed in Table 3.5-2 could result in effects on valley/foothill riparian and associated rookeries in all regions due to the construction of water recycling, groundwater management, and groundwater recovery projects, which would include construction of storage basins, conveyance canals, pipelines, pump stations, and associated buildings; however, the amount of habitat removed would be in discrete locations and of minimal size. Water recycling could also result in reduced instream flows where water captured for residential use in upper watersheds does not make it back into streams following treatment, which could result in reduced flows during summer months that could reduce available surface water and groundwater available to riparian vegetation. Groundwater recovery projects could also reduce available groundwater for riparian vegetation if pumping occurs in proximity to these habitats and at a depth that actually affects shallow groundwater available to riparian vegetation. Although there is some potential for effect from these projects, the overall effect on riparian vegetation would not be significant due to the small amount that would likely be moved for construction and because most riparian vegetation in the region is adapted to more seasonal flows.

All Action Alternatives

The construction of all the action alternatives would affect modeled nesting habitat for cormorants, herons, and egrets (Appendix I1, Tables I1-67 and I1-68). The loss of habitat would primarily occur as a result of levee improvements, new roads and road improvements, and construction of the intakes.

Alternative 1 would result in the greatest effects on modeled cormorant, great blue heron, and great egret rookery habitat, and Alternative 4b would result in the fewest.

Construction activities associated with all action alternatives could result in the disruption of normal behaviors, injury, and mortality of cormorants, herons, and egrets. Implementation of Environmental Commitments EC-1: *Conduct Environmental Resources Worker Awareness Training*, EC-2: *Develop and Implement Hazardous Materials Management Plans*, EC-3: *Develop and Implement Spill Prevention, Containment, and Countermeasure Plans*, EC-11: *Fugitive Dust Control*, and EC-14: *Construction Best Management Practices for Biological Resources* (Appendix C1) would reduce the potential for effects by training construction staff on the needs of protecting cormorant, heron, or egret rookeries, reporting requirements, and the ramifications for not following these measures; implementing spill prevention and containment plans that would avoid material spills that could affect suitable habitat; reducing the potential for discharge of construction-related dust; ensuring that temporarily disturbed areas are restored; and by having a biological monitor present to ensure that nondisturbance buffers are intact and all other protective measures are being implemented, where applicable.

Maintenance under all action alternatives could result in effects on cormorant, heron, and egret rookeries.

The CMP would offset the loss of riparian and emergent wetland habitat (Appendix C3, Section 3F.3.2.3) by creating riparian habitat on Bouldin Island and at the I-5 ponds and by creating or restoring channel margin enhancement and tidal emergent wetlands (Appendix C3, Section 3F.4.3) and managing these areas in perpetuity.

The CMP could affect cormorants, herons, and egrets through restoration activities at the I-5 ponds, on Bouldin Island, from tidal restoration, from channel margin enhancement, and from the management of lands under site protection instruments. The CMP and site-specific permitting approvals would ensure that there is no significant loss of habitat or habitat value by adjusting the overall commitment (Appendix C3, Sections 3F.1 and 3F.2.4 and Attachment C3.1, Table 3F.1-2, CMP-0—*General Design Guidelines*).

The CMP would also have the potential to increase cormorant, heron, and egret exposure to selenium, methylmercury, and cyanobacterial harmful algal blooms; however, as discussed in detail in Delta Conveyance Project Draft EIR Chapter 13, *Terrestrial Biological Resources* (California

Department of Water Resources 2022), these potential effects would be reduced through water quality monitoring plans or would not be expected to result in adverse effects on the species.

Compared to the No Action Alternative, the action alternatives would result in effects on rookeries. Through the CMP (Appendix C3) and Mitigation Measures AES-4b: *Minimize Fugitive Light from Portable Sources Used for Construction*, AES-4c: *Install Visual Barriers along Access Routes, Where Necessary, to Prevent Light Spill from Truck Headlights toward Residences*, NOI-1: *Develop and Implement Noise Control Plan Including Site-Specific Measures*, BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities*, BIO-2c: *Electrical Power Line Support Placement*, and BIO-35: *Avoid and Minimize Impacts on Cormorant, Heron, and Egret Rookeries*, these effects would be reduced.

Based on the information presented above, including proposed mitigation measures, environmental commitments, and the riparian and tidal emergent wetlands that would be created by implementation of the CMP, the effect of all action alternatives on cormorants, herons, and egrets does not appear to be significant.

Impact BIO-36: Effects of the Project on Osprey, White-Tailed Kite, and Cooper's Hawk

No Action Alternative

The extent of the habitat for osprey, white-tailed kite, and Cooper's hawk in the study area would not significantly change under the No Action Alternative when considering the balance of likely sources of loss and programs to protect and create riparian habitat in the Delta. A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly modify valley/foothill riparian habitat in the study area. Periodic levee and channel maintenance activities associated with current strategies would result in localized disturbances to this community.

Many existing and planned projects and programs would include riparian creation and protection, which increase the quality of valley/foothill riparian and habitat for osprey, white-tailed kite, and Cooper's hawk in the study area. Projects in the area include levee repairs, improvements, and some setbacks, which would result in the permanent loss of riparian in those areas due to current policies not allowing the planting of riparian on levees. In the longer term, both gradual and catastrophic natural phenomena could affect the mix of open water, tidal wetland, agricultural, and riparian forest natural communities in the study area through continued land subsidence on Delta islands, levee degradation and potential failure from floods or seismic events, and climate change.

Water reliability projects listed in Table 3.5-2 could result in effects on valley/foothill riparian in all regions for the construction of water recycling, groundwater management, and groundwater recovery projects, which would include construction of storage basins, conveyance canals, pipelines, pump stations, and associated buildings; however, the amount of habitat removed would be in discrete locations and of minimal size. Water recycling could also result in reduced instream flows where water captured for residential use in upper watersheds does not make it back into streams following treatment, which could result in reduced flows during summer months that could reduce available surface water and groundwater available to riparian vegetation. Groundwater recovery projects could also reduce available groundwater for riparian vegetation if pumping occurs in proximity to these habitats and at a depth that actually affects shallow groundwater available to riparian vegetation. Although there is some potential for effect from these projects, the overall effect on riparian vegetation would not be significant due to the small amount that would likely be moved for construction and because most riparian vegetation in the region is adapted to more seasonal flows.

All Action Alternatives

The construction of all action alternatives would affect modeled habitat for osprey, white-tailed kite, and Cooper's hawk (Appendix I1, Tables I1-69, I1-70, and I1-71), including indirect effects on habitat. Other nesting raptors (e.g., red-tailed hawk, great horned owl) use the same habitat. The loss of nesting habitat would primarily occur as a result of levee improvements, new roads and road improvements, and construction of the intakes. The loss of white-tailed kite foraging habitat and foraging habitat for other raptors would primarily occur as a result of construction of the Southern Forebay (Alternatives 1, 2b, 3, and 4b) and from the placement of RTM (all action alternatives).

Alternative 1 would result in the greatest effects on osprey, white-tailed kite, and Cooper's hawk, Alternative 4b would result in the fewest on osprey and Cooper's hawk, and DWR's Preferred Alternative would result in the fewest on white-tailed kite.

Construction activities and removal of suitable nest trees could result in the injury, mortality, or disturbance of raptors, including the incidental loss of fertile eggs or nestlings and nest abandonment. Implementation of Environmental Commitments EC-1: *Conduct Environmental Resources Worker Awareness Training*, EC-2: *Develop and Implement Hazardous Materials Management Plans*, EC-3: *Develop and Implement Spill Prevention, Containment, and Countermeasure Plans*, EC-11: *Fugitive Dust Control*, and EC-14: *Construction Best Management Practices for Biological Resources* (Appendix C1) would reduce these potential effects by training construction staff on the needs of protecting the species, reporting requirements, and the ramifications for not following these measures; implementing spill prevention and containment plans that would avoid material spills that could affect suitable habitat; reducing the potential for discharge of construction-related dust; ensuring that temporarily disturbed areas are restored; and by having a biological monitor present that would ensure that nondisturbance buffers are intact and all other protective measures are being implemented, where applicable.

The maintenance activities under all action alternatives could result in effects on osprey, white-tailed kite, and Cooper's hawk.

The CMP would offset the loss of nesting and foraging habitat for white-tailed kite, osprey, Cooper's hawk, and other nesting raptors by creating and protecting wetlands, riparian, and grasslands on Bouldin Island and at the I-5 ponds (Appendix C3, Section 3F.3.3, *Approach to Special-Status Species Mitigation*) by creating or acquiring and permanently protecting tidal perennial aquatic habitat to ensure no significant loss of tidal perennial aquatic habitat functions and values (Appendix C3, Section 3F.4.3 and Attachment C3.1, Table 3F.1-2, CMP-1—*Tidal Perennial Aquatic Habitat*) and through the protection and management of agricultural foraging habitat for Swainson's hawk, tricolored blackbird, and greater sandhill crane (Appendix C3, Attachment C3.1, Table 3F.1-3). The CMP would also compensate for the temporal loss of suitable nest trees for these species (Appendix C3, Attachment C3.1, Table 3F.1-3, CMP-19a—*Swainson's Hawk Nesting Habitat*).

The CMP could affect special-status and non–special-status raptors through restoration activities at the I-5 ponds, on Bouldin Island, from tidal restoration, from channel margin enhancement, and from the management of lands under site protection instruments. The CMP and site-specific permitting approvals would ensure that there is no significant loss of habitat or habitat value by adjusting the overall commitment (Appendix C3, Sections 3F.1 and 3F.2.4 and Attachment C3.1, Table 3F.1-2, CMP-0—*General Design Guidelines*).

The CMP would also have the potential to increase osprey, Cooper's hawk, and white-tailed kite's exposure to selenium, methylmercury, and cyanobacterial harmful algal blooms; however, as discussed in detail in Delta Conveyance Project Draft EIR Chapter 13, *Terrestrial Biological Resources* (California Department of Water Resources 2022), these potential effects would be reduced through water quality monitoring plans or would not be expected to result in adverse effects on the species.

Compared to the No Action Alternative, the action alternatives would result in effects on osprey, white-tailed kite, and Cooper's hawk. Through the CMP (Appendix C3) and Mitigation Measures AES-4b: *Minimize Fugitive Light from Portable Sources Used for Construction*, AES-4c: *Install Visual Barriers along Access Routes, Where Necessary, to Prevent Light Spill from Truck Headlights toward Residences*, NOI-1: *Develop and Implement Noise Control Plan Including Site-Specific Measures*, BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities*, BIO-2c: *Electrical Power Line Support Placement*, BIO-36a: *Conduct Nesting Surveys for Special-Status and Non–Special-Status Birds and Raptors and Implement Protective Measures to Avoid Disturbance of Nesting Birds and Raptors*, and BIO-36b: *Conduct Preconstruction Surveys and Implement Protective Measures to Avoid Disturbance of White-Tailed Kite*, these effects would be reduced.

Based on the information presented above, including proposed mitigation measures, environmental commitments, and implementation of the CMP, the effect of all action alternatives on osprey, white-tailed kite, and Cooper's hawk does not appear to be significant.

Impact BIO-37: Effects of the Project on Golden Eagle and Ferruginous Hawk

No Action Alternative

The extent of golden eagle and ferruginous hawk habitat in the study area would not significantly change under the No Action Alternative because effects on this habitat would be limited to small discrete areas relative to the extent of this habitat available in the study area, which in itself is very small. A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly affect golden eagle and ferruginous hawk habitat.

Existing and planned projects and programs would not likely result in significant effects on or benefits to golden eagle and ferruginous hawk because their potential habitat is largely outside of where these actions take place; however, the programs do include protections of grasslands that may provide habitat for these species.

Water reliability projects in Table 3.5-2 could result in effects on golden eagle and ferruginous hawk habitat from the construction of water recycling, groundwater management, and groundwater recovery projects across all regions. These projects would include the construction of storage basins, conveyance canals, pipelines, pump stations, and associated buildings; however, the amount of habitat removed would be in discrete locations and of minimal size. Effects would be limited to surface disturbances.

All Action Alternatives

The construction of all action alternatives would affect modeled foraging habitat for golden eagle and ferruginous hawk (Appendix I1, Table I1-72). Moreover, the same habitat is also suitable to support other wintering raptors (e.g., red-tailed hawk, merlin). The loss of foraging habitat for golden eagle, ferruginous hawk, and other wintering raptors would primarily occur as a result of the construction of the Southern Forebay (Alternatives 1, 2b, 3, and 4b) and from the placement of RTM (all action alternatives).

Alternative 1 would result in the greatest effects on modeled golden eagle and ferruginous hawk habitat and DWR's Preferred Alternative the fewest.

Construction activities are not expected to injure or kill foraging raptors because they are highly mobile and would avoid direct injury or mortality from slow-moving or stationary construction equipment. Implementation of Environmental Commitments EC-1: *Conduct Environmental Resources Worker Awareness Training*, EC-2: *Develop and Implement Hazardous Materials Management Plans*, EC-3: *Develop and Implement Spill Prevention, Containment, and Countermeasure Plans*, EC-11: *Fugitive Dust Control*, and EC-14: *Construction Best Management Practices for Biological Resources* (Appendix C1) would reduce potential effects by training construction staff on the needs of protecting these species, reporting requirements, and the ramifications for not following these measures; implementing spill prevention and containment plans that would avoid material spills that could affect suitable habitat; reducing the potential for discharge of construction-related dust; ensuring that temporarily disturbed areas are restored; and by having a biological monitor present that would ensure that nondisturbance buffers are intact and all other protective measures are being implemented, where applicable.

The maintenance activities under all action alternatives could result in effects on golden eagle and ferruginous hawk.

The CMP would offset the loss of golden eagle and ferruginous hawk habitat by creating and protecting grasslands on Bouldin Island and at the I-5 ponds (Appendix C3, Section 3F.3.2, *Approach to Aquatic Resources Mitigation*). The protection and management of agricultural foraging habitat for sandhill crane, Swainson's hawk, and tricolored blackbird may also provide suitable habitat for these species (Appendix C3, Attachment C3.1, Table 3F.1-3). The purchasing of conservation credits for California red-legged frog and California tiger salamander (Appendix C3, Section 3F.3.3.3 and Attachment C3.1, Table 3F.1-3, CMP-13—*California Tiger Salamander Habitat* and CMP-14—*California Red-Legged Frog Habitat*) would contain upland grasslands also potentially suitable for golden eagle and ferruginous hawk.

The CMP could affect golden eagle and ferruginous hawk foraging habitat through restoration activities at the I-5 ponds and on Bouldin Island and from the management of lands under site protection instruments. The CMP and site-specific permitting approvals would account for any losses of nesting habitat from habitat creation by adjusting the overall commitment of riparian and wetland creation and grassland and cultivated lands protection (Appendix C3, Sections 3F.1 and 3F.2.4 and Attachment C3.1, Table 3F.1-2, CMP-0—*General Design Guidelines*).

Compared to the No Action Alternative, the action alternatives would result in effects on golden eagle and ferruginous hawk. Through the CMP (Appendix C3) and Mitigation Measures AES-4b: *Minimize Fugitive Light from Portable Sources Used for Construction*, AES-4c: *Install Visual Barriers along Access Routes, Where Necessary, to Prevent Light Spill from Truck Headlights toward Residences*, NOI-1: *Develop and Implement Noise Control Plan Including Site-Specific Measures*, BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities*, BIO-2c: *Electrical Power Line Support Placement*, and BIO-37: *Conduct Surveys for Golden Eagle and Avoid Disturbance of Occupied Nests*, these effects would be reduced.

Based on the information presented above, including proposed mitigation measures, environmental commitments, and implementation of the CMP, the effect of all action alternatives on golden eagle and ferruginous hawk does not appear to be significant.

Impact BIO-38: Effects of the Project on Ground-Nesting Grassland Birds

Special-status ground-nesting grassland birds analyzed include northern harrier, short-eared owl, California horned lark, and grasshopper sparrow.

No Action Alternative

The extent of ground-nesting grassland bird habitat in the study area would not significantly change under the No Action Alternative because effects on this habitat would be limited to small discrete areas relative to the extent of this habitat available in the study area. A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly affect ground-nesting grassland birds.

Existing and planned projects and programs would not likely result in significant effects on or benefits to grassland nesting birds because their potential habitat is largely outside of where these actions take place; however, the programs do include protections of grasslands that may provide habitat for these species.

Water reliability projects in Table 3.5-2 could result in effects on ground-nesting grassland bird habitat from the construction of water recycling, groundwater management, and groundwater recovery projects across all regions. These projects would include the construction of storage basins, conveyance canals, pipelines, pump stations, and associated buildings; however, the amount of habitat removed would be in discrete locations and of minimal size. Effects would be limited to surface disturbances.

All Action Alternatives

The construction of all action alternatives would affect modeled nesting habitat for northern harrier, short-eared owl, California horned lark, and grasshopper sparrow (Appendix I1, Tables I1-73 and I1-74).

The loss of nesting habitat for northern harrier, short-eared owl, California horned lark, and grasshopper sparrow would primarily occur as a result of the construction of the Southern Forebay (Alternatives 1, 2b, 3, and 4b) and the placement of RTM and associated conveyor features north of Cosumnes River Preserve (all action alternatives), on Bouldin Island (Alternatives 1 and 2b), and on Lower Roberts Island (Alternatives 3, 4b, and DWR's Preferred Alternative; Delta Conveyance Project Draft EIR Appendix 13C, *Impact Tables* [California Department of Water Resources 2022]). Construction of the Bethany Complex and associated access roads (DWR's Preferred Alternative) would also remove modeled habitat for these species.

Alternative 3 would result in the greatest effects on northern harrier and short-eared owl, and Alternative 1 would result in the greatest effects on California horned lark and grasshopper sparrow. DWR's Preferred Alternative would have the fewest effects on all four species of ground-nesting birds.

Construction activities associated with all action alternatives could result in the disruption of normal behaviors, injury, and mortality of ground-nesting birds. Grasshopper sparrows and short-eared owl are considered rare breeders in the study area (Unitt 2008:395; Roberson 2008:244), but northern harrier and California horned lark have a high potential to occur within or adjacent to work areas. Implementation of Environmental Commitments EC-1: *Conduct Environmental Resources Worker Awareness Training*, EC-2: *Develop and Implement Hazardous Materials Management Plans*, EC-3: *Develop and Implement Spill Prevention, Containment, and Countermeasure Plans*, EC-11: *Fugitive Dust Control*, and EC-14: *Construction Best Management Practices for Biological Resources* (Appendix C1) would reduce these potential effects by training construction staff on the needs of protecting these species, reporting requirements, and the ramifications for not following these measures; implementing spill prevention and containment plans that would avoid material spills that could affect suitable habitat; reducing the potential for discharge of construction-related dust; ensuring that temporarily disturbed areas are restored; and by having a biological monitor present that would ensure that nondisturbance buffers are intact and all other protective measures are being implemented, where applicable.

Maintenance under all action alternatives could potentially affect ground-nesting birds.

The CMP would offset the loss of habitat for northern harrier, short-eared owl, California horned lark, and grasshopper sparrow by creating and protecting grasslands on Bouldin Island and at the I-5 ponds (Appendix C3, Section 3F.3.2) and through the protection and management of agricultural foraging habitat for Swainson's hawk, tricolored blackbird, and greater sandhill crane (Appendix C3, Attachment C3.1, Table 3F.1-3). The creation and protection of wetlands would also provide suitable habitat for northern harrier and short-eared owl (Appendix C3, Section 3F.3.3.1).

The CMP could affect northern harrier, short-eared owl, California horned lark, and grasshopper sparrow through restoration activities at the I-5 ponds and on Bouldin Island and from the management of lands under site protection instruments. The CMP and site-specific permitting approvals would ensure that there is no significant loss of habitat or habitat value by adjusting the overall commitment (Appendix C3, Sections 3F.1 and 3F.2.4 and Attachment C3.1, Table 3F.1-2, CMP-0—*General Design Guidelines*).

Compared to the No Action Alternative, the action alternatives would result in effects on northern harrier, short-eared owl, California horned lark, and grasshopper sparrow. Through the CMP (Appendix C3) and Mitigation Measures AES-4b: *Minimize Fugitive Light from Portable Sources Used for Construction*, AES-4c: *Install Visual Barriers along Access Routes, Where Necessary, to Prevent Light Spill from Truck Headlights toward Residences*, NOI-1: *Develop and Implement Noise Control Plan Including Site-Specific Measures*, BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities*, BIO-2c: *Electrical Power Line Support Placement*, and BIO-36a: *Conduct Nesting Surveys for Special-Status and Non–Special-Status Birds and Raptors and Implement Protective Measures to Avoid Disturbance of Nesting Birds and Raptors*, these effects would be reduced.

Based on the information presented above, including proposed mitigation measures, environmental commitments, and implementation of the CMP, the effect of all action alternatives on ground-nesting grassland birds does not appear to be significant.

Impact BIO-39: Effects of the Project on Swainson's Hawk

No Action Alternative

The gradual conversion of cultivated land and grassland in the study area under existing and planned projects and programs could affect Swainson's hawk through the loss of foraging habitat; however, there are also plans to continue and expand partnerships with agricultural interests to manage croplands for wildlife-friendly crops. Many of the programs in the area would include riparian creation and protection, which increase the amount of nesting habitat in the study area. Projects in the area include levee repairs, improvements, and some setbacks, which would result in the permanent loss of riparian in those areas due to current policies not allowing the planting of riparian on levees. In the longer term, both gradual and catastrophic natural phenomena could affect agricultural and riparian forest natural communities in the study area through continued land subsidence on Delta islands, levee degradation and potential failure from floods or seismic events, and climate change. Despite the potential conversion of habitat, the concerted policies and programs would likely ensure that habitat persists in the study area.

Water reliability projects listed in Table 3.5-2 could result in effects on nesting and foraging habitat in the southern inland region, the only region supporting the species, for the construction of water recycling, groundwater management, and groundwater recovery projects, which would include construction of storage basins, conveyance canals, pipelines, pump stations, and associated buildings; however, the amount of habitat removed would be in discrete locations and of minimal size. Water recycling could also result in reduced instream flows where water captured for residential use in upper watersheds does not make it back into streams following treatment, which could result in reduced flows during summer months that could reduce available surface water and groundwater available to riparian vegetation used as nesting habitat. Groundwater recovery projects could also reduce available groundwater for riparian vegetation if pumping occurs in proximity to these habitats and at a depth that actually affects shallow groundwater available to riparian vegetation. Although there is some potential for effect from these projects, the overall effect on riparian vegetation would not be significant due to the small amount that would likely be moved for construction and because most riparian vegetation in the region is adapted to more seasonal flows.

All Action Alternatives

The construction of all action alternatives would affect modeled habitat for Swainson's hawk (Appendix I1, Table I1-75), including indirect effects on habitat. The loss of Swainson's hawk modeled nesting habitat would primarily occur as a result of levee improvements, new roads and road improvements, and construction of the intakes (all action alternatives). The loss of Swainson's hawk modeled foraging habitat would primarily occur as a result of the construction of the Southern Forebay (Alternatives 1, 2b, 3, and 4b) and the placement of RTM (all action alternatives).

Alternative 1 would result in the greatest effects on modeled Swainson's hawk habitat and DWR's Preferred Alternative the fewest.

Construction activities and removal of suitable nest trees could result in the injury, mortality, or disturbance of Swainson's hawk, including the incidental loss of fertile eggs or nestlings and nest abandonment. Implementation of Environmental Commitments EC-1: *Conduct Environmental Resources Worker Awareness Training*, EC-2: *Develop and Implement Hazardous Materials Management Plans*, EC-3: *Develop and Implement Spill Prevention, Containment, and Countermeasure*

Plans, EC-11: *Fugitive Dust Control*, and EC-14: *Construction Best Management Practices for Biological Resources* (Appendix C1) would reduce these potential effects by training construction staff on the needs of protecting the species, reporting requirements, and the ramifications for not following these measures; implementing spill prevention and containment plans that would avoid material spills that could affect suitable habitat; reducing the potential for discharge of construction-related dust; ensuring that temporarily disturbed areas are restored; and by having a biological monitor present that would ensure that nondisturbance buffers are intact and all other protective measures are being implemented, where applicable.

Maintenance activities under all action alternatives could affect Swainson's hawk.

The CMP would offset the loss of Swainson's hawk nesting habitat by creating and protecting riparian habitat (Appendix C3, Section 3F.3.1 and Attachment C3.1, Table 3F.1-3, CMP-19a—*Swainson's Hawk Nesting Habitat*) and by compensating for the temporal loss of suitable Swainson's hawk nest sites and for the loss of nest trees (Appendix C3, Attachment C3.1, Table 3F.1-3, CMP-19a—*Swainson's Hawk Nesting Habitat*). The CMP would offset the loss of Swainson's hawk foraging habitat through the protection and management of grassland and agricultural lands (Appendix C3, Section 3F.3.2 and Attachment C3.1, Table 3F.1-3, CMP-19b—*Swainson's Hawk Foraging Habitat*).

The CMP could affect Swainson's hawk through restoration activities at the I-5 ponds and on Bouldin Island and from the management of lands under site protection instruments. The CMP and site-specific permitting approvals would ensure that there is no significant loss of habitat or habitat value by adjusting the overall commitment (Appendix C3, Sections 3F.1 and 3F.2.4 and Attachment C3.1, Table 3F.1-2, CMP-0—*General Design Guidelines*).

Compared to the No Action Alternative, the action alternatives would result in effects on Swainson's hawk. Through the CMP (Appendix C3) and Mitigation Measures AES-4b: *Minimize Fugitive Light from Portable Sources Used for Construction*, AES-4c: *Install Visual Barriers along Access Routes, Where Necessary, to Prevent Light Spill from Truck Headlights toward Residences*, NOI-1: *Develop and Implement Noise Control Plan Including Site-Specific Measures*, BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities*, BIO-2c: *Electrical Power Line Support Placement*, and BIO-39: *Conduct Preconstruction Surveys and Implement Protective Measures to Minimize Disturbance of Swainson's Hawk*, these effects would be reduced.

Based on the information presented above, including proposed mitigation measures, environmental commitments, and implementation of the CMP, the effect of all action alternatives on Swainson's hawk does not appear to be significant.

Impact BIO-40: Effects of the Project on Burrowing Owl

No Action Alternative

The extent of burrowing owl habitat in the study area would not significantly change under the No Action Alternative because effects on this habitat would be limited to small discrete areas relative to the extent of this habitat available in the study area. A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly affect burrowing owl.

Existing and planned projects and programs would not likely result in significant effects on or benefits to burrowing owl because their potential habitat is largely outside of where these actions take place; however, the programs do include protections of grasslands that may provide habitat for this species.

Water reliability projects in Table 3.5-2 could result in effects on burrowing owl habitat from the construction of water recycling, groundwater management, and groundwater recovery projects across all regions. These projects would include the construction of storage basins, conveyance canals, pipelines, pump stations, and associated buildings; however, the amount of habitat removed would be in discrete locations and of minimal size. Effects would be limited to surface disturbances.

All Action Alternatives

The construction of all action alternatives would affect modeled habitat for burrowing owl (Appendix I1, Table I1-76). The loss of burrowing owl habitat would primarily occur as a result of construction of the Southern Forebay (Alternatives 1, 2b, 3, and 4b) and the placement of RTM conveyor and handling facilities at the Twin Cities Complex (all action alternatives), on Bouldin Island (Alternatives 1 and 2b), and on Lower Roberts Island (Alternatives 3, 4b, and DWR's Preferred Alternative). The majority of these effects would occur on cultivated lands, which provide low-value habitat for burrowing owl.

Alternative 1 would result in the greatest effects on modeled burrowing owl habitat, and DWR's Preferred Alternative would result in the fewest.

Construction activities associated with all action alternatives could result in the potential injury or mortality of individual owls and eggs, as well as nest abandonment. Ground disturbance and construction vehicles could injure or kill burrowing owls by crushing occupied burrows or collapsing burrow entrances, trapping any owls inside. Construction-generated noise and vibration near nest burrows could cause adult owls to abandon eggs or recently hatched young or cause wintering owls to abandon their burrows, leaving them vulnerable to predation. Implementation of Environmental Commitments EC-1: *Conduct Environmental Resources Worker Awareness Training*, EC-2: *Develop and Implement Hazardous Materials Management Plans*, EC-3: *Develop and Implement Spill Prevention, Containment, and Countermeasure Plans*, EC-11: *Fugitive Dust Control*, and EC-14: *Construction Best Management Practices for Biological Resources* (Appendix C1) would reduce these potential effects by training construction staff on the needs of protecting breeding and wintering burrowing owls, reporting requirements, and the ramifications for not following these measures; implementing spill prevention and containment plans that would avoid material spills that could affect suitable habitat; reducing the potential for discharge of construction-related dust; ensuring that temporarily disturbed areas are restored; and by having a biological monitor present that would ensure that nondisturbance buffers are intact and all other protective measures are being implemented.

Maintenance activities under all action alternatives could result in effects on burrowing owl.

The CMP would offset the loss of burrowing owl habitat by creating and protecting grassland habitat (Appendix C3, Section 3F.3.2) on Bouldin Island and at the I-5 ponds through the protection and management of agricultural foraging habitat for Swainson's hawk (Appendix C3, Section 3F.3.2 and Attachment C3.1, Table 3F.1-3, CMP-19b—*Swainson's Hawk Foraging Habitat*) and by mitigating for occupied burrowing owl habitat (Appendix C3, Attachment C3.1, Table 3F.1-3, CMP-20—*Occupied Burrowing Owl Habitat*).

The CMP could affect burrowing owl through restoration activities at the I-5 ponds and on Bouldin Island and from the management of lands under site protection instruments. The CMP and site-specific permitting approvals would ensure that there is no significant loss of habitat or habitat value by adjusting the overall commitment (Appendix C3, Sections 3F.1 and 3F.2.4 and Attachment C3.1, Table 3F.1-2, CMP-0—*General Design Guidelines*).

Compared to the No Action Alternative, the action alternatives would result in effects on western burrowing owl. Through the CMP (Appendix C3) and Mitigation Measures AES-4b: *Minimize Fugitive Light from Portable Sources Used for Construction*, AES-4c: *Install Visual Barriers along Access Routes, Where Necessary, to Prevent Light Spill from Truck Headlights toward Residences*, NOI-1: *Develop and Implement Noise Control Plan Including Site-Specific Measures*, BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities*, BIO-2c: *Electrical Power Line Support Placement*, and BIO-40: *Conduct Surveys and Minimize Impacts on Burrowing Owl*, these effects would be reduced.

Based on the information presented above, including proposed mitigation measures, environmental commitments, and implementation of the CMP, the effect of all action alternatives on burrowing owl does not appear to be significant.

Impact BIO-41: Effects of the Project on Other Nesting Special-Status and Non–Special-Status Birds

Other nesting special-status birds analyzed include least bittern, loggerhead shrike, Modesto song-sparrow, yellow-breasted chat, yellow-headed blackbird, bank swallow, and yellow warbler.

No Action Alternative

The extent of areas that could support nesting birds in the study area would not significantly change under the No Action Alternative when considering the balance of likely sources of loss and programs to protect and create habitat in the Delta. A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly modify habitats in the study area.

Many existing and planned projects and programs would include the creation, protection, and management of a variety of habitats that could be used by nesting birds. Construction associated with these programs would need to comply with federal and state laws and regulations protecting nesting birds.

Water reliability projects listed in Table 3.5-2 could result in effects on nesting birds in all regions for the construction of all project types, which could result in habitat conversions and direct effects on nesting birds. Construction associated with these projects would need to comply with federal and state laws and regulations protecting nesting birds.

All Action Alternatives

The construction of all action alternatives would result in the permanent and temporary loss of habitat for special-status and non–special-status birds (Appendix I1, Tables I1-77 through I1-82). The removal of riparian vegetation, grassland, wetland vegetation, and cultivated lands resulting from the construction of project facilities would reduce the amount of available nesting and foraging habitat for special-status and non–special-status birds, and effects would vary by species.

Alternatives 1 and 2b would typically result in greater effects on modeled nesting and foraging habitat for special-status nesting bird species compared to the eastern and Bethany Reservoir alignment alternatives (Alternatives 3, 4b, and DWR's Preferred Alternative).

Construction activities associated with all action alternatives could result in the disruption of normal behaviors, injury, and mortality of special-status and non–special-status nesting birds.

Implementation of Environmental Commitments EC-1: *Conduct Environmental Resources Worker Awareness Training*, EC-2: *Develop and Implement Hazardous Materials Management Plans*, EC-3: *Develop and Implement Spill Prevention, Containment, and Countermeasure Plans*, EC-11: *Fugitive Dust Control*, and EC-14: *Construction Best Management Practices for Biological Resources* (Appendix C1) would reduce these potential effects by training construction staff on the needs of protecting nesting special-status and non–special-status birds, reporting requirements, and the ramifications for not following these measures; implementing spill prevention and containment plans that would avoid material spills that could affect suitable habitat; reducing the potential for discharge of construction-related dust; ensuring that temporarily disturbed areas are restored; and by having a biological monitor present that would ensure that nondisturbance buffers are intact and all other protective measures are being implemented, where applicable.

Maintenance activities under all action alternatives could result in effects on nesting birds.

The CMP would offset the loss of nesting and foraging habitat for special-status and non–special-status birds by creating and protecting riparian, tidal emergent wetland, and grassland habitat for least Bell's vireo, western yellow-billed cuckoo, California black rail, Swainson's hawk, and burrowing owl (Appendix C3, Sections F3.3.2.3, F3.2.5, and F3.3.2 and Attachment C3.1, Table 3F.1-3) on Bouldin Island and at the I-5 ponds and by restoring or protecting nesting and foraging habitat for western yellow-billed cuckoo, California black rail, sandhill crane, Swainson's hawk, least Bell's vireo, and tricolored blackbird and agricultural foraging habitat for sandhill cranes, Swainson's hawk, and tricolored blackbird (Appendix C3, Attachment C3.1, Table 3F.1-3).

The CMP could affect special-status and non–special-status birds through restoration activities at the I-5 ponds, on Bouldin Island, from tidal restoration, from channel margin enhancement, and from the management of lands under site protection instruments. The CMP and site-specific permitting approvals would account for any losses of nesting habitat from habitat creation by adjusting the overall commitment of riparian and wetland creation and grassland and cultivated lands protection (Appendix C3) and, therefore, minimize any habitat losses associated with the CMP. The creation and enhancement activities would also have the potential for injury, mortality, and the disruption of normal behaviors of individuals if restoration activities occur during the breeding season (February 1 through August 31), as described above under construction-related effects. The CMP and site-specific permitting approvals would ensure that there is no significant loss of habitat or habitat value by adjusting the overall commitment (Appendix C3, Sections F3.1 and F3.2.4 and Attachment C3.1, Table 3F.1-2, CMP-0—*General Design Guidelines*).

The CMP would also have the potential to increase bird exposure to selenium, methylmercury, and cyanobacterial harmful algal blooms; however, as discussed in detail in Delta Conveyance Project Draft EIR Chapter 13, *Terrestrial Biological Resources* (California Department of Water Resources 2022), these potential effects would be reduced through water quality monitoring plans or would not be expected to result in adverse effects on the species.

Compared to the No Action Alternative, the action alternatives would result in effects on special-status and non–special-status birds. Through the CMP (Appendix C3) and Mitigation Measures AES-4b: *Minimize Fugitive Light from Portable Sources Used for Construction*, AES-4c: *Install Visual Barriers along Access Routes, Where Necessary, to Prevent Light Spill from Truck Headlights toward Residences*, NOI-1: *Develop and Implement Noise Control Plan Including Site-Specific Measures*, BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities*, BIO-2c: *Electrical Power Line Support Placement*, and BIO-36a: *Conduct Nesting Surveys for Special-Status and Non–Special-Status Birds and Raptors and Implement Protective Measures to Avoid Disturbance of Nesting Birds and Raptors*, these effects would be reduced.

Based on the information presented above, including proposed mitigation measures, environmental commitments, and implementation of the CMP, the effect of all action alternatives on other nesting special-status and non–special-status birds does not appear to be significant.

Impact BIO-42: Effects of the Project on Least Bell's Vireo

No Action Alternative

The extent of least Bell's vireo habitat in the study area would not significantly change under the No Action Alternative when considering the balance of likely sources of loss and programs to protect and create riparian habitat in the Delta. A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly modify valley/foothill riparian habitat in the study area. Periodic levee and channel maintenance activities associated with current strategies would result in localized disturbances to least Bell's vireo habitat.

Many existing and planned projects and programs would include riparian creation and protection, which increase the quality of potential least Bell's vireo habitat in the study area. Projects in the area include levee repairs, improvements, and some setbacks, which would result in the permanent loss of riparian in those areas due to current policies not allowing the planting of riparian on levees. In the longer term, both gradual and catastrophic natural phenomena could affect the mix of open water, tidal wetland, agricultural, and riparian forest natural communities in the study area through continued land subsidence on Delta islands, levee degradation and potential failure from floods or seismic events, and climate change.

Water reliability projects listed in Table 3.5-2 could result in effects on least Bell's vireo in all regions due to the construction of water recycling, groundwater management, and groundwater recovery projects, which would include construction of storage basins, conveyance canals, pipelines, pump stations, and associated buildings; however, the amount of habitat removed would be in discrete locations and of minimal size. Water recycling could also result in reduced instream flows where water captured for residential use in upper watersheds does not make it back into streams following treatment, which could result in reduced flows during summer months that could reduce available surface water and groundwater available to riparian vegetation. Groundwater recovery projects could also reduce available groundwater for riparian vegetation if pumping occurs in proximity to these habitats and at a depth that actually affects shallow groundwater available to riparian vegetation. Although there is some potential for effect from these projects, the overall effect on riparian vegetation would not be significant due to the small amount that would likely be moved for construction and because most riparian vegetation in the region is adapted to more seasonal flows.

All Action Alternatives

The construction of all action alternatives would result in the permanent and temporary loss of modeled least Bell's vireo recolonization habitat (Appendix I1, Table I1-83). The loss of habitat would primarily occur as a result of levee improvements, new roads and road improvements, and construction of the intakes.

Alternative 1 would result in the greatest effects on modeled least Bell's vireo habitat and Alternative 4b the fewest.

Construction activities under all action alternatives could result in the disruption of normal behaviors, injury, or mortality of least Bell's vireo. If least Bell's vireo were to nest in or adjacent to work areas, construction-related noise and visual disturbances during the breeding season could mask calls, disrupt foraging and nesting behaviors, and reduce the functions of nesting habitat for the species. Implementation of Environmental Commitments EC-1: *Conduct Environmental Resources Worker Awareness Training*, EC-2: *Develop and Implement Hazardous Materials Management Plans*, EC-3: *Develop and Implement Spill Prevention, Containment, and Countermeasure Plans*, EC-11: *Fugitive Dust Control*, and EC-14: *Construction Best Management Practices for Biological Resources* (Appendix C1) would reduce these potential effects by training construction staff on the needs of protecting the species, reporting requirements, and the ramifications for not following these measures; implementing spill prevention and containment plans that would avoid material spills that could affect suitable habitat; reducing the potential for discharge of construction-related dust; ensuring that temporarily disturbed areas are restored; and by having a biological monitor present that would ensure that nondisturbance buffers are intact and all other protective measures are being implemented, where applicable.

Maintenance activities under all action alternatives could affect least Bell's vireo.

The CMP (Appendix C3) would offset the loss of recolonization habitat (Appendix C3, Sections 3F.3.2.3 and 3F.3.3.1 and Attachment C3.1, Table 3F.1-3, CMP-21—*Least Bell's Vireo*) by creating riparian habitat on Bouldin Island and at the I-5 ponds and managing these areas in perpetuity. Channel margin restoration would include riparian plantings on rock benches (Appendix C3, Section 3F.4.3.3.3) that may provide habitat for least Bell's vireo.

The CMP could affect least Bell's vireo through restoration activities at the I-5 ponds and on Bouldin Island and from the management of land under site protection instruments. The CMP and site-specific permitting approvals would account for any losses of least Bell's vireo habitat from habitat creation by adjusting the overall commitment of riparian creation (Appendix C3, Sections 3F.1 and 3F.2.4 and Attachment C3.1, Table 3F.1-2, CMP-0—*General Design Guidelines*).

The CMP would also have the potential to increase least Bell's vireo exposure to selenium, methylmercury, and cyanobacterial harmful algal blooms; however, as discussed in detail in Delta Conveyance Project Draft EIR Chapter 13, *Terrestrial Biological Resources* (California Department of Water Resources 2022), these potential effects would be reduced through water quality monitoring plans or would not be expected to result in adverse effects on the species.

Compared to the No Action Alternative, the action alternatives would result in effects on least Bell's vireo. Through the CMP (Appendix C3) and Mitigation Measures AES-4b: *Minimize Fugitive Light from Portable Sources Used for Construction*, AES-4c: *Install Visual Barriers along Access Routes, Where Necessary, to Prevent Light Spill from Truck Headlights toward Residences*, NOI-1: *Develop and Implement Noise Control Plan Including Site-Specific Measures*, BIO-2b: *Avoid and Minimize Impacts* *on Terrestrial Biological Resources from Maintenance Activities*, BIO-2c: *Electrical Power Line Support Placement*, and BIO-42: *Conduct Surveys and Minimize Impacts on Least Bell's Vireo*, these effects would be reduced.

Based on the information presented above, including proposed mitigation measures, environmental commitments, and implementation of the CMP, the effect of all action alternatives on least Bell's vireo does not appear to be significant.

Impact BIO-43: Effects of the Project on Suisun Song Sparrow and Saltmarsh Common Yellowthroat

No Action Alternative

The extent of the Suisun song sparrow and saltmarsh common yellowthroat habitat in the study area would not significantly change under the No Action Alternative because direct fill of this habitat would be limited to small discrete areas relative to the extent of this habitat available in the study area and within the geographic regions analyzed.

A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly modify habitat for these species in the study area. Periodic levee and channel maintenance activities associated with current strategies would result in localized disturbances to habitat for Suisun song sparrow and saltmarsh common yellowthroat.

Many existing and planned projects and programs would include tidal restoration, which increases the quality of Suisun song sparrow and saltmarsh common yellowthroat habitat in the study area. In the longer term, both gradual and catastrophic natural phenomena could affect the mix of open water, tidal wetland, agricultural and riparian forest natural communities in the study area through continued land subsidence on Delta islands, levee degradation and potential failure from floods or seismic events, and climate change. Based on trends in land use conversions in the Delta during recent years, these natural changes would result in the conversion of additional cultivated land and possibly managed wetlands to tidal wetlands and tidal perennial aquatic.

Water reliability projects listed in Table 3.5-2 would not likely result in effects on Suisun song sparrow habitat because the northern coastal region, which includes portions of the study area, would not likely have an effect on where habitat for this species is located. Projects across all other regions could affect habitat for common yellowthroat. These projects would include the construction of storage basins, conveyance canals, pipelines, pump stations, and associated buildings; however, the amount of habitat removed would be in discrete locations and of minimal size. Groundwater recovery projects could also reduce available groundwater supporting saltmarsh common yellowthroat habitat if pumping occurs in proximity to these habitats and at a depth that actually affects shallow groundwater supporting these habitats. The potential for effects from these projects will vary by region and watershed but could be significant for areas where wetlands are dependent on groundwater and pumping occurs at shallow depths.

All Action Alternatives

The construction of the action alternatives would not affect Suisun song sparrow or saltmarsh common yellowthroat (Appendix I1, Table I1-84). The modeled habitat for these species (Appendix I3, Figure 13B.82-1 and Figure 13B.86-1) is more than 11 miles from the nearest infrastructure for the action alternatives and more than 14 miles from the nearest occurrences (California Department of Fish and Wildlife 2020).

The maintenance of the water-conveyance facilities under all action alternatives would not result in effects on Suisun song sparrow or saltmarsh common yellowthroat due to the distance of modeled and known occupied habitat from the infrastructure and any affected Delta waterways. The implementation of the CMP would not result in effects on Suisun song sparrow or saltmarsh common yellowthroat, and none of the measures in the plan would specifically benefit these species because the locations of compensatory mitigation sites are outside of the known species' ranges.

Based on the information presented above, the effect of all action alternatives on Suisun song sparrow and saltmarsh common yellowthroat does not appear to be significant.

Impact BIO-44: Effects of the Project on Tricolored Blackbird

No Action Alternative

The gradual conversion of cultivated land and grassland in the study area under existing and planned projects and programs could affect tricolored blackbird through the loss of foraging habitat; however, there are also plans to continue and expand partnerships with agricultural interests to manage croplands for wildlife-friendly crops. Many of the programs in the area would include wetland creation and protection, which increase the amount of nesting habitat in the study area. In the longer term, both gradual and catastrophic natural phenomena could affect agriculture in the study area through continued land subsidence on Delta islands, levee degradation and potential failure from floods or seismic events, and climate change. Despite the potential conversion of habitat, the concerted policies and programs would likely ensure that habitat persists for tricolored blackbird in the study area.

Water reliability projects listed in Table 3.5-2 could result in effects on nesting and foraging habitat in all regions due to the construction of water recycling, groundwater management, and groundwater recovery projects, which would include construction of storage basins, conveyance canals, pipelines, pump stations, and associated buildings; however, the amount of habitat removed would be in discrete locations and of minimal size. Groundwater recovery projects could also reduce available groundwater supporting tricolored blackbird habitat if pumping occurs in proximity to wetland habitats and at a depth that actually affects shallow groundwater supporting these communities. The potential for effects from these projects will vary by region and watershed but could be significant for areas where wetlands are dependent on groundwater and pumping occurs at shallow depths.

All Action Alternatives

The construction of all action alternatives would affect modeled habitat for tricolored blackbird (Appendix I1, Table I1-85). However, there would be no permanent or temporary loss of previously occupied habitat under any action alternative. Loss of potentially suitable nesting habitat would occur primarily from the construction of levee improvements and areas on Bouldin Island (Alternatives 1 and 2b) and on Lower Roberts Island (Alternatives 3, 4b, and DWR's Preferred Alternative; Delta Conveyance Project Draft EIR Appendix 13C [California Department of Water Resources 2022]). Suitable nesting habitat also meets habitat criteria for nighttime roosting habitat during the nonbreeding season (August 1 through March 14), and thus roosting birds could potentially be affected by construction in these areas. Loss of foraging habitat would occur primarily from the construction of the Southern Forebay (Alternatives 1, 2b, 3, and 4b) and the placement of RTM (all action alternatives).

Alternative 1 would result in the greatest effects on modeled tricolored blackbird habitat and DWR's Preferred Alternative the fewest.

Construction activities associated with all action alternatives could result in the disruption of normal behaviors, injury, and mortality of tricolored blackbirds. Risk of injury or mortality would be greatest to eggs and nestlings, which are susceptible to land-clearing activities, nest abandonment, or increased exposure to the elements or to predators. Injury to adults and fledged juveniles is less likely, as these individuals are mobile and have the ability to avoid contact with construction equipment. Implementation of Environmental Commitments EC-1: *Conduct Environmental Resources Worker Awareness Training*, EC-2: *Develop and Implement Hazardous Materials Management Plans*, EC-3: *Develop and Implement Spill Prevention, Containment, and Countermeasure Plans*, EC-11: *Fugitive Dust Control*, and EC-14: *Construction Best Management Practices for Biological Resources* (Appendix C1) would reduce these potential effects by training construction staff on the needs of protecting nesting tricolored blackbirds, reporting requirements, and the ramifications for not following these measures; implementing spill prevention and containment plans that would avoid material spills that could affect suitable habitat; reducing the potential for discharge of construction-related dust; ensuring that temporarily disturbed areas are restored; and by having a biological monitor present that would ensure that nondisturbance buffers are intact and all other protective measures are being implemented, where applicable.

Maintenance activities of all action alternatives could result in effects on tricolored blackbird.

The CMP would offset the loss of tricolored blackbird previously occupied colony habitat (occupied in the last 15 years) and occupied nesting habitat by protecting tricolored blackbird colonies or by restoring and managing nesting habitat (Appendix C3, Attachment C3.1, Table 3F.1-3, CMP-22a—*Tricolored Blackbird Habitat – Nesting Habitat*) and associated foraging habitat *(*Appendix C3, Attachment C3.1, Table 3F.1-3, CMP-22b—*Tricolored Blackbird Habitat – Foraging*).

The CMP could affect tricolored blackbird through restoration activities at the I-5 ponds, on Bouldin Island, from tidal restoration, from channel margin enhancement, and from the management of lands under site protection instruments. The CMP and site-specific permitting approvals would account for any losses of tricolored blackbird occupied nesting habitat from habitat creation by adjusting the overall commitment (Appendix C3, Sections 3F.1 and 3F.2.4 and Attachment C3.1, Table 3F.1-2, CMP-0—*General Design Guidelines*).

The CMP would also have the potential to increase tricolored blackbird exposure to selenium, methylmercury, and cyanobacterial harmful algal blooms; however, as discussed in detail in Delta Conveyance Project Draft EIR Chapter 13, *Terrestrial Biological Resources* (California Department of Water Resources 2022), these potential effects would be reduced through water quality monitoring plans or would not be expected to result in adverse effects on the species.

Compared to the No Action Alternative, the action alternatives would result in effects on tricolored blackbird. Through the CMP (Appendix C3) and Mitigation Measures AES-4b: *Minimize Fugitive Light from Portable Sources Used for Construction*, AES-4c: *Install Visual Barriers along Access Routes, Where Necessary, to Prevent Light Spill from Truck Headlights toward Residences*, NOI-1: *Develop and Implement Noise Control Plan Including Site-Specific Measures*, BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities*, BIO-2c: *Electrical Power Line Support*

Placement, and BIO-44: *Conduct Preconstruction Surveys and Implement Protective Measures to Avoid Disturbance of Tricolored Blackbird*, these effects would be reduced.

Based on the information presented above, including proposed mitigation measures, environmental commitments, and implementation of the CMP, the effect of all action alternatives on tricolored blackbird does not appear to be significant.

Impact BIO-45: Effects of the Project on Bats

Bat species analyzed include pallid bat, Townsend's big-eared bat, big brown bat, silver-haired bat, western red bat, hoary bat, California myotis, little brown bat, western small footed myotis, Yuma myotis, western pipistrelle, western mastiff bat, and Mexican free-tailed bat.

No Action Alternative

The extent of areas that could support bat habitat in the study area would not significantly change under the No Action Alternative when considering the balance of likely sources of loss and programs to protect and create habitat in the Delta. A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly modify habitats in the study area.

Many existing and planned projects and programs would include the creation, protection, and management of a variety of habitats that could be used by bats for foraging and tree roosting. Construction associated with these programs would need to comply with state laws and regulations protecting roosting bats.

Water reliability projects listed in Table 3.5-2 could result in effects on bats in all regions for the construction of all project types, which could result in habitat conversions and direct effects on roosting bats. Construction associated with these projects would need to comply with state regulations protecting roosting bats.

All Action Alternatives

The construction of all action alternatives would result in permanent and temporary effects on modeled habitat for bats. The implementation of Environmental Commitment EC-14: *Construction Best Management Practices for Biological Resources* would ensure that temporarily disturbed areas are restored (Appendix C1).

Construction activities associated with all facilities under all action alternatives have a potential for injury, mortality, and the disruption of normal behaviors (i.e., foraging, roosting, breeding) of bats. Implementation of Environmental Commitments EC-1: *Conduct Environmental Resources Worker Awareness Training* and EC-14: *Construction Best Management Practices for Biological Resources* (Appendix C1) would ensure that construction staff are trained on the needs of protecting bat colonies, reporting requirements, and the ramifications for not following these measures and reduce these potential effects by having a qualified biological monitor present and implementing nondisturbance buffers using construction fencing, where applicable.

Alternative 1 would result in the greatest effects on modeled bat habitat and DWR's Preferred Alternative the fewest.

The maintenance of aboveground water-conveyance facilities for all action alternatives infrastructure could result in effects on bats.

The CMP would offset the loss of bat tree roosting habitat by creating and protecting riparian habitat on Bouldin Island and at the I-5 ponds and managing these areas in perpetuity (Appendix C3, Section 3F.3.2.3). Bat foraging habitat losses would be offset by creating and protecting wetlands, riparian, and grasslands on Bouldin Island and at the I-5 ponds (Appendix C3, Sections 3F.3.2 and C3.3.3) and through the protection and management of agricultural foraging habitat for sandhill cranes, Swainson's hawk, and tricolored blackbird, which would also generally benefit foraging bats, in particular on lands managed for tricolored blackbird, which have limitations on insecticide use (Appendix C3, Attachment C3.1, Table 3F.1-3). Channel margin restoration would include riparian plantings on rock benches (Appendix C3, Section 3F.4.3.3.3) that may provide for future tree roosting bat habitat once trees mature.

The CMP could affect bats through restoration activities at the I-5 ponds, on Bouldin Island, from tidal restoration, from channel margin enhancement, and from the management of lands under site protection instruments. The CMP and site-specific permitting approvals would ensure no significant loss of habitat or habitat value (Appendix C3, Section 3F.2.4 and Attachment C3.1, Table 3F.1-2, CMP-0—*General Design Guidelines*).

Compared to the No Action Alternative, the action alternatives would result in effects on bats. Through the CMP (Appendix C3) and Mitigation Measures AES-4b: *Minimize Fugitive Light from Portable Sources Used for Construction*, BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities*, and BIO-45b: *Avoid and Minimize Impacts on Roosting Bats*, these effects would be reduced.

Based on the information presented above, including proposed mitigation measures, environmental commitments, and implementation of the CMP, the effect of all action alternatives on bats does not appear to be significant.

Impact BIO-46: Effects of the Project on San Joaquin Kit Fox

No Action Alternative

The extent of San Joaquin kit fox habitat in the study area would not significantly change under the No Action Alternative because effects on this habitat would be limited to small discrete areas relative to the extent of this habitat in the study area, which in itself is very small. A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly affect San Joaquin kit fox.

Existing and planned projects and programs would not likely result in significant effects on or benefits to San Joaquin kit fox because their potential habitat is largely outside of where these actions take place.

Water reliability projects in Table 3.5-2 could result in effects on San Joaquin kit fox habitat from the construction of water recycling, groundwater management, and groundwater recovery projects across the northern and southern inland regions. These projects would include the construction of storage basins, conveyance canals, pipelines, pump stations, and associated buildings; however, the amount of habitat removed would be in discrete locations and of minimal size. Effects would be limited to surface disturbances.

All Action Alternatives

The construction of Alternatives 1, 2b, 3, and 4b would not result in effects on modeled habitat for San Joaquin kit fox.

The construction of DWR's Preferred Alternative via the Bethany Reservoir alignment would result in the permanent and temporary loss of San Joaquin kit fox modeled habitat as a result of grading and excavation (Appendix I1, Table I1-88). The implementation of Environmental Commitment EC-14: *Construction Best Management Practices for Biological Resources* would ensure that temporarily disturbed areas are restored (Appendix C1).

Construction of all action alternatives could result in the injury, mortality, and disruption of normal behaviors of San Joaquin kit fox if they are active in these areas during construction. Implementation of Environmental Commitments EC-1: *Conduct Environmental Resources Worker Awareness Training*, EC-2: *Develop and Implement Hazardous Materials Management Plans*, EC-3: *Develop and Implement Spill Prevention, Containment, and Countermeasure Plans*, and EC-14: *Construction Best Management Practices for Biological Resources* (Appendix C1) would reduce the potential for injury and mortality by having a biological monitor present, ensuring trenches are covered at the end of the day or escape ramps are installed, by limiting construction vehicle traffic to a maximum speed limit of 15 miles per hour, by properly disposing of trash, by reducing the potential for discharge of construction materials in areas of potential habitat, and by keeping the work area free of firearms and pets.

The maintenance of the Bethany Reservoir discharge structure and associated access road under DWR's Preferred Alternative could result in effects on San Joaquin kit fox.

The CMP does not include specific compensatory mitigation for San Joaquin kit fox. The proposed mitigation for California red-legged frog and California tiger salamander (Appendix C3, Section 3F.3.3.3 and Attachment C3.1, Table 3F.1-3) could provide benefits to San Joaquin kit fox through the protection of grasslands associated with aquatic habitats. As specified in Appendix C3, Attachment C3.1, Table 3F.1-3, CMP-13—*California Tiger Salamander Habitat* and CMP-14 – *California Red-Legged Frog Habitat*, mitigation for those species would be prioritized in recovery areas for both species, which overlap with the range of San Joaquin kit fox.

Implementation of the CMP could result in effects on dispersing San Joaquin kit fox in the event that non-bank sites are used for vernal pool or alkaline wetland creation or enhancement; however, the likelihood of this happening is low.

Compared to the No Action Alternative, the action alternatives would result in effects on San Joaquin kit fox. Through the CMP (Appendix C3) and Mitigation Measures BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities*, BIO-22b: *Avoid and Minimize Operational Traffic Impacts on Wildlife*, and BIO-46: *Conduct Preconstruction Survey for San Joaquin Kit Fox and Implement Avoidance and Minimization Measures*, these effects would be reduced.

Based on the information presented above, including proposed mitigation measures, environmental commitments, and the protection of grasslands from implementation of the CMP, the effect of all action alternatives on San Joaquin kit fox does not appear to be significant.

Impact BIO-47: Effects of the Project on American Badger

No Action Alternative

The extent of American badger habitat in the study area would not significantly change under the No Action Alternative because effects on this habitat would be limited to small discrete areas relative to the extent of this habitat available in the study area. A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly affect American badger.

Existing and planned projects and programs would not likely result in significant effects on or benefits to American badger because their potential habitat is largely outside of where these actions take place; however, the programs do include protections of grasslands that may provide habitat for this species.

Water reliability projects in Table 3.5-2 could result in effects on American badger habitat from the construction of water recycling, groundwater management, and groundwater recovery projects across all regions. These projects would include the construction of storage basins, conveyance canals, pipelines, pump stations, and associated buildings; however, the amount of habitat removed would be in discrete locations and of minimal size. Effects would be limited to surface disturbances.

All Action Alternatives

The construction of all the action alternatives would affect modeled habitat for American badger. Construction effects would include the permanent and temporary loss of habitat and habitat fragmentation. The implementation of Environmental Commitment EC-14: *Construction Best Management Practices for Biological Resources* would ensure that temporarily disturbed areas are restored (Appendix C1).

Construction activities for all action alternatives could result in the injury, mortality, and disruption of foraging, breeding, and dispersal of American badgers. Implementation of Environmental Commitments EC-1: *Conduct Environmental Resources Worker Awareness Training*, EC-2: *Develop and Implement Hazardous Materials Management Plans*, EC-3: *Develop and Implement Spill Prevention, Containment, and Countermeasure Plans*, and EC-14: *Construction Best Management Practices for Biological Resources* (Appendix C1) would reduce the potential for injury and mortality by training construction staff on the needs of protecting American badger, reporting requirements, and the ramifications for not following these measures; by having a biological monitor present that would ensure that nondisturbance buffers and associated construction fencing are intact and all other protective measures are being implemented; ensuring trenches are covered at the end of the day or escape ramps are installed; by limiting construction vehicle traffic to a maximum speed limit of 15 miles per hour on unpaved nonpublic construction access roads; by properly disposing of trash; by reducing the potential for discharge of construction materials in areas of potential habitat; and by keeping the work area free of firearms and pets.

Alternative 1 would result in the greatest effects on modeled habitat for American badger and DWR's Preferred Alternative the fewest.

The maintenance of aboveground water-conveyance facilities for all action alternatives could result in effects on American badger, including injury, mortality, and disruption of normal behaviors.

The CMP does not include specific compensatory mitigation for American badger; however, with its creation and protection of grasslands on Bouldin Island (Appendix C3, Section 3F.3.3.2) and through the protection of upland grasslands as part of California red-legged frog and California tiger salamander mitigation (Appendix C3, Section 3F.3.3.3 and Attachment C3.1, Table 3F.1-3), habitat that could be used by American badger would be conserved.

The CMP could affect American badger through restoration activities at the I-5 ponds, on Bouldin Island, from tidal restoration, from channel margin enhancement, in the event that non-bank sites are used for vernal pool or alkaline wetland creation or enhancement, and also from the management of lands under site protection instruments. The CMP and site-specific permitting approvals would ensure no significant loss of habitat or habitat value (Appendix C3, Section 3F.2.4 and Attachment C3.1, Table 3F.1-2, CMP-0—*General Design Guidelines*).

Compared to the No Action Alternative, the action alternatives would result in effects on American badger. Through the CMP (Appendix C3) and Mitigation Measures BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities*, BIO-22b: *Avoid and Minimize Operational Traffic Impacts on Wildlife*, and BIO-47: *Conduct Preconstruction Survey for American Badger and Implement Avoidance and Minimization Measures*, these effects would be reduced.

Based on the information presented above, including proposed mitigation measures, environmental commitments, and the creation and protection of upland grasslands with implementation of the CMP, the effect of all action alternatives on American badger does not appear to be significant.

Impact BIO-48: Effects of the Project on San Joaquin Pocket Mouse

No Action Alternative

The extent of San Joaquin pocket mouse habitat in the study area would not significantly change under the No Action Alternative because effects on this habitat would be limited to small discrete areas relative to the extent of this habitat available in the study area. A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly affect San Joaquin pocket mouse.

Existing and planned projects and programs would not likely result in significant effects on or benefits to San Joaquin pocket mouse because their potential habitat is largely outside of where these actions take place; however, the programs do include protections of grasslands that may provide habitat for this species.

Water reliability projects in Table 3.5-2 could result in effects on San Joaquin pocket mouse habitat from the construction of water recycling, groundwater management, and groundwater recovery projects in the northern and southern inland regions. These projects would include the construction of storage basins, conveyance canals, pipelines, pump stations, and associated buildings; however, the amount of habitat removed would be in discrete locations and of minimal size. Effects would be limited to surface disturbances.

All Action Alternatives

The construction of all action alternatives would affect modeled habitat for San Joaquin pocket mouse through the permanent and temporary loss of habitat and habitat fragmentation. The implementation of Environmental Commitment EC-14: *Construction Best Management Practices for Biological Resources* would ensure that temporarily disturbed areas are restored (Appendix C1).

Construction activities for all action alternatives could result in the injury, mortality, and disruption of feeding, breeding, and dispersal of San Joaquin pocket mouse. Implementation of Environmental Commitments EC-1: *Conduct Environmental Resources Worker Awareness Training*, EC-2: *Develop and Implement Hazardous Materials Management Plans*, EC-3: *Develop and Implement Spill Prevention, Containment, and Countermeasure Plans*, and EC-14: *Construction Best Management Practices for Biological Resources* (Appendix C1) would reduce the potential for injury and mortality by training construction staff on the needs of protecting sensitive biological resources, reporting requirements, and the ramifications for not following these measures; by having a biological monitor present that would ensure that nondisturbance buffers and associated construction fencing are intact and all other protective measures are being implemented; ensuring trenches are covered at the end of the day or escape ramps are installed; by limiting construction vehicle traffic to a maximum speed limit of 15 miles per hour on unpaved nonpublic construction access roads; by properly disposing of trash; by reducing the potential for discharge of construction materials in areas of potential habitat; and by keeping the work area free of firearms and pets.

Alternative 1 would result in the greatest effects on modeled habitat for San Joaquin pocket mouse and DWR's Preferred Alternative the fewest.

The maintenance of aboveground water-conveyance facilities for all action alternatives could result in effects on San Joaquin pocket mouse, including injury, mortality, and disruption of normal behaviors.

The CMP does not include specific compensatory mitigation for San Joaquin pocket mouse; however, with the CMP's creation and protection of grasslands on Bouldin Island (Appendix C3, Section 3F.3.3.2) and through the protection of upland grasslands as part of California red-legged frog and California tiger salamander mitigation, which would involve purchasing conservation credits at a USFWS- and CDFW-approved conservation bank (Appendix C3, Section 3F.3.3.3 and Attachment C3.1, Table 3F.1-3), habitat that could be used by San Joaquin pocket mouse would be conserved.

The CMP could affect San Joaquin pocket mouse through restoration activities at the I-5 ponds, on Bouldin Island, from tidal restoration, from channel margin enhancement, in the event that non-bank sites are used for vernal pool or alkaline wetland creation or enhancement, and also from the management of lands under site protection instruments. The CMP would ensure that there is no significant loss of habitat or habitat value by adjusting the overall commitment (Appendix C3, Section 3F.2.4 and Attachment C3.1, Table 3F.1-2, CMP-0—*General Design Guidelines*).

Compared to the No Action Alternative, the action alternatives would result in effects on San Joaquin pocket mouse. Through the CMP (Appendix C3) and Mitigation Measures BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities* and BIO-22b: *Avoid and Minimize Operational Traffic Impacts on Wildlife*, effects would be reduced.

Based on the information presented above, including proposed mitigation measures, environmental commitments, and the creation and protection of grasslands from implementation of the CMP, the effect of all action alternatives on San Joaquin pocket mouse does not appear to be significant.

Impact BIO-49: Effects of the Project on Salt Marsh Harvest Mouse

No Action Alternative

The extent of the salt marsh harvest mouse habitat in the study area would not significantly change under the No Action Alternative because direct fill of this habitat would be limited to small discrete areas relative to the extent of this habitat available in the study area and within the geographic regions analyzed.

A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly modify habitat for this species in the study area. Periodic levee and channel maintenance activities associated with current strategies would result in localized disturbances to habitat for salt marsh harvest mouse.

Many existing and planned projects and programs would include tidal restoration, which increases the quality of salt marsh harvest mouse habitat in the study area. In the longer term, both gradual and catastrophic natural phenomena could affect the mix of open water, tidal wetland, agricultural, and riparian forest natural communities in the study area through continued land subsidence on Delta islands, levee degradation and potential failure from floods or seismic events, and climate change. Based on trends in land use conversions in the Delta during recent years, these natural changes would result in the conversion of additional cultivated land and possibly managed wetlands to tidal wetlands and tidal perennial aquatic.

Water reliability projects listed in Table 3.5-2 would not likely result in effects on salt marsh harvest mouse because the northern coastal region, which includes the southwestern portion of the study area, would not likely have an effect on where habitat for this species is located, which is found in the northwestern portion of the study area.

All Action Alternatives

The construction of the action alternatives would not affect salt marsh harvest mouse. The modeled habitat for salt marsh harvest mouse is more than 9 miles from the nearest infrastructure for the action alternatives (i.e., the park-and-ride lot on SR 12), which is approximately 10 miles from the nearest CNDDB record (California Department of Fish and Wildlife 2020).

The maintenance activities of all action alternatives would not result in effects on salt marsh harvest mouse because of the distance of modeled and known occupied habitat from the infrastructure.

The implementation of the CMP would not result in effects on salt marsh harvest mouse or benefits to the species because the locations of these activities are outside of the known range of the species.

Based on the information presented above, there would be no impact on salt marsh harvest mouse

Impact BIO-50: Effects of the Project on Riparian Brush Rabbit

No Action Alternative

The extent of the riparian brush rabbit habitat in the study area would not significantly change under the No Action Alternative when considering the balance of likely sources of loss and programs to protect and create riparian habitat in the Delta. A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly modify valley/foothill riparian habitat in the study area. Periodic levee and channel maintenance activities associated with current strategies would result in localized disturbances on riparian brush rabbit habitat.

Many existing and planned projects and programs would include riparian creation and protection, which increase the quality of riparian brush rabbit habitat in the study area if it takes place in the southern portion of the study area. Projects in the vicinity include levee repairs, improvements, and some setbacks, which would result in the permanent loss of riparian in those areas due to current policies not allowing the planting of riparian on levees. In the longer term, both gradual and catastrophic natural phenomena could affect the mix of open water, tidal wetland, agricultural, and riparian forest natural communities in the study area through continued land subsidence on Delta islands, levee degradation and potential failure from floods or seismic events, and climate change.

Water reliability projects listed in Table 3.5-2 would not result in effects on riparian brush rabbit because the species' known range is outside of the regions analyzed.

All Action Alternatives

The construction of the action alternatives, including future field investigations, would not affect riparian brush rabbit. The modeled habitat for riparian brush rabbit is approximately 4.5 miles southeast of the nearest infrastructure for the action alternatives (road improvements north of SR 4), which is approximately 10 miles from the nearest CNDDB record (California Department of Fish and Wildlife 2020).

The maintenance activities of all action alternatives would not result in effects on riparian brush rabbit because of the distance of modeled and known occupied habitat from the infrastructure.

The implementation of the CMP would not result in effects on riparian brush rabbit or benefits to the species because the locations of these activities are outside of the known range of the species.

Based on the information presented above, there would be no effect from the action alternatives on riparian brush rabbit.

Effects of the Alternatives on General Biological Resources

Impact BIO-51: Substantial Adverse Effect on State- or Federally Protected Wetlands or Waters (Including, but Not Limited to, Marsh, Vernal Pool, Coastal, etc.) through Direct Removal, Filling, Hydrological Interruption, or Other Means

No Action Alternative

The extent of aquatic resources in the study area would not significantly change under the No Action Alternative because direct fill of this community would be limited to small discrete areas relative to the extent of aquatic resources available in the study area and within the geographic regions analyzed.

A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly modify aquatic resources in the study area. Periodic levee and channel maintenance activities associated with current strategies would result in localized disturbances on aquatic resources.

Many existing and planned projects and programs would include aquatic resource restoration, which increases the quality of the wetlands and waters in the study area. In the longer term, both gradual and catastrophic natural phenomena could affect the mix of open water, tidal wetland, agricultural, and riparian forest natural communities in the study area through continued land subsidence on Delta islands, levee degradation and potential failure from floods or seismic events, and climate change. Based on trends in land use conversions in the Delta during recent years, these natural changes would result in the conversion of additional cultivated land and possibly managed wetlands to tidal wetlands and tidal perennial aquatic.

Water reliability projects listed in Table 3.5-2 could result in effects on aquatic resources in all regions for the construction of all projects. These projects would include the construction of desalination plants, storage basins, conveyance canals, pipelines, pump stations, and associated buildings; however, the amount of habitat removed would be in discrete locations and of minimal size. Groundwater recovery projects could also reduce available groundwater supporting wetlands and waters if pumping occurs in proximity to these habitats and at a depth that actually affects shallow groundwater supporting these communities. The potential for effects from these projects will vary by region and watershed but could be significant for areas where wetlands are dependent on groundwater and pumping occurs at shallow depths.

All Action Alternatives

The construction of all action alternatives would result in temporary (those lasting less than 1 year), long-term temporary (those lasting longer than 1 year), and permanent effects on aquatic resources, including wetlands, considered to be waters of the United States pursuant to CWA Section 404 or waters of the State under the Porter-Cologne Act. Temporary effects were defined as construction-related effects on aquatic resources that would persist for a period of less than 1 year and that would be addressed through restoration of the affected area to predisturbance conditions within 1 year of the initial effect. The estimated discharge of dredged and fill material into aquatic resources associated with the alternatives is provided in Table 3.5-11, which sets out totals for permanent, long-term temporary, and temporary effects. Construction may result in the permanent, long-term temporary, or temporary conversion or degradation of such aquatic resources through direct removal, filling, dredging, hydrological interruption (e.g., cofferdams, dewatering), and changes to water quality resulting from accidental discharges of construction-related materials. Construction effects related to water quality are addressed in Section 3.21, *Water Quality.* The majority of the effects for all action alternatives are on aquatic resources found in agricultural areas, such as agricultural ditches and seasonal wetlands found in agricultural fields. Alternative 1 (central alignment) would result in greater effects than Alternative 2b (central alignment), Alternative 3 (eastern alignment), Alternative 4b (eastern alignment), and DWR's Preferred Alternative (Bethany Reservoir alignment), largely from the levee improvements and access road improvements on Bouldin Island. DWR's Preferred Alternative would have significantly fewer effects because the alternative does not require the construction of a new forebay.

Construction-related grading, excavation, work area silt fencing, and material staging areas could result in permanent, long-term temporary, and temporary effects on aquatic resources through hydrological changes. The construction of facilities could permanently alter the topography or subsurface conditions and thus the supporting hydrology of nearby aquatic resources, resulting in changes in the natural hydroperiods, which could alter the size and condition of aquatic resources. Activities that may occur in construction work areas, such as the installation of silt fences, excavation of temporary borrow areas, and the stockpiling of construction materials and spoils, could also temporarily alter surface and subsurface hydrology of aquatic resources in the vicinity of work areas. The implementation of Environmental Commitments EC-1: *Conduct Environmental*

Resources Worker Awareness Training, EC-2: *Develop and Implement Hazardous Materials Management Plans*, EC-3: *Develop and Implement Spill Prevention, Containment, and Countermeasure Plans*, EC-4a: *Develop and Implement Erosion and Sediment Control Plans*, EC-4b: *Develop and Implement Stormwater Pollution Prevention Plans,* and EC-14: *Construction Best Management Practices for Biological Resources* would reduce the potential for discharge of construction materials into aquatic resources and ensure that temporarily disturbed areas are restored (Appendix C1).

Table 3.5-11. Estimated Discharge of Dredged and Fill Material into Aquatic Resources Associated with the Construction of Project Facilities (acres [a])

	Alternative 1	Alternative 2b	Alternative 3	Alternative 4b	DWR's Preferred Alternative
Wetlands					
Alkaline Wetland [b]	6.30	6.30	6.30	6.30	0.98
Seasonal Wetland	59.13	59.11	30.54	30.53	5.00
Vernal Pool	0.00	0.00	0.00	0.00	0.20
Forested Wetland	4.02	3.56	3.06	2.80	3.23
Scrub-Shrub Wetland	4.45	4.39	1.53	1.47	2.21
Freshwater Emergent Wetland	10.67	9.92	1.25	0.73	1.32
Wetlands Subtotal	84.57	83.28	42.68	41.83	12.94
Other Waters					
Agricultural Ditch	86.04	82.16	81.96	77.09	35.22
Conveyance Channel	22.42	22.42	22.42	22.42	0.40
Tidal Channel	31.88	28.03	20.56	17.20	10.74
Natural Channel	0.59	0.59	0.59	0.59	0.25
Depression	0.83	0.55	0.65	0.37	1.43
Other Waters Subtotal	141.76	133.75	126.18	117.67	48.04
Total	226.33	217.03	168.86	159.50	60.98

[a] Acres include permanent, long-term temporary, and temporary effects.

[b] The alkaline wetland acreage includes alkaline wetlands that fall within vernal pool complexes. As explained in the *Vernal Pool Complex* subsection of Delta Conveyance Project Draft EIR Section 13.1.2.1, *Land Cover Mapping Methods* (California Department of Water Resources 2022), the southwestern portion of the delineation study area near Clifton Court Forebay consists of a mosaic of vernal pools, alkaline seasonal wetlands, and grasslands that fall within vernal pool complexes mapped by Witham et al. (2014); therefore, some of these wetlands fall under the vernal pool complex natural community.

The maintenance of aboveground water-conveyance facilities for all action alternatives could result in the periodic disturbance of jurisdictional aquatic resources. No permanent loss or discharge of dredged and fill material would result from these activities.

The CMP would be used to ensure no net loss in the overall abundance, diversity, and condition of aquatic resources within the study area through the creation and protection of aquatic resources on Bouldin Island, through the purchase of mitigation credits for vernal pools and alkaline wetlands at an agency-approved mitigation bank, and through tidal marsh and channel margin mitigation either through restoration in the study area or through the purchase of mitigation credits at an agency-approved mitigation bank (Appendix C3, Section 3F.3.2).

The creation and enhancement of aquatic resources, as well as habitat for special-status species under the CMP (Appendix C3), on Bouldin Island and at the I-5 ponds would result in the permanent and temporary discharge of fill material into existing jurisdictional aquatic resources and the permanent and temporary alteration of hydrology from grading to create the appropriate topography and soil conditions to establish and enhance habitats. The CMP also includes a framework for channel margin enhancement and tidal wetland habitat creation. The activities to enhance channel margins would generally include removal of existing riprap, modification of the existing channel margin with heavy equipment, and placement of large woody debris on the channel margin, which would result in the permanent and temporary discharge of fill material into aquatic resources. Channel margin enhancement sites would be targeted within the same general geography of the project, including the north Delta along the Sacramento River mainstem, north Delta along Sacramento River tributaries (e.g., Steamboat, Sutter, and Elk Sloughs), lower Yolo Bypass, and Cache Slough Complex. Tidal restoration activities would include grading, creation of setback levees, planting, and breaching of existing levees, which would result in the permanent and temporary discharge of fill material into aquatic resources and permanent changes to hydrological conditions. Potential areas for tidal restoration would be within the lower Yolo Bypass and Cache Slough Complex.

In the event that non-bank sites are used for vernal pool or alkaline wetland creation or enhancement (Appendix C3, Section 3F.3.2.4), these activities could result in the temporary discharge of fill into aquatic resources enhanced or created adjacent to existing aquatic resources. Site-specific analyses are not provided because locations of potential non-bank sites are not currently known.

Site protection instruments (e.g., conservation easements, deed restrictions) for greater sandhill crane, Swainson's hawk, and tricolored blackbird would primarily consist of the protection and management of agricultural areas but may also include natural communities in the study area (Appendix C3, Section 3F.4.2.2, *Site Protection Instruments*, and Attachment C3.1, Table 3F.1-3, CMP-18a—*Sandhill Crane Roosting Habitat*, CMP-18b—*Sandhill Crane Foraging Habitat*, CMP-19a—*Swainson's Hawk Nesting Habitat*, CMP-19b—*Swainson's Hawk Foraging Habitat*, CMP-22a—*Tricolored Blackbird Habitat – Nesting Habitat*, and CMP-22b—*Tricolored Blackbird Habitat – Foraging*). These areas may contain aquatic resource and management activities in agricultural areas that could result in the temporary discharge of fill into these resources. Site-specific analyses are not provided because locations of potential protection instruments are not currently known.

As stated in Appendix C3, Section 3F.4, *Mitigation Work Plan*, the compensatory mitigation actions at Bouldin Island would be designed to provide compensatory mitigation for aquatic resources under both federal and state mitigation standards and ensures a net gain in aquatic resources, accounting for any conversions of existing aquatic resources (e.g., agricultural ditches converted to freshwater emergent wetland). Implementation of Environmental Commitments EC-1: *Conduct Environmental Resources Worker Awareness Training*, EC-3: *Develop and Implement Spill Prevention, Containment, and Countermeasure Plans*, EC-4a*: Develop and Implement Erosion and Sediment Control Plans*, EC-4b*: Develop and Implement Stormwater Pollution Prevention Plans*, and EC-14: *Construction Best Management Practices for Biological Resources* (Appendix C1) would reduce the potential temporary effect on aquatic resources by training construction staff on the needs of protecting aquatic resources and the ramifications for not following protective measures; implementing spill prevention, erosion, sediment, and stormwater pollution plans to ensure that grading for sites does not result in the transport of sediment and other materials into adjacent aquatic resources; and by having a biological monitor present that would ensure that nondisturbance buffers and associated construction fencing are intact and all other protective measures are being implemented where applicable.

Compared to the No Action Alternative, the action alternatives would result in effects on aquatic resources. Through the CMP (Appendix C3) and Mitigation Measure BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities*, effects would be reduced such that there is no net loss of aquatic resources.

Based on the information presented above, including proposed mitigation measures, environmental commitments, and implementation of the CMP, the effect of all action alternatives on state- or federally protected wetlands or waters does not appear to be significant.

Impact BIO-52: Effects of Project Construction and Operations from Invasive Plant Species

No Action Alternative

The potential for the introduction of invasive plants under the No Action Alternative would be ongoing from the ongoing proposed actions, programs, and other activities. A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly result in the spread of invasive plant species.

Many existing and planned projects and programs would include the creation, protection, and management of a variety of habitats that would likely include measures to avoid the spread of invasive plants and will actively plant native or noninvasive plants. Construction associated with these programs would need to comply with local and state regulations on the spread of invasive plants.

Water reliability projects listed in Table 3.5-2 could result in the introduction of invasive plants in all regions for the construction of all project types. Construction associated with these projects would need to comply with local and state regulations on the spread of invasive plants.

All Action Alternatives

Constructing the water-conveyance facilities would remove established natural vegetation, which would create opportunities for the introduction and spread of invasive and noxious plant species into the study area. Also, work constructed in aquatic habitat has the potential to result in the introduction and spread of aquatic invasive plant species. Implementation of Environmental Commitment EC-14: *Construction Best Management Practices for Biological Resources* (Appendix C1) would reduce the potential for the introduction and spread of invasive plants by restoring temporarily disturbed areas, reseeding areas with noninvasive species, and ensuring equipment used is cleaned and inspected before entering new areas.

Maintenance activities would take place in existing or developed facilities and would include management of invasive plants. Vegetation management would take place along the sedimentation basins, sediment drying lagoons, and Southern Forebay. Management actions would include removal of aboveground plants by mowing or trimming and would not include ground disturbance. Therefore, maintenance activities could not promote the invasion and spread of invasive plant species into terrestrial natural communities.

The creation and enhancement of wetlands and other waters as well as habitat for special-status species under the CMP could result in the spread of invasive plant species from equipment used to grade and excavate areas for restoration. Implementation of Environmental Commitment EC-14: *Construction Best Management Practices for Biological Resources* (Appendix C1) would reduce the potential for the spread of invasive plant species by cleaning and inspecting equipment used for grading and excavation.

Based on the information presented above, including the proposed environmental commitment, the effect of construction and operation from invasive species under all action alternatives does not appear to be significant.

Impact BIO-53: Interfere Substantially with the Movement of Any Native Resident or Migratory Fish or Wildlife Species or with Established Native Resident or Migratory Wildlife Corridors or Impede the Use of Native Wildlife Nursery Sites

No Action Alternative

The extent of areas that could support wildlife connectivity in the study area would not significantly change under the No Action Alternative when considering the balance of likely sources of loss and programs to protect and create habitat in the Delta. A continuation of current water management strategies used by state, federal, and local water purveyors would not significantly modify habitats in the study area.

Many existing and planned projects and programs would include the creation, protection, and management of a variety of habitats that could improve wildlife connectivity through the study area.

Water reliability projects listed in Table 3.5-2 could result in effects on wildlife connectivity resources in all regions for the construction of all project types.

All Action Alternatives

The construction of all action alternatives would result in permanent and temporary effects on terrestrial wildlife connectivity and existing connectivity resources. These effects would occur as a result of construction of access roads, rail lines, forebays, intake structures, levee improvements, outlet and control structures, park-and-ride facilities, transmission lines, switching stations, RTM areas, and tunnel shafts. Construction-related grading, excavation, vegetation removal, and habitat modifications (e.g., loss of vegetative structure, contiguity, cover, or canopy) would result in the permanent and temporary loss of or alteration of habitat and associated connectivity function or create new wildlife movement barriers. Construction noise and disturbances from increased human presence and lighting during night work could disrupt species movement and habitat selection, habitat access, and wildlife behavior potentially, resulting in effects on wildlife connectivity.

The effects vary across the study area, but generally Alternative 2b with the facilities constructed on Bouldin Island and the road improvements associated with the alternative would result in the greatest effects on wildlife connectivity, and DWR's Preferred Alternative would have the fewest due to not constructing a new forebay.

Maintenance activities could result in periodic temporary disturbances that could disrupt wildlife movement.

The CMP would offset the loss of wetlands, waters, and habitat for several special-status species through the creation of habitat on Bouldin Island and at the I-5 ponds and by managing these areas in perpetuity, as well as purchasing mitigation credits within the region for species requiring alkaline seasonal wetland, vernal pool complex, and grassland habitat (Appendix C3, Section 3F.3, *Mitigation Approach*). This mitigation will create habitat in perpetuity within areas identified as important core habitat and regional wildlife corridors and will support live-in, movement, migratory, and stopover habitat for a wide variety of species inhabiting the region.

The CMP could temporarily affect wildlife connectivity resources and wildlife movement from direct vegetation removal, grading, noise, and other disturbances to create the appropriate topography and soil conditions to establish or restore habitats. These activities would also have the potential for injury, mortality, habitat avoidance, and the disruption of normal behaviors and movements of individuals, which may have a temporary effect on habitat connectivity and wildlife movement.

Compared to the No Action Alternative, the action alternatives would result in effects on wildlife connectivity. Through the CMP (Appendix C3) and Mitigation Measures AES-4b: *Minimize Fugitive Light from Portable Sources Used for Construction*, AES-4c: *Install Visual Barriers along Access Routes, Where Necessary, to Prevent Light Spill from Truck Headlights toward Residences*, BIO-2b: *Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities*, BIO-22b: *Avoid and Minimize Operational Traffic Impacts on Wildlife*, and BIO-53: *Avoid and Minimize Impacts on Terrestrial Wildlife Connectivity and Movement*, these effects would be reduced.

Based on the information presented above, including proposed mitigation measures, environmental commitments, and implementation of the CMP, the effect of all action alternatives on terrestrial wildlife connectivity and existing connectivity resources does not appear to be significant.

Impact BIO-54: Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local, Regional, or State Habitat Conservation Plan

No Action Alternative

Under the No Action Alternative, existing and planned projects and programs would take place within plan areas of several habitat conservation plans (HCPs) and natural community conservation plans. Because the goals of many of these programs are to also contribute to the conservation of sensitive biological resources, they would generally not conflict with these plans. Some projects in Table 3.5-2 may be covered under the respective plans and would thus be constructed in a manner that ensures the effects are offset through plan participation.

Water reliability projects in Table 3.5-2 could result in construction that takes place across all regions analyzed, depending on the specific locations. Depending on the entity and location, some of these projects could be covered under the overlapping plans and if not would generally be of a size and scope that would not result in conflicts. Individual projects may be subject to environmental review, and specific conflicts would be addressed at that time.

All Action Alternatives

Construction of any of the action alternatives would result in permanent surface effects within the boundaries of the three overlapping conservation plans that could reduce the availability of land for acquisition, cause temporary effects that could affect quality of habitats and agricultural lands, and cause effects on species and natural communities covered by these plans. To quantify the potential effects of construction of the action alternatives on overlapping plans, the permanent surface effects of all action alternatives were identified (Appendix I1, Table I1-97).

The surface effects of all action alternatives represent less than 1% of the plan areas of each of the overlapping conservation plans. In general, the central alignment alternatives (Alternatives 1 and 2b) would have greater surface effects within the overlapping conservation plans than the eastern and Bethany Reservoir alignment alternatives (Alternatives 3, 4b, and DWR's Preferred Alternative), primarily due to the larger disturbance area on Bouldin Island. DWR's Preferred Alternative would have the least surface effects across all overlapping conservation plans because it does not include construction of the Southern Complex (Appendix I1, Table I1-97). No permanent surface effects would occur within existing or planned preserves for any of the overlapping conservation plans.

The maintenance of water-conveyance facilities would not result in additional surface effects within the overlapping conservation plans for all action alternatives.

The CMP would offset the loss of habitat for species and natural communities covered by the overlapping HCPs (Appendix C3, Sections 3F.3.2 and 3F.3.3 and Attachment C3.1, Tables 3F.1-2 and 3F.1-3) by providing compensatory mitigation. The mitigation approach includes initial mitigation actions at specific sites, purchase of mitigation credits at existing or proposed mitigation banks, and proposing a mitigation framework for future compensatory mitigation actions for tidal habitats.

Implementation of the CMP (Appendix C3) would include creation and enhancement of wetlands on Bouldin Island and ponds west of I-5, which would occur within the plan area of the San Joaquin County Multi-Species Habitat Conservation Plan (SJC MSHCP). These activities would occur on private and state-owned property and would not reduce the availability of conservation lands for the SJC MSHCP.

Compared to the No Action Alternative, the action alternatives would similarly not result in conflicts with approved conservation plans.

Based on the information presented above, including proposed mitigation measures, environmental commitments, and implementation of the CMP, the effect of all action alternatives on HCPs and natural community conservation plans does not appear to be significant.

Impact BIO-55: Conflict with Any Local Policies or Ordinances Protecting Biological Resources, Such as a Tree Preservation Policy or Ordinance

No Action Alternative

Under the No Action Alternative, existing and planned projects and programs would take place within the jurisdiction of various local agencies. Because the goals of many of these programs are to also contribute to the conservation of sensitive biological resources, they would generally not conflict with local policies and ordinances.

Water reliability projects in Table 3.5-2 could result in construction that takes place across all regions analyzed. Depending on the location, some of these projects could affect biological resources addressed in local policies and ordinances. Generally, the entity implementing these projects would need to comply with these policies and ordinances.

All Action Alternatives

The construction of all of the action alternatives would result in effects on terrestrial biological resources identified for protection in goals and policies of general plans and ordinances for local jurisdictions overlapping with the project footprint. Implementation of Environmental Commitment

EC-14: *Construction Best Management Practices for Biological Resources* would ensure that temporarily disturbed areas are restored (Appendix C1).

Alternative 1 would generally affect more biological resources identified for protection in goals and policies of general plans and ordinances for local jurisdictions and DWR's Preferred Alternative the fewest.

None of the action alternatives would result in effects on biological resources identified for protection in local policies and ordinances resulting from maintenance activities because even though some vegetation management would occur, it would be limited to mowing of grasses and trimming of shrubs and trees planted within water-conveyance facilities and not removal of habitats or protected trees.

The CMP would result in creation and protection of wetlands, riparian, and habitat for special-status species on Bouldin Island and at the I-5 ponds in San Joaquin County and the purchase of mitigation bank credits for vernal pool fairy shrimp, vernal pool tadpole shrimp, California tiger salamander, and California red-legged frog, which likely would take place in either Contra Costa, Alameda, or San Joaquin Counties (Appendix C3).

The CMP could affect biological resources identified for protection in local policies and ordinances through the removal of trees and temporary disturbances to habitat and the displacement of wildlife. Implementation of Environmental Commitments EC-1: *Conduct Environmental Resources Worker Awareness Training*, EC-3: *Develop and Implement Spill Prevention, Containment, and Countermeasure Plans*, and EC-14: *Construction Best Management Practices for Biological Resources* (Appendix C1) would reduce these potential effects.

Compared to the No Action Alternative, the action alternatives would result in effects on biological resources identified for protection in local policies and ordinances. Through the CMP, these effects would be reduced.

Based on the information presented above, including proposed mitigation measures, environmental commitments, and implementation of the CMP, the potential for the action alternatives to conflict with local policies or ordinances protecting biological resources does not appear to be significant.

3.5.2.2 Cumulative Analysis

The cumulative effects analysis for terrestrial biological resources addresses the potential for the action alternatives to act in combination with other past, present, and reasonably foreseeable future projects, programs, or conditions to create a cumulatively considerable effect.

The geographic scope of the analysis for natural communities, including regulated wetlands and waters, is the terrestrial biology study area and lands immediately adjacent to this study area where past, present, or reasonably foreseeable activities might indirectly affect the natural communities in the study area. While the natural communities extend beyond these boundaries, the focus of the actions that might affect these resources is the Delta. The geographic scope for cumulative effects from effects on wildlife connectivity includes the study area and all areas in the following counties: Sacramento, San Joaquin, Santa Clara, Alameda, Contra Costa, Solano, and Napa.

The projects and programs that have been considered as part of the cumulative analysis and their effects on terrestrial biological resources are summarized in Table 3.5-12.

1 **Table 3.5-12. Plans, Policies, and Programs Included in the Cumulative Analysis**

Program/ Project	Agency	Status	Description of Program/Project	Effects on Terrestrial Biological Resources
East Alameda County Conservation Strategy	Alameda County	Ongoing	The East Alameda County Conservation Strategy (EACCS) is intended to preserve endangered species with a plan for long-term habitat protection. The EACCS will assess the conservation value of East Alameda County to establish biological principles for conservation in that area. The EACCS will provide a framework for regional conservation of biological species, streamline the environmental permitting process, provide guidance to project proponents, and facilitate ongoing conservation programs. The EACCS will identify land suitable for voluntary mitigation or conservation, mitigation ratios, standards for habitat restorations, best management and maintenance practices for conservation sites, monitoring standards, and guidelines for adaptive management.	Beneficial effects on terrestrial biological resources.
CALFED Levee System Integrity Program	DWR, CDFW, USACE	Ongoing	The CALFED Record of Decision requires that the Levee System Integrity Program be managed to provide for long-term protection for Delta resources through maintenance and improvement of the Delta levee system. Goals are to protect life, infrastructure, and properties and reduce the risk to land use and associated economic activities, water supply, infrastructure, and ecosystem from catastrophic breaching of Delta levees. The primary focus is on the legal Delta as defined in Section 12220 of the California Water Code. Protection and maintenance of 1,300 miles of project and nonproject levees have taken place since the inception of the CALFED Levee System Integrity Program in 2000. Other major undertakings include restoration of native vegetation and reuse of dredged material to bolster levee stability. Major activities include levee maintenance, levee improvement, environmental mitigation, emergency response functions, and other components carried out using local funds, with additional funds provided by the state and federal governments. However, uncertainty in program funding has required that some goals be revised and schedules be extended. Proposition 50 provided $70 million for Delta levees.	Beneficial effects on a variety of wildlife with potential for effects on species during activities.
Lower Cache Creek/Woodland Flood Risk Management Project	City of Woodland, USACE, DWR, CVFPB	Planning phase	The Final EIR and Final EIS evaluate impacts associated with a proposed flood risk reduction project on lower Cache Creek. As part of the overall effort, USACE is also preparing a project feasibility study. Similarly, the City of Woodland is partnering with DWR through its Urban Flood Risk Reduction Program to identify and implement the flood risk reduction project to meet the State's urban level of protection requirements in a cost-effective manner that	Could result in effects on giant garter snake and other species that occur in the Cache Creek Settling

Program/ Project	Agency	Status	Description of Program/Project	Effects on Terrestrial Biological Resources
			would be compatible with and supportive of elements of the Integrated Watershed Monitoring Program. Project components include secondary earthen levees and a diversion channel to redirect overland flood flows into the Yolo Bypass, modification of the Cache Creek Settling Basin to allow conveyance of flood flows into the Yolo Bypass, and various bridge and/or culvert improvements to facilitate conveyance of flood flows in the diversion channel.	Basin and Yolo Bypass.
Submersed Aquatic Vegetation (SAV) Control Program	California State Parks Division of Boating and Waterways (DBW)	Ongoing	Previously known as the *Egeria densa* Control Program, the SAV Control Program is part of the California State Parks DBW Aquatic Invasive Plant Control Program (AIPCP). From 2001 through 2015, DBW operated the original *Egeria densa* Control Program (EDCP) in the Sacramento–San Joaquin Delta and its tributaries. With the addition of curlyleaf pondweed (*Potamogeton crispus* L.) in 2016, the program was renamed as the SAV Control Program. The program includes treatment with herbicides and annual environmental monitoring, pursuant to BiOps issued by USFWS and NMFS and the State Water Resources Control Board Statewide General NPDES permit.	Beneficial effects on freshwater marsh and aquatic habitats.
Floating Aquatic Vegetation (FAV) Control Program	California State Parks DBW	Ongoing	The FAV Control Program is part of the California State Parks DBW AIPCP. It was created in 2015 when DBW combined the Water Hyacinth (and Spongeplant) Control Program with the Water Primrose (*Ludwigia hexapetala*) Control Program. The program includes treatment with herbicides, mechanical harvesting, biological control (in partnership with USDA), hand picking, and annual environmental monitoring, pursuant to the AIPCP BiOps issued by USFWS and NMFS and the State Water Resources Control Board Statewide General NPDES permit.	Beneficial effects on freshwater marsh and aquatic habitats.
Private Lands Incentive Programs	CDFW	Ongoing	CDFW manages the California Waterfowl Habitat Program (Presley Program), a multi-faceted wetland incentive program designed to improve habitat for waterfowl on private lands. Consistent with its primary waterfowl habitat objectives, the program also endeavors to enhance habitat for shorebirds, wading birds, and other wetland-dependent species. The program pays private landowners $30/acre ($60/acre in the Tulare Basin) annually for a 10-year duration to implement habitat practices in accordance with a detailed management plan. In cooperation with Wildlife Conservation Board's Inland Wetland Conservation Program, CDFW also administers the Permanent Wetland Easement Program that pays willing landowners approximately 50%-70% of their property's fair market value to purchase the farming and development rights in perpetuity. Landowner retains many rights, including trespass rights, the right to hunt and/or operate a hunting club, and the ability	Beneficial effects on waterfowl.

Program/ Project	Agency	Status	Description of Program/Project	Effects on Terrestrial Biological Resources
			to pursue other types of undeveloped recreation (e.g., fishing, hiking). Easement landowners are required to follow a cooperatively developed wetland management plan. CDFW also administers the California Winter Rice Habitat Incentive Program to pay annual incentive payments of $15/acre to landowners for winter flooding of harvested rice fields for a minimum of 70 continuous days.	
California Aquatic Invasive Species Management Plan	CDFW	Ongoing	The California Aquatic Invasive Species Management Plan (CAISMP) was released in January 2008. The plan's overall goal is to identify the steps that need to be taken to minimize the harmful ecological, economic, and human health impacts of aquatic invasive species in California. This plan provides the state's first comprehensive, coordinated effort to prevent new invasions, minimize impacts from established aquatic invasive species, and establish priorities for action statewide. In addition, it proposes a process for annual plan evaluation and improvement so that aquatic invasive species can continue to be managed in the most efficient manner in the future. Eight major objectives and 163 actions were identified in the CAISMP.	Beneficial effects on terrestrial biological resources.
Aquatic Invasive Species Draft California Rapid Response Plan	CDFW	Ongoing	The CAISMP (described above) proposes an Aquatic Invasive Species Rapid Response Plan for the State of California. The Rapid Response Plan establishes a draft general procedure for rapid response following detection of new aquatic invasive species infestation. It provides a framework for developing and implementing a rapid response plan. It is preliminary in that it describes types of information, resources, and decisions necessary to finalize the plan. In order to finalize, fund, and implement the draft Rapid Response Plan, CDFW expects that cooperating agencies will assign staff to participate. CDFW Invasive Species Program staff will provide coordination for the interagency activities called for in the agreement(s).	Beneficial effects on freshwater marsh and aquatic habitats.
Bethany Dams Improvement Project	DWR	In progress	To ensure the long-term safety and operations of the State Water Project (SWP), DWR is conducting additional vegetation removal in the drainage ditches at Dams 1 and 2, removing accumulated sediment blocking the culvert in the drainage ditch at Dam 3, repairing existing rodent burrow damage on the dam faces, establishing a long-term, sustainable program of effective rodent control to reduce or eliminate further burrowing within the dam embankments, and performing annual maintenance to repair new rodent burrow damage at the four Bethany Reservoir Dams. Work for this project began in April 2021 for completion in 2022.	Potential effects on California tiger salamander and other terrestrial biological resources.
Lower Sherman Island Wildlife Area (LSIWA) Land	CDFW	Ongoing	The LSIWA occupies roughly 3,900 acres, primarily marsh and open water, at the confluence of the Sacramento and San Joaquin Rivers in the western Delta. This extensive tract of natural vegetation and Delta waters provides diverse	Beneficial effects on terrestrial biological resources.

Program/ Project	Agency	Status	Description of Program/Project	Effects on Terrestrial Biological Resources
Management Plan (LMP)			and valuable wildlife habitats and related recreational opportunities and is integral to the functioning and human use of the Delta. The mission of the CDFW is to manage California's diverse fish, wildlife, and plant resources and the habitats upon which they depend for their ecological values and for their use and enjoyment by the public. The LMP is consistent with that mission. The purpose of the LMP is to: (1) guide management of habitats, species, and programs described in the LMP to achieve the CDFW's mission to protect and enhance wildlife values; (2) serve as a guide for appropriate public uses of the LSIWA; (3) serve as descriptive inventory of fish, wildlife, and native plant habitats that occur on or use the LSIWA; (4) provide an overview of the property's operation and maintenance and of the personnel requirements associated with implementing management goals (this LMP also serves as a budget planning aid for annual regional budget preparation); and (5) present the environmental documentation necessary for compliance with state and federal statutes and regulations, provide a description of potential and actual environmental impacts that may occur during plan management, and identify mitigation measures to avoid or lessen these impacts.	
Yolo Bypass Wildlife Area Land Management Plan	CDFW	Ongoing	The Yolo Bypass Wildlife Area comprises approximately 16,770 acres of managed wildlife habitat and agricultural land within the Yolo Bypass. The bypass conveys seasonal high flows from the Sacramento River to help control river stage and protect the cities of Sacramento, West Sacramento, and Davis and other local communities, farms, and lands from flooding. Important environmental, social, and economic benefits are provided by the Yolo Bypass, benefiting the people of the State of California. The stated purposes of the Yolo Bypass Wildlife Area Land Management Plan are to: (1) guide the management of habitats, species, appropriate public use, and programs to achieve CDFW's mission; (2) direct an ecosystem approach to managing the Yolo Bypass Wildlife Area in coordination with the objectives of the CALFED ERP; (3) identify and guide appropriate, compatible public-use opportunities within the Yolo Bypass Wildlife Area; (4) direct the management of the Yolo Bypass Wildlife Area in a manner that promotes cooperative relationships with adjoining private-property owners; (5) establish a descriptive inventory of the sites and the wildlife and plant resources that occur in the Yolo Bypass Wildlife Area; (6) provide an overview of the Yolo Bypass Wildlife Area's operation, maintenance, and personnel requirements to implement management goals, and serve as a planning aid for preparation of the annual budget for the Bay-Delta Region (Region 3); and (7) present the environmental documentation necessary for compliance with state and federal	Beneficial effects on terrestrial biological resources.

Program/ Project	Agency	Status	Description of Program/Project	Effects on Terrestrial Biological Resources
			statutes and regulations, provide a description of potential and actual environmental impacts that may occur during plan management, and identify mitigation measures to avoid or lessen these impacts.	
Staten Island Wildlife-Friendly Farming Demonstration	CDFW	Ongoing	Acquisition and restoration of Staten Island (9,269 acres) by The Nature Conservancy to protect critical agricultural wetlands used by waterfowl and sandhill cranes. Phase II of this project improved wildlife-friendly agriculture to foster recovery of at-risk species and to investigate effects of agriculture on water quality. This demonstration project for wildlife-friendly agriculture practices increased habitat availability by flooding 2,500–5,000 acres of corn for a longer duration than previously possible. The demonstration project also determined the effect of winter flooding strategies on target bird species, namely greater sandhill crane and northern pintail in the Delta Ecological Management Zone.	Beneficial for cranes.
Restoring Ecosystem Integrity in the Northwest Delta	CDFW	Completed	Completed in 2015, this project acquired conservation easements within the Cache Slough complex, along the Barker, Lindsey, and Calhoun Sloughs, north Delta tidal channels located west of the Yolo Bypass. Acquisition of conservation easements on 978 acres of existing riparian, wetland, and/or agricultural lands.	Beneficial effects on terrestrial biological resources.
Suisun Marsh Habitat Management, Preservation, and Restoration Plan	CDFW, USFWS, Reclamation, and Suisun Marsh Charter Group	Ongoing	The Suisun Marsh Charter Group, a collaboration of federal, state, and local agencies with primary responsibility in Suisun Marsh, prepared the Suisun Marsh Habitat Management, Preservation, and Restoration Plan. The plan balances implementation of the CALFED Program, the Suisun Marsh Preservation Agreement, and other management and restoration programs within the Suisun Marsh in a manner that is based upon voluntary participation by private landowners and that responds to the concerns of interested parties. Charter agencies include Reclamation, DWR, USFWS, Delta Stewardship Council, Suisun Resource Conservation District, and NMFS. The Charter Group is charged with developing a regional plan that would outline the actions needed in Suisun Marsh to preserve and enhance managed seasonal wetlands, restore tidal marsh habitat, implement a comprehensive levee protection/improvement program, and protect ecosystem and drinking water quality. The plan would be consistent with the goals and objectives of the Bay-Delta Program and would balance those goals and objectives with the Suisun Marsh Preservation Agreement and federal and state endangered species programs within the Suisun Marsh. The Suisun Marsh Habitat Management, Preservation, and Restoration Plan also provides for simultaneous protections and enhancement of: (1) existing wildlife values in managed wetlands, (2) endangered species, (3) tidal marshes and other	Beneficial for marsh species.

Program/ Project	Agency	Status	Description of Program/Project	Effects on Terrestrial Biological Resources
			ecosystems, and (4) water quality, including, but not limited to, the maintenance and improvement of levees. Restoration projects that are expected to partially fulfill requirements of the Suisun Marsh Habitat Management, Preservation, and Restoration Plan include the Chipps Tidal Habitat Restoration Project, Arnold Slough Restoration Project, Bradmoor Island Restoration Project, Tule Red Tidal Restoration Project, and Wings Landing Tidal Habitat Restoration Project.	
Central Valley Vision	California State Parks	Ongoing	In 2003, California State Parks began work on a long-term Central Valley Vision to develop a strategic plan for State Parks expansion in the Central Valley. The plan will provide a 20-year road map for State Park actions to focus on increasing service to Valley residents and visitors. Within the Great Central Valley (San Joaquin Valley, Sacramento Valley, and the Delta region), California State Parks operates and maintains 32 state park units representing 7% of the total state park system acreage. Plans include: Delta Meadows River Park, Brannan Island SRA, Franks Tract SRA, Locke Boarding House, and San Joaquin and Sacramento Rivers. In 2008, California State Parks published a Draft Central Valley Vision Implementation Plan that focuses on meeting the public's recreation needs in the Central Valley 20 years into the future. It outlines planning options to develop new and improved recreation opportunities, acquire new park lands, and build economic and volunteer partnerships.	Beneficial effects on terrestrial biological resources.
Central Valley Flood Protection Plan	DWR	Ongoing	Central Valley Flood Protection Plan (CVFPP) is a sustainable, integrated flood management plan that reflects a system-wide approach for protecting areas of the Central Valley currently receiving protection from flooding by existing facilities of the State Plan of Flood Control (SPFC). The plan incorporates the SPFC and Flood Control System Status Update. The first plan was adopted in 2012 and is updated every 5 years. The CVFPP recommends actions to reduce the probability and consequences of flooding. Produced in partnership with federal, Tribal, local, and regional partners and other interested parties, the CVFPP also identifies the mutual goals, objectives, and constraints important in the planning process; distinguishes plan elements that address mutual flood risks; and, finally, recommends improvements to the state-federal flood protection system.	Could result in effects on giant garter snake and other species that occur in the Yolo Bypass if plans include expanding the Bypass.
Delta Flood Emergency Preparedness, Response, and Recovery Program	DWR	Ongoing	Pursuant to the Disaster Preparedness and Flood Prevention Bond Act of 2006, DWR developed the Delta Flood Emergency Preparedness, Response, and Recovery Program to prepare for, respond to, and recover from large-scale catastrophic flooding emergencies in the Delta region.	Beneficial effects on terrestrial biological resources.

Program/ Project	Agency	Status	Description of Program/Project	Effects on Terrestrial Biological Resources
			The objectives of this program include: (1) protect the lives, property, and infrastructure critical to the functioning of both the Delta and California; (2) protect water quality and restore water supply for both Delta and export water users; (3) reduce the recovery time of California's water supply to less than 6 months; and (4) minimize impacts on environmental resources. Under this program, DWR finalized the Delta Flood Emergency Management Plan in 2018 to help manage risk of levee failures in the Delta and guide DWR Delta flood emergency management.	
Levee Repairs Program	DWR	Ongoing	On February 24, 2006, Governor Arnold Schwarzenegger declared a State of Emergency for California's levee system, commissioning up to $500 million of state funds to repair and evaluate state/federal project levees. Following the emergency declaration, the Governor directed DWR to secure the necessary means to fast-track repairs of critical erosion sites. Hundreds of levee sites were identified for immediate repair throughout the Central Valley. These repairs were necessary to maintain the functionality of flood control systems that have deteriorated over time and/or do not meet current design standards. While many of the most urgent repairs have been completed or are near completion, other sites of lower priority are still in progress, and still more are in the process of being identified, planned, and prioritized. In general, repairs to state/federal project levees are being conducted under three main programs: the Flood System Repair Project, the Sacramento River Bank Protection Project, and the Public Law 84-99 (PL 84-99) Rehabilitation Program. DWR has completed geotechnical exploration, testing, and analysis of state and federal levees that protect several highly populated urban areas of greater Sacramento, Stockton/Lathrop, and Marysville/Yuba City. This program is being implemented simultaneously with the various urgent levee repairs.	Effects on plants and wildlife that occur along Delta shorelines and on Delta islands.
Old Banks Landfill Cap Project	DWR	Completed	DWR is constructing the Old Banks Landfill Cap Project to cap the Old Banks Landfill (also known as the Harvey O. Banks Pumping Plant Landfill) to address concerns related to landfill debris exposure raised by the Contra Costa County Health Department (CCCHD). This project is located approximately 9 miles northwest of the City of Tracy and 12 miles northeast of the City of Livermore in Contra Costa County. Landfill debris concerns would be addressed by DWR by confining the landfill materials and preventing the landfill contents from being exposed by rodent activities, as well as improving surface drainage and minimizing future maintenance. Project activities include clearing existing vegetation,	Potential effects on terrestrial species during construction.

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			removing the upper 2 to 4 inches of topsoil of the landfill crown, grading the existing landfill crown by adding fill soil materials in localized areas to bring the site to grade, placing a commercially available rodent control barrier material, placing a 1-foot-thick surface layer on top of the rodent control fill fabric to protect it, and returning the project site to near pre-project conditions by hydroseeding. A Notice of Completion for an IS/MND was filed on October 25, 2019. This project was completed December 10, 2021.	
Lower Yolo Ranch Restoration Project	State and Federal Contractors Water Agency, DWR, and MOA Partners	Ongoing	The project is located in the lower Yolo Bypass and is a tidal and seasonal salmon habitat project restoring tidal flux to about 1,670 acres of existing pasture land. The project site includes the Yolo Ranch, also known as McCormack Ranch, which was purchased in 2007 by the Westlands Water District. The goal of this project is to provide important new sources of food and shelter for a variety of native fish species at the appropriate scale in strategic locations in addition to ensuring continued or enhanced flood protection. The lower Yolo wetlands restoration project is part of an adaptive management approach in the Delta to learn the relative benefits of different fish habitats, quantify the production and transport of food, and understand how fish species take advantage of new habitat.	Beneficial effects on terrestrial biological species that use marshes and effects on grassland species.
Meins Landing Restoration	DWR, Suisun Marsh Preservation Agreement agencies, and State Coastal Conservancy	In progress	Meins Landing is a 668-acre property in the eastern Suisun Marsh along Montezuma Slough that was purchased in 2005 as part of a multi-agency tidal restoration project. Previously a duck club, the property was purchased to restore it to tidal influence by breaching the levee. Due to the presence of three underground gas and oil pipelines with restrictive easements, the original restoration concept for the site was not able to be implemented. While DWR explored other restoration options, the property was leased to the previous owners for 10 years and was operated as a duck club until the lease ended in 2016. The property is currently being operated as a managed marsh and maintained by DWR and Suisun Resource Conservation District, with no hunting leases on the property and restricted public access. As a managed marsh, the current operation goals are: (1) Operate Meins as a managed marsh to provide productive habitat for a diverse population of waterfowl, salt marsh harvest mouse, and other wildlife.	Benefits to tidal species.

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			(2) Formulate and test management practices to maximize nutrient production and export into adjacent sloughs to meet objectives of the Delta Smelt Resiliency Strategy. (3) Provide research opportunities for study of primary and secondary production, waterfowl feed utilization, nutrient export, and other topics to meet objectives of the Delta Smelt Recovery Plan. (4) Explore providing public access and hunting opportunities to meet demands by the SF Bay Conservation and Development Commission (BCDC) for habitat restoration projects in Suisun Marsh to include public access. Managed wetlands, like Meins Landing, are potentially more effective (and cheaper) at augmenting local food production than creating intertidal wetlands while providing more diverse habitats for multiple species. Research on managed wetlands is critical to understand the management techniques best suited to boost food/nutrient production while minimizing impacts to other species (e.g., waterfowl, western pond turtle, salt marsh harvest mouse). Once best management practices are identified, they could be evaluated on other sites throughout Suisun Marsh with cooperating landowners. Research by UC Davis and California Trout is currently underway on Meins Landing to evaluate primary and secondary production and determine optimal conditions to increase the production.	
Mayberry Farms Subsidence Reversal and Carbon Sequestration Project	DWR	Completed in 2010	The Mayberry Farms Subsidence Reversal and Carbon Sequestration Project created permanently flooded wetlands on a 307-acre parcel on Sherman Island that is owned by DWR. The project has restored approximately 192 acres of emergent wetlands and enhanced approximately 115 acres of seasonally flooded wetlands. Construction occurred in summer 2010. Ongoing operations and maintenance are routinely performed by DWR. The Mayberry Farms project was conceived as a demonstration project that would provide subsidence reversal benefits and develop knowledge that could be used by operators of private wetlands (including duck clubs) that manage lands for waterfowl-based recreation. By maintaining permanent water, the growth and subsequent decomposition of emergent vegetation is expected to control and reverse subsidence. The project is also anticipated to provide climate benefits by sequestering atmospheric CO_2. The project is expected to provide year-round wetland habitat for waterfowl and other wildlife.	Beneficial effects on marsh species.

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Sherman Island Setback Levee—Mayberry Slough	DWR	Completed	Reclamation District 341, with funding from DWR, constructed four sections of setback levee to increase levee stability along Mayberry Slough on Sherman Island in 2004 and 2005. The Sherman Island setback levee represents an opportunity to reverse some of the ecological damage resulting from levee construction and maintenance by implementing a habitat development project that will augment the existing riparian vegetation and provide habitat for native species. Project implementation restored tidal wetland and riparian habitat. Construction of the waterside portion of the setback levee was divided into two phases (Phase IIA, Phase IIB) that were completed in fall 2008 and fall 2009, respectively. Vegetation monitoring and maintenance was conducted until 2013.	Beneficial effects on terrestrial biological resources.
Sherman Island Whale's Mouth Wetlands	DWR	Completed	The Sherman Island Whale's Mouth Wetland Restoration Project restored approximately 600 acres of palustrine emergent wetlands within an 877-acre project boundary on a nearly 975-acre parcel on Sherman Island that is owned by the California Department of Water Resources (DWR). The property is currently managed for flood irrigated pasture land, which includes a regular and extensive disturbance regime associated with field prepping, disking, and grazing. The ultimate outcome of the restoration project was hundreds of additional acres of freshwater emergent wetlands. Other native plant restoration components included installation of native trees and shrubs compatible with their respective hydrologic regime as well as a large amount of upland transitional area, all of which provide a diversity of habitat structure and function. The project was completed in 2015.	Beneficial effects on terrestrial biological resources.
Sherman Island—Whale's Belly Wetlands	DWR	In progress	Whale's Belly is part of the California EcoRestore Initiative to restore and protect at least 30,000 acres of habitat across the Sacramento–San Joaquin Delta. The project objectives are to reduce the effects of climate change and Delta subsidence, as well as improve habitat for millions of migrating birds along the Pacific Flyway that rely on the Delta as a crucial rest stop and safe haven. Whale's Belly is one of four projects on Sherman Island that creates managed wetlands, tidal wetlands, and setback levees to contribute toward EcoRestore's restoration targets. The Whale's Belly Wetland Restoration Project includes adding soils and materials to support protective levees and riverbanks, enabling these structures to effectively hold back high floodwaters. Construction will also involve relocation of drainage ditches, pipelines, and water pumps. Upon completion of construction activities, the island will be inundated to an	Beneficial effects on terrestrial biological resources.

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			approximate depth of 1–3 feet, allowing marshland growth to eliminate subsidence on this southeast section of Sherman Island. The project began in May 2020 and is scheduled for completion by summer 2022.	
Twitchell Island—East End Wetland Restoration	DWR	Completed	The Twitchell Island East End Wetland Restoration Project restored approximately 740 acres of palustrine emergent wetlands and approximately 50 acres of upland and riparian forest habitat on Twitchell Island. This property is owned by the DWR and was previously managed as flood irrigated corn and alfalfa. This project was completed in 2013.	Beneficial effects on terrestrial biological resources.
Twitchell Island—San Joaquin River Setback Levee	DWR	Planning phase	This project will stabilize a threatened section of levee along the San Joaquin River and allow for several different types of waterside habitat features to be constructed. Expected habitat types include riparian shaded riverine aquatic, intertidal habitats, and upland vegetation created by waterside beaches, benches, and undulations. An original 2,200-feet section was completed in 2000 and is currently serving as a model for an approximately 23,000-foot setback spanning the entire San Joaquin River levee plus a proposed 80-acre tidal marsh restoration site on Chevron Point. There are eight reaches to the setback project. Reach #6, a 2,680-foot setback levee reach is the top priority. Funding has not yet been secured, but all permits have been obtained. Reach #10 is the Chevron Point Dryland Levee that separates the 80-acre tidal marsh restoration site from the rest of the island.	Beneficial effects on terrestrial biological resources.
North Delta Flood Control and Ecosystem Restoration Project	DWR	Ongoing	Consistent with objectives contained in the CALFED Record of Decision, the North Delta Flood Control and Ecosystem Restoration Project is intended to improve flood management and provide ecosystem benefits in the north Delta area through actions such as construction of setback levees and configuration of flood bypass areas to create quality habitat for species of concern. These actions are focused on McCormack-Williamson Tract and Staten Island. The purpose of the project is to implement flood control improvements in a manner that benefits aquatic and terrestrial habitats, species, and ecological processes. Flood control improvements are needed to reduce damage to land uses, infrastructure, and the Bay-Delta ecosystem resulting from overflows caused by insufficient channel capacities and catastrophic levee failures near where the Mokelumne River, Cosumnes River, Dry Creek, and Morrison Creek converge.	Beneficial effects on terrestrial biological resources.
South Delta Temporary Barriers Project	DWR	In progress	The 2017–2022 South Delta Temporary Barriers Project consists of annual construction, operation, and removal of the Middle River, Old River near Tracy, Grant Line Canal, and Heald of Old River spring and fall rock barriers. The project reduces adverse water level impacts (i.e., minimum tide elevations)	Potential effects on giant garter snake, Swainson's hawk,

Program/ Project	Agency	Status	Description of Program/Project	Effects on Terrestrial Biological Resources
			caused by the SWP and CVP export pumping on local agricultural diverters within the South Delta Water Agency. The South Delta Temporary Barriers Project consists of four rock barriers across south Delta channels. The objectives of the project are to increase water levels, improve water circulation patterns and water quality in the southern Delta for local agricultural diversions, and improve operational flexibility of the SWP to help reduce fishery impacts and improve fishery conditions. Of the four rock barriers, the barrier at the Head of Old River serves as a fish barrier (intended to primarily benefit migrating San Joaquin River Chinook salmon) and is installed and operated in April–May and again in September–November. The remaining three barriers (Old River at Tracy, Grant Line Canal, Middle River) serve as agricultural barriers (intended to primarily benefit agricultural water users in the south Delta) and are installed and operated between April 15 and November 30 of each season.	and other aquatic and terrestrial species.
Dutch Slough Tidal Marsh Restoration Project	DWR and California State Coastal Conservancy	In progress	The Dutch Slough Tidal Marsh Restoration Project, located near Oakley in eastern Contra Costa County, would restore wetland and uplands and provide public access to the 1,187-acre Dutch Slough property owned by DWR. The property is composed of three parcels separated by narrow manmade sloughs. The project would provide ecosystem benefits, including habitat for sensitive aquatic species. It also would be designed and implemented to maximize opportunities to assess the development of those habitats and measure ecosystem responses so that future Delta restoration projects will be more successful. Two neighboring projects proposed by other agencies that are related to the Dutch Slough Restoration Project collectively contribute to meeting project objectives. These include the City of Oakley's proposed Community Park and Public Access Conceptual Master Plan for 55 acres adjacent to the wetland restoration project and 4 miles of levee trails on the perimeter of the DWR lands. The City Community Park will provide parking and trailheads for the public access components of the Dutch Slough Restoration Project. Construction on two of the parcels, Emerson and Gilbert, started in May 2018 and site grading completed in 2019, followed by revegetation planting. Breaching of these two parcels will be completed in 2021. Restoration planning of the third parcel, Burroughs, would begin in 2022.a	Beneficial effects on terrestrial biological resources.
Los Vaqueros Reservoir Expansion	Reclamation, DWR, and CCWD	Planning phase	The Los Vaqueros Reservoir Expansion Project consists of enlarging the existing Los Vaqueros Reservoir and constructing related reservoir system facilities to develop water supplies for environmental water management that supports fish protection, habitat management, and other environmental needs	Potential effects on California red-legged frog, California tiger salamander, golden

Program/ Project	Agency	Status	Description of Program/Project	Effects on Terrestrial Biological Resources
			in the Delta and tributary river systems and to improve water supply reliability and water quality for urban users in the San Francisco Bay Area. Los Vaqueros Reservoir is a 100,000 acre-foot offstream storage reservoir owned and operated by Contra Costa Water District (CCWD) that is used to store water pumped from the Delta. This storage capacity allows CCWD to improve the water quality delivered to its customers and to adjust the timing of its Delta water diversions to accommodate the life cycles of Delta aquatic species, thus reducing species impact and providing a net benefit to the Delta environment. The proposed expansion project would increase the reservoir capacity to 275,000 acre-feet and add a new 470 cfs connection that would allow the Los Vaqueros system to provide water to South Bay water agencies—Alameda County Flood Control and Water Conservation District, Zone 7, Alameda County Water District, and Santa Clara Valley Water District—that otherwise would receive all of their Delta supplies through the existing SWP and CVP export pumps. It also would include construction of a new diversion on Old River with a capacity of 170 cfs. The new and expanded facilities would be operated in coordination with Reclamation and DWR to shift Delta pumping for the three South Bay water agencies from the CVP and SWP Delta export pumps to the expanded Los Vaqueros Reservoir system. In August 2020, Reclamation released its Final Feasibility Report, which documents potential costs and benefits of the expansion of Los Vaqueros Reservoir. The recommended plan described in the report provides for federal cost sharing of up to 25% of project construction costs. A similar 25% federal share for Phase 2 construction was requested by members of Congress in a letter dated April 2, 2021, to the Department of the Interior. On January 20, 2021, the California Water Commission increased its Water Storage Investment Program funding for the project based on inflation.	eagle, and other terrestrial biological resources.
Transfer-Bethany Pipeline with the Los Vaqueros Reservoir Expansion	Reclamation, DWR, and Contra Costa Water District	Planning phase	The Los Vaqueros Reservoir Expansion Project includes expansion of the Los Vaqueros Reservoir from its current capacity of 160 TAF to 275 TAF, construction of a pipeline between CCWD's Transfer Pump Station and the SWP's California Aqueduct at Bethany Reservoir (the "Transfer-Bethany Pipeline"), upgrades to the existing Transfer Pump Station Facilities, and construction of the Neroly High Lift Station. Expansion of Los Vaqueros Reservoir improves Bay Area water supply reliability and water quality while protecting Delta fisheries and providing additional Delta ecosystem benefits. The proposed project will include a regional intertie (the Transfer-Bethany Pipeline) and improved pump stations and pipelines.	Potential effects on California red-legged frog, California tiger salamander, golden eagle, and other terrestrial biological resources.

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			The Transfer-Bethany Pipeline is composed of a new 300-cfs (84-inch-diameter) pipeline that would deliver water from the Transfer Facility to the vicinity of Bethany Reservoir for south of Delta partners. The new Transfer-Bethany Pipeline would tie into the California Aqueduct just north of Bethany Reservoir in the Bethany Recreation Area.	
The Riparian Bird Conservation Plan	California Partners in Flight and Riparian Habitat Joint Venture	Ongoing	The Riparian Habitat Joint Venture (RHJV) was initiated by California Partners in Flight in 1994. To date, 18 federal, state, and private organizations have signed the Cooperative Agreement to protect and enhance habitats for native landbirds throughout California. These organizations include CDFW, DWR, California State Lands Commission, Ducks Unlimited, National Audubon Society, National Fish and Wildlife Foundation, The Nature Conservancy, The Trust for Public Land, The Resources Agency State of California, Reclamation, USFWS, U.S. Geological Survey, and Wildlife Conservation Board. The RHJV, modeled after the successful joint venture projects of the North American Waterfowl Management Plan, reinforces other collaborative efforts currently underway that protect biodiversity and enhance natural resources as well as the human element they support. The vision of the RHJV is to restore, enhance, and protect a network of functioning riparian habitat across California to support the long-term viability of landbirds and other species. A wide variety of other species of plants and animals will benefit through the protection of forests along rivers, streams, and lakes. The RHJV mission is to provide leadership and guidance to promote the effective conservation and restoration of riparian habitats in California through the following goals: (1) identify and develop technical information based on sound science for a strategic approach to conserving and restoring riparian areas in California; (2) promote and support riparian conservation on the ground by providing guidance, technical assistance, and a forum for collaboration; and (3) develop and influence riparian policies through outreach and education. In 2004, Partners in Flight and the RHJV prepared The Riparian Bird Conservation Plan, a guidance document that outlines a strategy for conserving riparian birds, including birds using the Delta.	Beneficial effects on riparian species.
Central Valley Joint Venture Program	Central Valley Joint Venture	Ongoing	The Central Valley Joint Venture (CVJV) is a self-directed coalition consisting of 22 state and federal agencies and private conservation organizations. The partnership directs its efforts toward the common goal of providing for the habitat needs of migrating and resident birds in the Central Valley of California. The CVJV was established in 1988 as a regional partnership focused on the conservation of waterfowl and wetlands under the North American Waterfowl Management Plan. It has since broadened its focus to the conservation of	Beneficial effects on waterfowl and wetland species.

Program/ Project	Agency	Status	Description of Program/Project	Effects on Terrestrial Biological Resources
			habitats for other birds, consistent with major national and international bird conservation plans and the North American Bird Conservation Initiative. The CVJV provides guidance and facilitates grant funding to accomplish its habitat goals and objectives. Integrated bird conservation objectives for wetland habitats in the Central Valley identified in the 2006 Implementation Plan include restoration of 19,170 acres of seasonal wetland, enhancement of 2,118 acres of seasonal wetland annually, restoration of 1,208 acres of semi-permanent wetland, and restoration of 1,500 acres of riparian habitat.	
Cache Creek, Bear Creek, Sulfur Creek, Harley Gulch Mercury TMDL	Central Valley Regional Water Quality Control Board	Ongoing	Historic mining activities in the Cache Creek watershed have discharged and continue to discharge large volumes of inorganic mercury to creeks in the watershed. Much of the mercury discharged from the mines is now distributed in the creek channels and floodplain downstream from the mines. Natural erosion processes are expected to slowly move the mercury downstream out of the watershed over the next several hundred years. However, current and proposed activities in and around the creek channel can enhance mobilization of this mercury. To reduce mercury loads in these streams, which ultimately connect to the northern Delta, the Central Valley Regional Water Quality Control Board is implementing mercury TMDLs for Cache Creek and its tributaries, as well as Sulfur Creek. The implementation plans require a reduction in mercury loads through a combination of actions to clean up mines, sediments, and wetlands; identify engineering options; control erosion reduction actions; and perform studies and monitoring.	Potential beneficial effects on Delta species that are part of the aquatic food chain.
Sacramento–San Joaquin Delta Estuary TMDL for Methylmercury	Central Valley Regional Water Quality Control Board	Ongoing	The Central Valley Regional Water Quality Control Board identified the Delta as impaired because of elevated levels of methylmercury in Delta fish that pose a risk for human and wildlife consumers. As a result, it initiated the development of a water quality attainment strategy to resolve the mercury impairment. The strategy has two components: the methylmercury total maximum daily load (TMDL) for the Delta and the amendment of the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins (the Basin Plan) to implement the TMDL program. The Basin Plan amendment requires methylmercury load and waste load allocations for dischargers in the Delta and Yolo Bypass to be met as soon as possible, but no later than 2030. The regulatory mechanism to implement the Delta Mercury Control Program for point sources would be through NPDES permits. Nonpoint sources would be regulated in conformance with the State Water Resources Control Board's Nonpoint Source Implementation and Enforcement Policy. Both point and nonpoint source dischargers would be required to conduct mercury and methylmercury control studies to develop and evaluate management practices to control mercury and methylmercury discharges. The Regional Water Board	Potential beneficial effects on Delta species that are part of the aquatic food chain.

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			will use the study results and other information to amend relevant portions of the Delta Mercury Control Program during the Delta Mercury Control Program Review. The Basin Plan amendment also requires proponents of new wetland and wetland restoration projects scheduled for construction after 2011 to either participate in a comprehensive study plan or implement a site-specific study plan, evaluate practices to minimize methylmercury discharges, and implement newly developed management practices as feasible. Projects would be required to include monitoring to demonstrate effectiveness of management practices. Activities, including changes to water management and storage in and upstream of the Delta, changes to salinity objectives, dredging and dredged materials disposal and reuse, and changes to flood conveyance flows, would be subject to the open water methylmercury allocations. Agencies would be required to include requirements for projects under their authority to conduct control studies and implement methylmercury reductions as necessary to comply with the allocations by 2030.	
East Contra Costa County Habitat Conservation Plan/Natural Community Conservation Plan	Contra Costa County and East Contra Costa County Habitat Conservancy	Ongoing	The East Contra Costa County Habitat Conservation Plan/Natural Community Conservation Plan (Plan) was adopted in 2006 and provides regional conservation and development guidelines to protect natural resources while improving and streamlining the permit process for endangered species and wetland regulations. The Plan was developed by a team of scientists and planners with input from independent panels of science reviewers and interested parties. Within the 174,018-acre inventory area, the Plan provides permits for between 8,670 and 11,853 acres of development and will permit impacts on an additional 1,126 acres from rural infrastructure projects. The Plan will result in the acquisition of a preserve system that will encompass 23,800 to 30,300 acres of land that will be managed for the benefit of 28 species as well as the natural communities that they depend upon. The East Contra Costa County Habitat Conservancy is a joint exercise of powers authority formed by Contra Costa County and the cities of Brentwood, Clayton, Oakley, and Pittsburg to implement the Plan. It allows Contra Costa County, the Contra Costa County Flood Control and Water Conservation District, the East Bay Regional Park District and the cities of Brentwood, Clayton, Oakley, and Pittsburg (collectively, the Permittees) to control permitting for activities and projects they perform or approve in the region that have the potential to adversely affect state- and federally listed species. The Plan also provides for comprehensive species, wetlands, and ecosystem conservation and contributes to the recovery of endangered species in northern California. The Plan avoids	Beneficial effects on terrestrial biological resources through coordinated planning efforts, despite effects on species from approved development.

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			project-by-project permitting that often results in uncoordinated and biologically ineffective mitigation.	
Delta Protection Commission Land Use and Resource Management Plan Update	Delta Protection Commission	Ongoing	The Delta Protection Commission (DPC), created with passage of the Delta Protection Act, was formed to adaptively protect, maintain, and, where possible, enhance and restore the overall quality of the Delta environment consistent with the Delta Protection Act and the Land Use and Resource Management Plan (LURMP) for the Primary Zone. The DPC is currently updating its LURMP, which was last adopted in 2010. The LURMP outlines the long-term land use requirements for the Delta and sets out findings, policies, and recommendations in the areas of environment, utilities and infrastructure, land use, agriculture, water, recreation and access, levees, and marine patrol/boater education/safety programs. The updated LURMP will place increased emphasis on the requirement for local government general plans to provide for consistency with the provisions of the LURMP. The DPC develops priorities and timelines for tasks to be implemented each year and provides annual progress reports to the Legislature. One of the tasks identified by the DPC is to monitor the Delta Vision, Bay Delta Conservation Plan, and Delta Risk Management Strategy processes and provide input as deemed appropriate.	Beneficial effects on terrestrial biological resources.
Delta Plan	Delta Stewardship Council	Ongoing	The Delta Reform Act, created by Senate Bill X7-1, established the coequal goals for the Delta of “providing a more reliable water supply for California and protecting, restoring, and enhancing the delta ecosystem.” (Pub. Resources Code, § 29702; Wat. Code, § 85054). These coequal goals are to be achieved “in a manner that protects and enhances the unique cultural, recreational, natural resources, and agricultural values of the Delta as an evolving place.” (Wat. Code, § 85054). The Delta Reform Act also established the DSC. The DSC is tasked with furthering the State’s coequal goals for the Delta through development of the Delta Plan, a comprehensive, long-term, resource management plan for the Delta, containing both regulatory policies and recommendations aimed at furthering the coequal goals and promoting a healthy Delta ecosystem. The Delta Plan provides for a distinct regulatory process for activities that qualify as Covered Actions under Water Code Section 85057.5. State and local agencies proposing Covered Actions, prior to initiating implementation of that action, must prepare a written certification of consistency with detailed findings regarding consistency with applicable Delta Plan policies and submit that certification to the DSC.	Beneficial effects on terrestrial biological resources.

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Delta Adapts	Delta Stewardship Council (DSC)	Ongoing	The DSC decided to take action in the Delta and Suisun Marsh in response to climate change at its May 2018 meeting, directing staff to begin a two-phase effort preparing: (1) a *vulnerability assessment* to improve understanding of regional vulnerabilities in order to protect the vital resources the Delta provides to California and beyond with state interests and investments top of mind; and (2) an *adaptation plan* detailing strategies and tools that state, regional, and local governments can use to help communities, infrastructure, and ecosystems thrive in the face of climate change. Together, these two phases form the *Delta Adapts: Creating a Climate Resilient Future* initiative, a comprehensive, regional approach to climate resiliency that cuts across regional boundaries and commits to collaboration across state, local, and regional levels. Delta Adapts supports the Delta Reform Act, Executive Order B-30-15, and the Delta Plan. The goals of Delta Adapts are to: (1) inform future work at the Council; Provide local governments with a toolkit of information to incorporate into their regulatory and planning documents; (2) integrate climate change into the state's prioritization of future Delta actions and investments; and (3) serve as a framework to be built upon by the Council and others in years to come. DSC staff are pursuing these goals across the two phases, while following the statutory requirements outlined in the Delta Reform Act of 2009. Delta Adapts will consider climate change impacts that are expected to occur and amend the Delta Plan, where applicable.	Beneficial effects on terrestrial biological resources.
Liberty Island Conservation Bank	Reclamation District 2093	Ongoing	This project received permits and approvals in 2009 to create a conservation bank on the northern tip of Liberty Island that would preserve, create, restore, and enhance habitat for native Delta fish species, including Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, California Central Valley steelhead, delta smelt, and Central Valley fall- and late fall–run Chinook salmon. The project consists of creating tidal channels, perennial marsh, riparian habitat, and occasionally flooded uplands on the site. The project also includes the breaching of the northernmost east–west levee and preservation and restoration of shaded riverine aquatic habitat along the levee shorelines of the tidal sloughs. The island's private levees failed in the 1997 flood and were not recovered, leaving all but the upper 1,000 acres and the adjacent levees permanently flooded. These upper acres encompass the proposed bank. The lower nearly 4,000 acres will remain, at least for the near future, predominantly open water	Beneficial effects on terrestrial biological species using riparian and wetland habitat; some effects on species using croplands for foraging.

Program/ Project	Agency	Status	Description of Program/Project	Effects on Terrestrial Biological Resources
			and subtidal because tidal elevations are too great for marsh or riparian habitat.	
Flood Management Program	SAFCA, CVFPB, and USACE	Ongoing	The Sacramento Area Flood Control Agency (SAFCA) Flood Management Program includes studies, designs, and construction of flood control improvements. In the South Sacramento area, SAFCA projects include the South Sacramento Streams Project and the Sacramento River Bank Protection Project. The South Sacramento Streams Project consists of levee, floodwall, and channel improvements starting south of the town of Freeport along the Sacramento River to protect the City of Sacramento from flooding associated with Morrison, Florin, Elder, and Union House creeks. The Sacramento River Bank Protection Project, which is implemented and funded primarily through USACE, addresses long-term erosion protection along the Sacramento River and its tributaries. Bank protection measures typically consist of large angular rock placed to protect the bank, with a layer of soil/rock material to allow bank revegetation. SAFCA contributes to funding the local share for bank protection activities within its jurisdiction.	Potential effects on species using agricultural areas for foraging, on riparian species, and on giant garter snake.
South Sacramento Habitat Conservation Plan	South Sacramento Conservation Agency Joint Powers Authority	Ongoing	The South Sacramento Habitat Conservation Plan (HCP) is a regional plan to address issues related to species conservation, agricultural protection, and urban development in south Sacramento County. Adopted in 2018, the HCP covers 40 different species of plants and wildlife, including 10 that are state- or federally listed as threatened or endangered, and allows landowners to engage in the “incidental take” of listed species (i.e., to destroy or degrade habitat) in return for conservation commitments from local jurisdictions. The conservation measures outlined in the HCP would minimize and mitigate the impact of incidental take and provide for the conservation of covered species that may occur in the plan area. The geographic location of the HCP includes a combined 317,656 acres within south Sacramento County (unincorporated area) and the cities of Rancho Cordova, Elk Grove, and Galt.	Beneficial effects on terrestrial biological resources through coordinated planning effort for conservation and development.
Harvest Water (formerly called the South County Ag Program)	Sacramento Regional County Sanitation District	Planning phase	Harvest Water is being developed by Sacramento Regional County Sanitation District (Regional San) and could deliver up to 50,000 acre-feet per year (AFY) of safe and reliable supply of tertiary-treated water for agricultural uses to more than 16,000 acres of permanent agriculture through irrigation, as well as habitat conservation lands near the Cosumnes River and Stone Lakes Wildlife Refuge. This project has received up to $287.5 million through the Proposition 1 grant funding of the California Water Commission, Water Storage Investment Program. Regional San is currently working with local farmers and the initial	Beneficial effects on terrestrial biological resources.

Program/ Project	Agency	Status	Description of Program/Project	Effects on Terrestrial Biological Resources
			planning stages of preliminary designs for transmission and distribution systems near Elk Grove in southern Sacramento County.	
San Francisco Bay Mercury TMDL	San Francisco Bay Regional Water Quality Control Board	Ongoing	San Francisco Bay is impaired because mercury contamination is adversely affecting existing beneficial uses, including sport fishing, preservation of rare and endangered species, and wildlife habitat. On February 12, 2008, EPA approved a Basin Plan amendment incorporating a TMDL for mercury in San Francisco Bay and an implementation plan to achieve the TMDL. The amendment was formally adopted by the San Francisco Bay Water Board, the State Water Resources Control Board, and the state Office of Administrative Law. It is now officially incorporated into the Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan). The San Francisco Bay mercury TMDL, which includes the waters of the Delta within the San Francisco Bay region, is intended to: (1) reduce mercury loads to achieve load and waste load allocations, (2) reduce methylmercury production and consequent risk to humans and wildlife exposed to methylmercury, (3) conduct monitoring and focused studies to track progress and improve the scientific understanding of the system, and (4) encourage actions that address multiple pollutants. The implementation plan establishes requirements for dischargers to reduce or control mercury loads and identifies actions necessary to better understand and control methylmercury production. In addition, it addresses potential mercury sources and describes actions necessary to manage risks to Bay fish consumers. Load reductions are expected via implementation of the Delta Methylmercury TMDL (river source), plus urban runoff management, Guadalupe River mine remediation, municipal and industrial wastewater source controls and pretreatment, and sediment remediation.	Potential beneficial effects on Delta species that are part of the aquatic food chain.
San Joaquin County Multi-Species Habitat Conservation and Open Space Plan	San Joaquin Council of Governments	Ongoing	Permitted in 2000, the key purpose of the San Joaquin County Multi-Species Habitat Conservation and Open Space Plan (Plan) is to provide a strategy for balancing the need to conserve open space and the need to convert open space to non-open space uses. These goals are intended to be met while protecting the region's agricultural economy; preserving landowner property rights; providing for the long-term management of plant, fish, and wildlife species, especially those that are currently listed, or may be listed in the future, under the federal Endangered Species Act (ESA) or the California Endangered Species Act (CESA); providing and maintaining multiple-use open spaces that contribute to the quality of life of the residents of San Joaquin County; and accommodating a growing population while minimizing costs to project proponents and society at large. The conservation strategy relies on minimizing, avoiding, and mitigating impacts on the species covered by the Plan. Minimization of impacts on covered	Beneficial effects on terrestrial biological resources.

Program/ Project	Agency	Status	Description of Program/Project	Effects on Terrestrial Biological Resources
			species takes a species-based approach, emphasizing the implementation of measures to minimize incidental take by averting the actual killing or injury of individual covered species and minimizing impacts on habitat for such species on open space lands converted to non-open space uses. Unavoidable impacts on covered species are addressed through a habitat-based approach that emphasizes compensation for habitat losses through the establishment, enhancement, and management-in-perpetuity of preserves composed of specific vegetation types or association of vegetation types (habitats) upon which discrete groups of covered species rely. The purchase of easements from landowners willing to sell urban development rights is the primary method for acquiring preserves. The Plan identifies zones distinguished by a discrete association of soil types, water regimes (e.g., Delta lands subject to tidal influence, irrigated lands, lands receiving only natural rainfall), elevation, topography, and vegetation types. In general, impacts within a particular zone are mitigated within the same zone.	
San Joaquin County General Plan Update	San Joaquin County	Ongoing	The General Plan 2035 was adopted by the in December 2016. The general plan contains designations for residential, commercial, and industrial development through 2035. Most of the urban growth is directed to existing urban communities.	Potential effects on terrestrial biological resources due to continued growth in the county.
Solano Multispecies Habitat Conservation Plan	Solano County Water Agency	In development	The Solano HCP is intended to support the issuance of an ITP under the federal ESA for a period of 30 years. This permit is required by the March 19, 1999, Solano Project Contract Renewal BiOp between the USFWS and Reclamation. The scope of the Solano HCP was expanded beyond the requirements of the BiOp to include additional voluntary applicants and additional species for incidental take coverage. Thirty-seven species are proposed to be covered under the Solano HCP. The minimum geographical area to be covered is the Solano County Water Agency's contract service area; that is, the cities of Fairfield, Vacaville, Vallejo, Suisun City, the Solano Irrigation District, and the Maine Prairie Water District. The area covered by the HCP is all of Solano County and a small portion of Yolo County. The Final Administrative Draft was submitted to the lead agencies in June 2009. The HCP includes a Coastal Marsh Natural Community Conservation Strategy designed to maintain the water and sediment quality standards and hydrology of this natural community; contribute to the restoration of tidally influenced coastal marsh habitat; and promote habitat connectivity. Primary conservation actions include preservation (primarily through avoidance), restoration, invasive species control, and improvement of water quality.	Potential future beneficial effects on terrestrial biological resources.

Program/ Project	Agency	Status	Description of Program/Project	Effects on Terrestrial Biological Resources
			The plan area covers 580,000 acres, which includes 12,000 acres of proposed development and 30,000 acres that will be preserved.	
Delta Dredged Sediment Long-Term Management Strategy (LTMS)/Pinole Shoal Management Study	USACE	Ongoing	The Delta Dredged Sediment Long-Term Management Strategy is a cooperative planning effort to coordinate, plan, and implement beneficial reuse of sediments in the Delta. Five agencies (USACE, EPA, DWR, California Bay Delta Authority, and the Central Valley Regional Water Quality Control Board) have begun to examine Delta dredging, reuse, and disposal needs. The strategy development process will examine and coordinate dredging needs and sediment management in the Delta to assist in maintaining and improving channel function (navigation, water conveyance, flood control, and recreation), levee rehabilitation, and ecosystem restoration. Agencies and interested parties will work cooperatively to develop a sediment management plan that is based on sound science and protective of the ecosystem, water supply, and water quality functions of the Delta. As part of this effort, the sediment management plan will consider regulatory process improvements for dredging and dredged material management so that project evaluation is coordinated, efficient, timely, and protective of Delta resources.	Potential effects on terrestrial species due to dredged material stockpiling and on giant garter snake and western pond turtle from dredging activities and potential benefits from the plan's coordinated reuse of dredged material.
Lower San Joaquin Feasibility Study	USACE	Planning phase	The Lower San Joaquin Feasibility Study is intended to determine if there is a federal interest in providing flood risk management and ecosystem restoration improvements along the lower (northern) San Joaquin River. The lower San Joaquin River study area includes the San Joaquin River from the Mariposa Bypass downstream to, and including, the city of Stockton. The study area also includes the channels of the San Joaquin River in the southernmost reaches of the Delta: Paradise Cut and Old River as far north as Tracy Boulevard and Middle River as far north as Victoria Canal. The floodplains of the lower San Joaquin River and its tributaries are also included in the study area. Additionally, studies have been funded by grants from the California Delta Conservancy and funds from Reclamation District Number 2062. Currently, the effort is being led by the San Joaquin County Resource Conservation District, American Rivers, and the South Delta Water Agency with the purpose of developing a mitigation strategy to consider and minimize the downstream effects of the future Paradise Cut Flood Bypass Expansion Project.	Potential effects and benefits on terrestrial biological resources would vary by location and species.
Sacramento River Bank Protection Project	USACE	Planning phase	Originally authorized by Section 203 of the Flood Control Act of 1960, the Sacramento River Bank Protection Project is a long-term flood risk management project designed to enhance public safety and help protect property along the Sacramento River and its tributaries. While the original authorization approved the rehabilitation of 430,000 linear feet of levee, the 1974 Water Resources Development Act added 405,000 linear feet to the	Effects on Swainson's hawk, valley elderberry longhorn beetle, and other riparian species. Effects on species

Program/ Project	Agency	Status	Description of Program/Project	Effects on Terrestrial Biological Resources
			authorization, and a 2007 bill authorized another 80,000 linear feet, for a total of 915,000 linear feet of project. USACE is set to release a Post Authorization Change Report, including an EIS, to address the effects of the latest authorization. USACE, Sacramento District is responsible for implementation of the project in conjunction with its non-federal partner, the California Central Valley Flood Protection Board. A Final Post Authorization Change Report and EIS/EIR were released in April and March 2020, respectively.	foraging in affected agricultural lands.
San Francisco Bay to Stockton Deep Water Ship Channel Project	USACE, Port of Stockton, and Contra Costa County Water Agency	Planning phase	The San Francisco Bay to Stockton Deep Water Ship Channel Project is a Congressionally authorized project being implemented by USACE, the Port of Stockton, and Contra Costa County Water Agency. A joint EIS/EIR will evaluate the action of navigational improvements to the Stockton Deep Water Ship Channel. A General Reevaluation Report and EIS, both released in January 2020, determined the feasibility of modifying the current dimensions of the West Richmond, Pinole Shoal, Suisun Bay, and Stockton Ship Channels, which are currently maintained to 35 feet and provide access to oil terminals, industry in Pittsburg, and the Port of Stockton. The proposed action consists of altering the depth of the deep draft navigation route.	Effects on giant garter snake, western pond turtle, Swainson's hawk, largely temporary in nature.
Sacramento Deep Water Ship Channel Project	USACE and Port of Sacramento	Planning phase (on hold)	The Sacramento River Deep Water Ship Channel Project is a Congressionally authorized project being implemented by USACE and the Port of Sacramento. The proposed project would complete the deepening and widening of the navigation channel to its authorized depth of 35 feet. Deepening of the existing ship channel is anticipated to allow for movement of cargo via larger, deeper draft vessels. Widening portions of the channel would increase navigational safety by increasing maneuverability. The 46.5-mile-long ship channel lies within Contra Costa, Solano, Sacramento, and Yolo Counties and serves the marine terminal facilities at the Port of Sacramento. The Sacramento Deep Water Ship Channel joins the existing 35-feet-deep channel at New York Slough, thereby affording the Port of Sacramento access to San Francisco Bay Area harbors and the Pacific Ocean. The project has been on hold since 2014.	Effects on giant garter snake, western pond turtle, Swainson's hawk, largely temporary in nature.
Agricultural Drainage Selenium Management Program Plan	Reclamation and San Luis & Delta-Mendota Water Authority	Ongoing	Impairment of water quality in the San Joaquin River, the Delta, and San Francisco Bay has resulted in the completion of a TMDL for selenium in the lower San Joaquin River, listing of the western Delta as having impaired water quality for selenium, and initiation of a TMDL study for selenium in North San Francisco Bay. The overall goal of the Agricultural Drainage Selenium Management Program is to minimize discharges of selenium in subsurface agricultural drainage from the western San Joaquin Valley to the river and downstream areas. Actions being taken include reduction in the generation of agricultural drainage containing elevated levels of selenium (through land and	Potential beneficial effects on bird species that are part of the aquatic food chain.

Program/ Project	Agency	Status	Description of Program/Project	Effects on Terrestrial Biological Resources
			irrigation management practices) and limiting where and when the drainage water can be discharged.	
North American Waterfowl Management Plan	USFWS	Ongoing	The North American Waterfowl Management Plan, a collaboration of Canada, the United States, and Mexico to enhance waterfowl populations, was originally written in 1986 and envisioned as a 15-year effort to achieve landscape conditions that could sustain waterfowl populations. The plan has been modified twice since the 1986 Plan to account for biological, sociological, and economic changes that influence the status of waterfowl and the conduct of cooperative habitat conservation. This 2018 Plan Update presents examples of progress toward achieving the goals of the 2012 Revision. It also establishes important groundwork for incorporating an understanding of people's relationship with nature into the North American waterfowl conservation enterprise.	Beneficial effects on waterfowl and species using similar habitats.
Stone Lakes National Wildlife Refuge Comprehensive Conservation Plan	USFWS	Ongoing	USFWS published a final Comprehensive Conservation Plan (CCP) for Stone Lakes National Wildlife Refuge in January 2007 to describe the selected alternative for managing Stone Lakes National Wildlife Refuge for the next 15 years. The refuge is located about 10 miles south of Sacramento, straddling I-5 and extending south from Freeport to Lost Slough. Under the plan, the refuge will continue its focus of providing wintering habitat for migratory birds and management to benefit endangered species. Management programs for migratory birds and other Central Valley wildlife will be expanded and improved, and public-use opportunities will also be expanded. The number of refuge units open to the public will increase from one to five. In addition, environmental education, interpretation, wildlife observation, wildlife photography, hunting, and fishing programs will be expanded. The plan achieves the refuge's purposes, vision, and goals; contributes to the refuge system mission; addresses the significant issues and relevant mandates; and is consistent with principles of sound fish and wildlife management.	Beneficial effects on terrestrial biological resources.
West Sacramento Levee Improvements Program	WSAFCA and USACE	Ongoing	The West Sacramento Levee Improvements Program would construct improvements to the levees protecting West Sacramento to meet local and federal flood protection criteria. The program area includes the entire WSAFCA boundary, which encompasses portions of the Sacramento River, the Yolo Bypass, the Sacramento Bypass, and the Sacramento Deep Water Ship Channel. The levee system associated with these waterways includes over 50 miles of levees in Reclamation District (RD) 900, RD 537, RD 811, DWR's Maintenance Area 4, and the Deep Water Ship Channel. These levees surround West Sacramento. For the purposes of this program, the levees have been generally divided into nine reaches: Sacramento River Levee North, Sacramento River	Potential effects on species using agricultural areas for foraging, on riparian species, and on aquatic species.

Program/ Project	Agency	Status	Description of Program/Project	Effects on Terrestrial Biological Resources
			Levee South, Port North Levee, Port South Levee, South Cross Levee, Deep Water Ship Channel Levee East, Deep Water Ship Channel Levee West, Yolo Bypass Levee, and Sacramento Bypass Levee.	
Yolo County Habitat/Natural Community Conservation Plan	Yolo Habitat Conservancy		The Yolo Habitat Conservancy, a Joint Powers Authority, launched the Yolo Natural Heritage Program in March 2007. This effort includes the continuing preparation of a joint Habitat Conservation Plan/ Natural Community Conservation Plan (HCP/NCCP). Member agencies include Yolo County, City of Davis, City of Woodland, City of West Sacramento, and City of Winters. The HCP/NCCP describes the measures that local agencies will implement in order to conserve biological resources, obtain permits for urban growth and public infrastructure projects, and continue to maintain the agricultural heritage and productivity of the county. The nearly 653,549-acre planning area provides habitat for covered species occurring within five dominant habitats/natural communities. The plan proposes to address 12 covered species, including five state-listed species: palmate-bracted bird's-beak, giant garter snake, Swainson's hawk, western yellow-billed cuckoo, and bank swallow. The Yolo Habitat Conservancy also consults regularly with CDFW and USFWS, as well as the Conservancy's Advisory Committee and other partners.	Beneficial effects on terrestrial biological resources.
Delta Science Plan	Delta Plan Interagency Implementation Committee (DPIIC)	Ongoing	The 2019 Delta Science Plan is the first comprehensive update to the 2013 Delta Science Plan. As with the 2013 document, the update process took on an open, transparent, and inclusive approach involving input from a diverse range of federal and state agencies, interested parties, academia, and the public. The actions identified in this updated Plan are intended to promote more forward looking and nimble science and management efforts. They address how to use open and transparent processes to prioritize science activities, determine how these can be carried out effectively and efficiently, and identify how the resulting information is best communicated to those who need it.	Generally beneficial to terrestrial biological resources.
Twitchell Island—San Joaquin Setback Levee Project	DWR	In progress	This project would stabilize a threatened section of levee along the San Joaquin River while also creating different habitat types and waterside features to be constructed. In 2000, 2,200 linear feet of the waterside levee was recontoured and replanted with native vegetation to create shaded riverine aquatic habitat. Additional riparian habitat, intertidal habitat, upland vegetation, and waterside beaches, benches, and undulations are planned in conjunction with an additional 23,000-foot setback along the San Joaquin River.	Beneficial effects on a variety of wildlife with potential for effects on species during activities.

Program/ Project	Agency	Status	Description of Program/Project	Effects on Terrestrial Biological Resources
Twitchell Island Mitigation Enhancement Site	DWR	In progress	The Twitchell Island Mitigation Enhancement Site (TIMES) is currently in pre-project maintenance, with work on the planting plan and freshwater marsh to begin in 2022. After establishment, the TIMES project will contribute 110 advanced mitigation acres to Delta Levee Program participants, and the 70 enhancement acres will continue its current lease.	Beneficial effects on terrestrial biological resources.
Grizzly Slough Floodplain Project at the Cosumnes River Preserve	DWR	In progress	The Grizzly Slough Floodplain Restoration Project is one of two main elements of the North Delta Flood Control and Ecosystem Restoration Project that consists of flood management and habitat improvements where the Mokelumne River, Cosumnes River, Dry Creek, and Morrison Creeks converge. Flood flows and high-water conditions in this area threaten levees, bridges, and roadways. The north Delta project will reduce flooding and provide contiguous aquatic and floodplain habitat along the downstream portion of the Cosumnes Preserve by modifying levees on Grizzly Slough. Benefits to ecosystem processes, fish, and wildlife will be achieved by recreating floodplain seasonal wetlands and riparian habitat on the Grizzly Slough proper. As of July 28, 2021, the grantee was securing final permits and subcontractors prior to construction.	Potential effects during construction but ultimately beneficial to species using riparian and wetlands.
Lower Putah Creek Realignment	CDFW	In progress	One of six separate projects identified and implemented to carry out the RPA Actions in the 2009 NMFS BiOp specific to the Yolo Bypass. The project will restore 300–700 acres of tidal freshwater wetlands, creating 5 miles of a new fish channel, improving anadromous fish access to 25 miles of stream, and restoring at least 5,000 square feet of salmon spawning habitat. Connectivity between these habitats will enhance salmonid in migration and spawning as well as rearing and outmigration conditions for smolts. The project will achieve this objective by enhancing habitat within Lower Putah Creek to support the recovery of local fall-run Chinook salmon, steelhead, and Sacramento splittail populations. This project has been identified as one of the projects that will be implemented under California EcoRestore.	Beneficial for aquatic species but potential effects on upland species during grading.
Prospect Island Tidal Habitat Restoration Project	DWR and CDFW	In progress	The northern portion of Prospect Island (about 1,253 acres) is currently owned by DWR, who acquired the property with the intent of restoring freshwater tidal marshes and associated aquatic habitat. Consistent with the objectives for the refuge, USACE and DWR completed the environmental documentation Mitigated Negative Declaration/Findings of No Significant Impact for a restoration project on Prospect Island in 2001. This project would partially fulfill the 80,000-acre tidal habitat restoration obligation outlined in Reasonable and Prudent Alternative (RPA) 4 of the 2019 USFWS BiOp for the effects of long-term coordinated operations of the SWP and the federal Central Valley Project (CVP) on delta smelt and has been fully funded by the SWP	Beneficial effects on aquatic species.

Program/ Project	Agency	Status	Description of Program/Project	Effects on Terrestrial Biological Resources
			contractors with several restoration activities in the planning process. The final EIR was certified in 2019.	
McCormack-Williamson Tract Flood Control and Ecosystem Restoration Project	DWR	Completed	This project is a part of the North Delta Flood Control and Ecosystem Restoration Project and will implement flood control improvements principally on and around McCormack-Williamson Tract in a manner that benefits aquatic and terrestrial habitats, species, and ecological processes. Flood control improvements are needed to reduce damage to land uses, infrastructure, and the Bay-Delta ecosystem caused by catastrophic levee failures in the project study area. This project has been identified as one of the projects that will be implemented under California EcoRestore.	Beneficial effects on aquatic and terrestrial species; some effects during construction.
Lookout Slough Tidal Habitat Restoration and Flood Improvement Project	DWR	In progress	The project is designed to be a multi-benefit project to restore approximately 3,100 acres of tidal marsh, increase flood storage and conveyance in the Yolo Bypass, increase levee resilience, and decrease flood risk. Habitat restoration and flood improvement goals would be attained by excavating a network of tidal channels, constructing a new setback levee along Duck Slough, breaching and degrading the Shag Slough (Yolo Bypass West) Levee, breaching the Vogel Levee, and improving the Cache/Hass Slough Levee. On November 3, 2020, DWR certified the EIR for the Lookout Slough Tidal Habitat Restoration and Flood Improvement Project and filed a Notice of Determination with the Governor's Office of Planning and Research. On July 16, 2021, the Delta Stewardship Council, as part of an Appeals of the Certification of Consistency case, remanded DWR on portions of the project which had not provided enough information to be shown as consistent with the Delta Plan. DWR is responsible for providing additional information. However, on July 27, 2021, approval of Permit No. 19477 was granted by the Central Valley Flood Protection Board under California Code of Regulations, Title 23, Article 3, Section 6 to construct approximately 2.9 miles of a new setback levee along Duck Slough and Liberty Island Road and breach the existing Yolo Bypass levee at Shag Slough. This permitted work would restore and enhance approximately 3,164 acres of upland, tidal, and floodplain habitat.	Beneficial effects on aquatic species; potential effects on terrestrial species during construction.
Decker Island Tidal Habitat Restoration Project	DWR, CDFW	In progress	Decker Island is located in the Sacramento–San Joaquin River Delta along the Sacramento River. DWR is undertaking the restoration of the Decker Island Tidal Habitat Restoration Project in conjunction with CDFW to enhance roughly 140 acres of established emergent wetland with muted tidal connectivity to Horseshoe Bend and uplands to fully tidal habitat. Construction began in August 2018 and was completed by mid-November of the same year. CDFW will implement biological monitoring to ensure desired site functions are established and to inform future restoration projects.	Beneficial effects on aquatic species.

Program/ Project	Agency	Status	Description of Program/Project	Effects on Terrestrial Biological Resources
SR-239 Project (East Bay–Contra Costa, Alameda, northern San Joaquin Counties)	Contra Costa Transportation Authority, Contra Costa County, Caltrans	Planning phase	The SR 239 project will provide a new, four-lane highway from SR 4 at Marsh Creek Road in Contra Costa County to I-580 in Alameda County. This new state route will ultimately improve the transportation network for an area that had few viable north–south roadway connections between East Contra Costa and the Central Valley.	Potential effects on California red-legged frog, California tiger salamander, vernal pool fairy shrimp, and wildlife connectivity.
City of Antioch Brackish Water Desalination Project	City of Antioch	In development	The Antioch Brackish Water Desalination Project, which utilizes existing infrastructure to the extent possible, includes the construction of new desalination facilities and associated infrastructure in order to improve the City's water supply reliability and operational flexibility. Once constructed, the desalination facility, located at the existing water treatment plant, will provide for 6 million gallons per day of capacity (producing up to 5,500 AFY), helping the City reduce its purchases of more expensive CCWD water.	No effects on terrestrial biological resources.
Three Creeks Parkway Restoration Project	Contra Costa County Flood Control and Water Conservation District	In development	In July 2015, the District partnered with American Rivers, a nonprofit partner, on the $2 million Three Creeks Parkway Restoration Project in Brentwood, a multiagency public-private partnership to transform 0.25 mile of the Marsh Creek flood control channel into high-quality salmon and riparian habitat, with enhanced public access. Since then, the project has expanded to restore 0.75 mile of Marsh Creek and costs approximately $9.0 million. Approximately $5.9 million of outside funding from private, federal, and state agencies has been obtained to date. The project has multiple local and regional partners, including the City of Brentwood, Friends of Marsh Creek Watershed, East Contra Costa County Habitat Conservancy, and East Bay Regional Park District. In 2018, planning and environmental studies were completed, and construction began in June 2020. Phase 1 has been completed.	Beneficial effects on riparian species.
Winter Island Tidal Habitat Restoration Project	DWR, CDFW	Completed	The Winter Island Tidal Habitat Restoration Project was created to partially fulfill the Fish Restoration Program (FRP)'s 8,000-acre tidal habitat restoration obligations of DWR in RPA 4 of the 2019 U.S. Fish and Wildlife Service (USFWS) Biological Opinion (BiOp) for the effects of the long-term coordinated operations of the SWP and the federal CVP on delta smelt. Because restoration of tidal habitat would provide access for salmonid rearing at Winter Island, the project is also consistent with RPA I.6.1 of the National Marine Fisheries Service (NMFS) Salmonid BiOp for SWP/CVP operations. These obligations were upheld in the 2019 Re-evaluation of Consultation published by USFWS and NMFS, with the addition that FRP now has until 2030 to reach these restoration goals. The project was also established to fulfill FRP's 800-acre mesohaline habitat requirement of the California Department of Fish and	Beneficial effects on riparian and wetland species.

Program/ Project	Agency	Status	Description of Program/Project	Effects on Terrestrial Biological Resources
			Wildlife (CDFW) Longfin Smelt Incidental Take Permit for the SWP Delta operations. The primary goal of the project is to restore unrestricted tidal connectivity between the interior of Winter Island and the surrounding channels, which would convert muted tidal emergent wetland and open water habitats into tidal wetland habitat and improve access for the benefit of native fish species. Construction was completed on September 25, 2019.	

AFY = acre-feet per year; AIPCP = Aquatic Invasive Plant Control Program; Bay Area = San Francisco Bay Area; BCDC = Bay Conservation and Development Commission; BiOp = biological opinion; CAISMP = California Aquatic Invasive Species Management Plan; Caltrans = California Department of Transportation; CCCHD = Contra Costa County Health Department; CCP = Comprehensive Conservation Plan; CCWD = Contra Costa Water District; CDFW = California Department of Fish and Wildlife; CESA = California Endangered Species Act; cfs = cubic feet per second; CO_2 = carbon dioxide; CVFPB = Central Valley Flood Protection Board; CVFPP = Central Valley Flood Protection Plan; CVJV = Central Valley Joint Venture; CVP = Central Valley Project; DBW = Division of Boats and Waterways; Delta = Sacramento–San Joaquin Delta; DPC = Delta Protection Commission; DPIIC = Delta Plan Interagency Implementation Committee; DSC = Delta Stewardship Council; DWR = California Department of Water Resources; EACCS = East Alameda County Conservation Strategy; EDCP = *Egeria densa* Control Program; EIR = environmental impact report; EIS = environmental impact statement; EPA = U.S. Environmental Protection Agency; ERP = Ecosystem Restoration Plan; ESA = Endangered Species Act; FAV = Floating Aquatic Vegetation; FRP = Fish Restoration Program; HCP = habitat conservation plan; I- = interstate; ITP = incidental take permit; LMP = Land Management Plan; LSIWA = Lower Sherman Island Wildlife Area; LTMS = Long-Term Management Strategy; LURMP = Land Use and Resource Management Plan; MOA = Memorandum of Agreement; NCCP = natural community conservation plan; NMFS = National Marine Fisheries Service; NPDES = National Pollutant Discharge Elimination System; RD = Reclamation District; Reclamation = U.S. Bureau of Reclamation; Regional San = Sacramento Regional County Sanitation District; Regional Water Board = Regional Water Quality Control Board; RHJV = Riparian Habitat Joint Venture; RPA = Reasonable and Prudent Alternative; SAFCA = Sacramento Area Flood Control Agency; SAV = Submersed Aquatic Vegetation; SF = San Francisco; SPFC = State Plan of Flood Control; SR = State Route; SRA = State Recreation Area; SWP = State Water Project; TAF = thousand acre-feet; TIMES = Twitchell Island Mitigation Enhancement Site; TMDL = total maximum daily load; UC = University of California; USDA = U.S. Department of Agriculture; USFWS = U.S. Fish and Wildlife Service; WSAFCA = West Sacramento Area Flood Control Agency.

The various projects and programs analyzed for cumulative effects will have cumulative effects on the existing biological resources of the study area through project construction and beyond. The most relevant elements of these projects and programs are their ability to modify land use patterns, modify land management practices, and change the patterns of hydrology and vegetation in the study area. Most of the local, state, and federal land use and land management programs that are affecting or will affect the Delta are designed to preserve open space and agricultural lands and to manage the resources of the area for multiple uses, including agriculture, recreation, fish and wildlife habitat, flood protection, and water management. The restoration programs will increase primarily wetland and riparian natural communities by converting agricultural land. The special-status and common plants and wildlife that rely on wetland and riparian habitats for some stage of their life will benefit from these changes over time. Other species that rely on agricultural land, but do not benefit from wetland and riparian expansion, may decline in the study area. On the upland fringes of the Delta, plans exist for small expansions of urban development that would remove primarily agricultural land uses. The management of state- and federally owned wildlife areas, including Sherman Island, Yolo Bypass State Wildlife Areas, and Stone Lakes National Wildlife Refuge, will continue to focus on multiple uses, including wildlife habitat improvement, public access for wildlife viewing, wildlife-friendly agricultural production, and hunting opportunities. Natural habitat will be improved and expanded. The principal changes that are likely to result from the various HCPs that overlap with the study area would be expected to include the restoration and protection of the habitats that support the same special-status species being addressed in the Delta Conveyance Project Draft EIR (Impact BIO-54: *Conflict with the Provisions of an Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local, Regional, or State Habitat Conservation Plan*) (California Department of Water Resources 2022). These changes would be expected to result in increases of wetland, grassland, and riparian habitats and a decrease in agricultural lands.

Implementation of water management strategies would not significantly modify the principal natural communities in the study area. These management strategies are designed, in part, to improve aquatic habitat conditions in the Delta for the benefit of special-status fish species. Periodic levee and channel maintenance activities associated with flood management would result in localized disturbances to valley/foothill riparian, grassland, and tidal perennial aquatic natural communities and to a lesser extent to tidal brackish and tidal freshwater emergent wetlands. To the extent that ongoing levee repair and replacement involves use of reinforcing rock and discouragement of replanting streamside vegetation, there could be a gradual decline in the extent and value of valley/foothill riparian habitat and grassland along minor and major waterways. Several water management and transportation regulations require localized removal of natural communities and agricultural land for expanding infrastructure. Most of these activities are on the periphery or just outside of the study area.

The overall direction of these existing and ongoing programs and policies that influence land conversion and land management in the study area would continue to be toward maintaining the mix of agricultural, recreational, water management, and wildlife uses in the study area. Some actions that will occur will expand natural and manmade terrestrial and wetland habitats that will benefit the special-status and common plants and wildlife with expanded and enhanced habitat in the study area. The potential will remain, however, for long-term trends in levee deterioration, global climate change, and seismic activity that could damage levees and result in changes in natural communities and cultivated lands.

For all action alternatives, the environmental commitments and best management practices (Appendix C1, *Environmental Commitments and Best Management Practices*), the mitigation measures in Appendix C2, *Mitigation Measures*, and the compensatory mitigation in the CMP (Appendix C3, *Compensatory Mitigation Plan for Special-Status Species and Aquatic Resources*) are sufficient to avoid cumulatively considerable effects from the combined habitat losses and conversions due to construction and restoration activities.

3.6 Climate Change

This section describes the affected environment for climate change and analyzes effects that could occur in the study area from construction, operation, and maintenance of the action alternatives, as well as the No Action Alternative.

While a variety of changes in climate changes will affect the study area, including changes in temperature, hydrology, and wildfire risk, the future climate modeling developed for this assessment focuses on projected sea level rise and hydrologic changes (e.g., shifts in surface water, groundwater, runoff, water demands) as they present the most pressing threats to operations and design of the action alternatives (see Delta Conveyance Project Draft EIR Appendix 5A, *Modeling Technical Appendix,* Section B, *Hydrology and Systems Operations Modeling*, for further detail). Additional information on the affected environment, methods, and the anticipated effects of the action alternatives can be found in the Delta Conveyance Project Draft EIR Chapter 30, *Climate Change* (California Department of Water Resources 2022). For information on the action alternatives' effects on GHG emissions, see Delta Conveyance Project Draft EIR Chapter 23*, Air Quality and Greenhouse Gases* (California Department of Water Resources 2022).

3.6.1 Introduction

Climate is the average weather over many years, measured most often in terms of temperature, precipitation, and wind. For example, the climate of California's Central Valley is a Mediterranean climate, which is hot and dry during the summer and cool and damp in winter, with the majority of precipitation falling as rain in the winter months. Climate is unique to a particular location and changes on timescales of decades to centuries or millennia.

Climate change generally refers to "statistically significant variations of the mean state of the climate or of its variability, typically persisting for decades or longer" (Intergovernmental Panel on Climate Change 2001:87). Although the climate can change, and has changed, in the past in response to natural drivers, recent climate change has been more rapid than previous episodes of climate change and has been unequivocally linked to increasing concentrations of GHGs in Earth's lower atmosphere and the rapid timescale on which these gases have accumulated (Intergovernmental Panel on Climate Change 2021:[18]SPM-5, TS-8). The major causes of this rapid loading of GHGs into the atmosphere include the burning of fossil fuels since the beginning of the Industrial Revolution, agricultural practices, increases in livestock grazing, and deforestation. More background information on GHG emissions is provided in Delta Conveyance Project Draft EIR Chapter 30, *Climate Change*.

Higher concentrations of heat-trapping GHGs in the atmosphere result in increasing global surface temperatures, a phenomenon commonly referred to as *global warming* or *climate change*. Higher atmospheric GHG concentrations and global surface temperatures, in turn, result in changes to

[18] To date, the Summary for Policymakers (SPM) is the approved version from IPCC 2021 and remains subject to final copyediting and layout. The Technical Summary, report chapters, annexes, and supplementary materials are the Final Government Distribution versions, and remain subject to revisions following SPM approval, corrigenda, copyediting, and layout. Although these documents still carry the note from the Final Government Distribution "Do Not Cite, Quote or Distribute" they may be freely published subject to the disclaimer above because the report has now been approved and accepted.

Earth's climate system, including rainfall patterns; extreme weather events; ocean temperature and acidity; the amount of spring snow cover in the Northern Hemisphere; atmospheric water content; and global sea level rise (Intergovernmental Panel on Climate Change 2021:SPM-6,19, 2-5–7). Some of these changes will result in specific effects at the state and local levels.

3.6.2 Purpose

This section analyzes three fundamental questions relating to climate change.

1. How will climate change affect the study area?
2. How will the effects of the action alternatives on resources in the study area be affected by climate change (i.e., are future changes in climate likely to exacerbate effects)?
3. How will the action alternatives affect the resiliency of the study area or its resources to climate change?

This section is organized differently from the other resource sections because analyzing how climate change would affect the study area, how anticipated resource effects from the alternatives would be affected by climate change, and how the action alternatives may improve the study area's resiliency and adaptability to climate change are fundamentally different analyses than those presented in other resource sections. Whereas, other sections are organized to identify existing conditions as of issuance of the Notice of Preparation in 2020, one of the functions of this section is to analyze and disclose the future conditions of the study area under climate change. The study area for this section includes areas upstream of the Delta region, and the Delta region. The action alternatives would not affect areas upstream of the Delta region; however, both the SWP and CVP water delivery systems rely on runoff and reservoir releases in areas upstream of the Delta and may be affected by Delta salinity levels, regardless of the action alternatives.

3.6.3 Affected Environment

Because this section discusses how the action alternatives would affect the resiliency and adaptability of the study area to the effects of climate change, it also discusses expected changes to the environmental setting. The following background sections provide brief descriptions of (1) recent trends in key climate metrics, such as temperature, precipitation, and sea level; and (2) projections of how the climate will change between now and 2100. Though the action alternatives are designed with a 100-year lifespan, an end-of-century time horizon was chosen for discussion of climate change trends in this section because it represents the latest time horizon for a range of best available sea level rise scenarios (California Ocean Protection Council 2017).

Delta Conveyance Project Draft EIR Chapter 30, *Climate Change* (California Department of Water Resources 2022), presents a detailed description of projections of future climate change are based on (1) the level of GHGs already in the atmosphere; (2) the current rate at which human activity releases GHGs to the atmosphere; and (3) the projected future rate of GHG emissions, which, in turn relies on predictions of future population, global economic growth, future available energy sources, and regulations.

3.6.3.1 Climate Change Trends and Associated Effects in the Study Area

Looking comparatively at existing conditions (2020) and projected 2040 conditions, scenarios were chosen to assess effects of the action alternatives, considering expected effects of climate change and sea level rise and changes in land use, population, and water demand (Delta Conveyance Project Draft EIR Appendix 5A, *Modeling Technical Appendix*; California Department of Water Resources 2022). Global model projections generated under RCPs 4.5 and 8.5 are used. These were selected because of their relevance to the applicant's programs and planning and as representative for broader climate projections. Historical events and future climate projections with this basis support precipitation and temperature data used for the 2040 scenario. The most feasible models were chosen for historical data and projected outcomes based on changing factors, including temperature and precipitation changing hydrologic conditions, sea level rise, water temperatures and quality, and salmonid populations.

As shown in Table 3.6-1, average daily maximum temperatures, temperature extremes, flood risks, and wildfire risks are all expected to increase in the study area by 2100 or earlier.

The character of precipitation within the Sacramento and San Joaquin River Basins is expected to change under warming conditions, resulting in more frequent rainfall events and less frequent snowfall events (He et al. 2019:11). Increased warming is expected to diminish the accumulation of snow during the cool season (i.e., late autumn through early spring) and the availability of snowmelt to sustain runoff during the warm season (i.e., late spring through early autumn). Warming may lead to more rainfall-runoff during the cool season rather than snowpack accumulation. Consequently, this change in runoff pattern leads to increases in December–March runoff and decreases in April–July runoff.

Recent modeling indicates that sea level along the San Francisco Coast is expected to increase from 0.08 foot (0.02 meter; RCP 8.5 modeling scenario, likely range with low risk aversion) to 1.8 feet (0.55 meter; H++ scenario, which is an extreme modeling scenario resulting from loss of the West Antarctic ice sheet) by 2040, and by as much as 3.4 feet (1.04 meters; RCP 8.5 modeling scenario, likely range with medium-high risk aversion) to 10.2 feet (3.11 meters; H++ modeling scenario) by 2100 (California Natural Resources Agency and Ocean Protection Council 2018:18). It is expected that more land in the study area will be subject to inundation by 2100 in comparison to current conditions. Potential changes in inundation zones (i.e., tidal regime) will affect the salinity and suitable habitat for species in the Delta.

Table 3.6-1 reflects climate projections (for all variables except sea level rise) provided in regional reports developed as part of the Fourth Assessment: Sacramento Valley (California Governor's Office of Planning and Research, California Energy Commission et al. 2018a:18–20), San Francisco Bay Area (California Governor's Office of Planning and Research, California Energy Commission et al. 2018b:14, 17, 31, 61), San Joaquin Valley (California Governor's Office of Planning and Research, California Energy Commission et al. 2018c:7–8), Central Coast (California Governor's Office of Planning and Research, California Energy Commission et al. 2018d:7, 13–17, 25, 39, 31), Los Angeles (California Governor's Office of Planning and Research, California Energy Commission et al. 2018e:6, 10–14, 18, 54, 61), San Diego (California Governor's Office of Planning and Research et al. 2018f:10, 19, 21, 27–29, 39, 74), Sierra Nevada (California Governor's Office of Planning and Research et al. 2018g:5, 15, 18, 28, 46), and Inland Deserts (California Governor's Office of Planning and Research et al. 2018h:14, 18, 21, 23, 29). The Delta Stewardship Council's *Delta Adapts: Creating a Climate Resilient Future* (2021:3-13, 5-8) is used to supplement some information. Sea level rise projections referenced are those developed for the 2018 update to the *State of California Sea-Level Rise Guidance*; data is provided for representative tide gages in each region (California Natural Resources Agency and Ocean Protection Council 2018:18, 63, 72, 78). Regions for which sea level rise data is not provided are indicated with a "–" symbol.

3.6.3.2 Climate Change Impacts in the Study Area

Water temperatures, precipitation and runoff, sea level rise, flooding, and drought climate change impacts are explored in more detail in the subsections that follow as they are common climate impacts within the study area among the resource areas covered in this EIR.

Water Temperatures

Increased water temperatures biologically, physically, and chemically affect aquatic organisms and habitats. These impacts may be seen in changing maximum dissolved oxygen saturation levels (i.e., the highest amount of oxygen water can dissolve) and primary productivity, nutrient and chemical cycling, and organisms' metabolism, growth, and reproductive and mortality rates (IEP MAST 2015:32). Reduced dissolved oxygen levels may have adverse effects on fish spawning in the form of reduced egg survival and may reduce the habitat zone (i.e., reduce abundance) of fish such as delta smelt (*Hypomesus transpacificus*) that are sensitive to higher temperatures. Salmonid egg survival and population productivity also may be affected by higher temperature levels that can limit sufficient oxygen levels, increase disease prevalence, and interfere with synchrony of natural systems like migration (National Oceanic and Atmospheric Administration 2018:4, 25, 31, 37).

Higher water temperatures can affect fish habitat, and there are some existing management strategies to maintain the desired water temperature; however, projected critically dry years resulting from climate change would make it more difficult to meet water temperature requirements for suitable aquatic habitat for sensitive species. Water temperatures in the lower American River are influenced primarily by the timing, magnitude, and temperature of water releases from Folsom and Nimbus Dams and are currently managed according to the Water Temperature Objectives established in the 2006 Flow Management Standard. Reclamation manages flows to meet a 65°F (18.3°C) water temperature objective in the lower American River for steelhead incubation and rearing during the late spring and summer; however, critically dry years and low reservoir storages could make flow and temperature management more difficult under future climate conditions.

1 **Table 3.6-1. Climate Change Projections for the Study Area [a]**

Study Area Region	Average Daily Max. Temperature [b]	Temperature Extremes [c]	Precipitation	Sea Level Rise [d]	Flood Risk	Wildfire Risk	Other Impacts
Sacramento Valley Region	Likely [e] to increase by 10°F (5.6°C)*†	Average number of extreme heat days (above 104°F [40°C]) increases from 4 to 40 per year in midtown Sacramento*†	Dry and wet extremes increase	Sea level rise in the San Francisco Bay Area will increase flood potential and salinity of Sacramento–San Joaquin Delta waters	More flood potential in Delta	Heightened risk of catastrophic wildfire	Streamflow shifts from spring to winter, more runoff, and less groundwater recharge
San Francisco Bay Area Region	Likely to increase by 7.2°F (4.0°C)*†	Average number of extreme heat days (over 85°F [29.4°C]) to potentially increase by 90*†	Dry and wet extremes increase	San Francisco tide gage: 1.8 feet (0.5 meter) to 10.2 feet (3.1 meters)	More flood potential	Frequent and sometimes large wildfire	Winter storms more intense; a once-in-20-year storm will become a one-in-seven-year or more frequent storm
San Joaquin Valley Region	Likely to increase by 10°F (5.6°C)*†	Average number of extreme heat days (above 101.6°F [38.7°C]) increases from 4 to 46 per year*† [f]	Dry and wet extremes increase	–	More flood potential in Delta	Longer fire season, increase in wildfire frequency, expansion in fire-prone areas	Salinity intrudes deeper into Delta; stream flows shift from spring to winter; more runoff and less groundwater recharge
Central Coast Region	Likely to increase by 7.5°F (4.2°C)*†	Average number of extreme heat days (above 87.5°F–90.1°F [30.8°C–32.3°C], depending on the county) increases from 4.3 to 20–50 per year*†	Dry and wet extremes increase	Port San Luis tide gage: 1.6 feet (0.5 meter) to 9.9 feet (3.0 meters)	More flood potential, particularly coastal flooding	Frequent and sometimes large wildfires continue, with heightened post-fire impacts	Sediment from wildfires intrudes flows
Los Angeles Region	Likely to increase by 8.4°F (4.7°C)*†	Average number of extreme heat days (over 90°F [32.2°C]) increases from less than 15 to up to 90 at Los Angeles International Airport*†	Dry and wet extremes increase	Los Angeles tide gage: 1.7 feet (0.5 meter) to 9.9 feet (3.1 meters)	More flood potential, particularly coastal flooding	Increase in wildfire frequency, expansion in fire-prone areas	More storm runoff and less groundwater recharge, possible changes in Santa Ana winds

Study Area Region	Average Daily Max. Temperature [b]	Temperature Extremes [c]	Precipitation	Sea Level Rise [d]	Flood Risk	Wildfire Risk	Other Impacts
San Diego Region	Likely to increase by 7°F–9°F (3.6°C–5°C) *†	Average hottest day per year increase by 10°F [5.5°C])*†	Dry and wet extremes increase	San Diego tide gage: 1.8 feet (0.5 meter) to 10.2 feet (3.1 meters)	More flood potential	Increase in wildfire frequency, expansion in fire-prone areas	Changes in Santa Ana winds, sediment from wildfires intrudes flows
Sierra Nevada Region	Average temperature likely to increase by 6°F–10°F (3.3°C–5.6°C)*†	–	Dry and wet extremes increase	–	More flood potential	Increase in wildfire frequency and size, expansion in fire-prone areas	Higher rain-to-snow ratio, earlier snowmelt, less snowpack
Inland Deserts Region	Likely to increase by 14°F (7.8°C)*†	Average number of extreme heat days (over 112°F [44.4°C]) increases from 10 to more than 80 per year*†	Dry and wet extremes increase	–	More flood potential, particularly flash floods	Increase in wildfire frequency	More runoff, diminished inflows into and increased salinity of Salton Sea

Sources: California Governor's Office of Planning and Research, California Energy Commission et al. 2018a:18–20; 2018b:14, 17, 31, 61; 2018c:7–8; 2018d:7, 13–17, 25, 31, 39; 2018e:6, 10–14, 18, 54, 61; 2018f:10, 19, 21, 27–29, 39, 74; 2018g:5, 15, 18, 28, 46; 2018hi:14, 18, 21, 23, 29; Delta Stewardship Council 2021:3-13, 5-8; California Natural Resources Agency and Ocean Protection Council 2018:18, 63, 72, 78.

°C = degrees Celsius; °F = degrees Fahrenheit.

[a] * indicates "under RCP8.5"; † indicates "by 2100." Temperature data shown in the table are probabilistic projections developed for RCP scenario 8.5 assuming an end-of-century (i.e., 2100) timeline (see second and third columns from left). Sea level rise changes shown (see fifth column from left) are projections developed for the H++ scenario, which does not have an associated likelihood of occurrence.

[b] Information available in the Fourth Assessment region reports varies by region; average daily maximum temperature is provided for all regions except the Sierra Nevada region, which has the average projected change in temperature (i.e., not average daily maximum).

[c] Information available in the Fourth Assessment region reports varies by region; average number of extreme heat days is provided for all regions except San Diego, which has average hottest day instead.

[d] Sea level rise projections referenced are those developed for the *State of California Sea-Level Rise Guidance: 2018 Update* (California Natural Resources Agency and Ocean Protection Council 2018). Projections provided are for the H++ scenario, a single scenario for extreme sea level rise, not a probabilistic projection; it does not have an associated likelihood of occurrence, but is recommended for consideration in significant, long-term decisions (California Natural Resources Agency and Ocean Protection Council 2018). For example, sea level rise at the San Diego tide gage for the H++ scenario is 1.8 feet in 2040 and 10.2 feet in 2100, shown as 1.8 feet (0.5 meter) to 10.2 feet (3.1 meters) in the table.

[e] The Intergovernmental Panel on Climate Change used this term to indicate the assessed likelihood of the outcome or result, based on an evaluation of underlying evidence and agreement. "Likely" probability indicates 66%–100% likelihood of this outcome or result (Intergovernmental Panel on Climate Change 2021:SPM-4).

Precipitation and Runoff

The geographic variation and unpredictability in precipitation that California receives make it challenging to manage the available runoff that can be diverted or captured in storage to meet urban and agricultural water needs. In California, winter precipitation and spring snowmelt are captured in surface water reservoirs to provide flood protection and water supply. In general, peak runoff times are projected to be earlier for watersheds in the study area according to climate projections. The peak is projected to shift 1 month earlier from March to February by the late twenty-first century for the Sacramento Four Rivers (i.e., the Sacramento River and its tributaries [the Feather, Yuba, and American Rivers]) under both 4.5 and 8.5 RCP modeling scenarios; Sacramento Valley watersheds are expected to peak earlier (except for Sacramento River above Bend Bridge) by midcentury (He et al. 2019:9). The San Joaquin Four Rivers (i.e., the San Joaquin River and its tributaries [the Stanislaus, Tuolumne, and Merced Rivers]) and San Joaquin Valley watersheds are projected to remain unchanged in May in both future periods under both 4.5 and 8.5 RCP modeling scenarios; however, the Stanislaus River is projected to have an earlier peak during late century under the RCP 8.5 modeling scenario (He et al. 2019:11).

Snowmelt is an important part of water systems in the study area. Due to elevation differences, Sacramento Valley watersheds generally have higher temperatures and are less affected by snow compared to San Joaquin Valley watersheds. Specifically, more runoff is from snowmelt for San Joaquin Valley watersheds (He et al. 2019:13). As mentioned in Section 3.22, *Water Supply*, snowmelt contributes the largest portion of the flows in the Stanislaus River, with the highest runoff occurring in the months of April, May, and June. With inadequate runoff and pattern changes of snowmelt runoff resulting from climate change, CalSim 3 model results show (although infrequent) simulated occurrences of extremely low storage conditions at SWP and CVP reservoirs during critical drought periods when storage is at *dead pool* levels (i.e., when the water level is so low that it cannot drain by gravity through the dam's outlets), and there may be instances in the simulation results in which flow conditions fall short of minimum flow criteria, salinity conditions may exceed salinity standards, diversion conditions fall short of allocated diversion amounts, and operating agreements are not met (as described in Section 3.22, *Water Supply*). However, real-life operations may include real-time adjustments to counteract these negative consequences. High temperatures and lower precipitation levels would result in a rapid drop of carryover storage and performance level for Folsom, Oroville, and Trinity reservoirs; however, Shasta reservoir could be slightly more resilient due to its greater inflow of rain rather than snowmelt (California Department of Water Resources 2018b:21–22).

Sea Level Rise

The likely effects of anticipated sea level rise on the study area were evaluated based on detailed modeling simulations as described in Delta Conveyance Project Draft EIR Appendix 5A, *Modeling Technical Appendix*. When considering potential sea level rise impacts, special consideration must be given to the following three interrelated elements.

- **Inundation.** Changes in sea levels and Delta inflows have the potential to cause more temporary or permanent inundation (e.g., permanent inundation due to higher sea levels, or temporary inundation due to higher inflows associated with higher sea levels and increased precipitation variability) (Delta Stewardship Council 2021:5-52–5-55).

- **Salinity gradient.** The location of the gradient between saline, brackish, and fresh water in the San Francisco Bay Area and Delta will be affected by sea level rise. As sea levels rise, the salinity gradient will shift farther upriver. The position of the daily average salinity gradient in the San Francisco Estuary is called "X2," which is the distance in kilometers upstream of the Golden Gate Bridge of the 2 parts per thousand (ppt) isohaline based on the1995 Bay-Delta Water Quality Control Plan (Bay-Delta WQCP) (State Water Resources Control Board 1995). The X2 position is highly variable due to daily tidal movement. Outflow objectives identified in the Bay-Delta WQCP manage the X2 position to control salinity intrusion into the Delta. The daily average X2 position provides an index of the upstream extent of saltwater intrusion as a consequence of sea level rise. Under the State Water Board Water Right Decision 1641 (D-1641), SWP and CVP operators are responsible for maintaining the X2 location, as specified in the 1995 Water Quality Control Plan (State Water Resources Control Board 1995).
- **Tidal variations.** Changes in sea level will influence natural tidal variations along the California coast and within the San Francisco Bay Area and Delta. Edge species that rely on existing variations between wet and dry conditions may become permanently inundated or otherwise experience inhospitable environmental changes. Sea level rise and heightened coastal storms have a combined effect on storm surges, particularly for coastal regions (California Governor's Office of Planning and Research, Scripps Institution of Oceanography et al. 2018:54).

Inland Flooding

Historical patterns of precipitation have been used by USACE and the applicant to develop reservoir storage criteria to reduce flood potential in watersheds. Assumptions for snowfall and rainfall patterns have been made for the action alternatives to reflect climate change that is anticipated to increase surface water runoff from rainfall in the winter and early spring and to decrease runoff from snowmelt in the late spring and early summer, as described in Section 3.18, *Surface Water*, and Section 3.22, *Water Supply.*

Flooding occurring from increased precipitation, sea level rise, and more intense storm events threatens California's critical infrastructure and populations. The increasing proportion of precipitation falling as rain rather than snow throughout California regions will exacerbate winter floods (California Department of Water Resources 2018b:3). Major sea ports on the West Coast are already flooding because of sea level rise and storms and this trend will continue. For example, an area of 0.89 square mile (2.28 square kilometers) within the Port of San Francisco is expected to be flooded in the two decades before the end of the century (California Governor's Office of Planning and Research, Scripps Institution of Oceanography et al. 2018:54). The San Francisco Bay Area is already experiencing flooding in part due to atmospheric rivers, which are expected to increase with rising temperatures (California Governor's Office of Planning and Research, California Energy Commission et al. 2018b:87). Sea level rise will increase the potential for flooding in the Delta, particularly during high tide events (California Governor's Office of Planning and Research, California Energy Commission et al. 2018a:33). North of Delta reservoirs will not have the capacity to hold runoff from early snow melting and increased precipitation, and instead it will be released as flood water and become Delta outflow (California Department of Water Resources 2018a:40–41). Throughout the Sacramento Valley region, growing storm intensity will create conditions that increase the likelihood of and shorten the timeline before inland mega-floods—such as one like the 1862 "Great Flood" (California Governor's Office of Planning and Research, California Energy Commission et al. 2018a:19, 34). The San Joaquin Valley region also is projected to experience a higher frequency of mega-flooding (California Governor's Office of Planning and Research, California Energy Commission et al. 2018c:6).

Drought

The study area experiences periodic droughts. The Sacramento and San Joaquin 8 River Index, the Sacramento 4 Rivers Index, and the San Joaquin 4 Rivers Index were included in a study evaluating drought using streamflow-based indices, looking for "deficits" (i.e., any negative difference between the annual flow and the long-term mean annual flow) from 1906 to 2012, which included six significant deficit spells: 1928 (an 8-year deficit), 1944 (a 7-year deficit), 1976 (a 2-year deficit), 1987 (a 6-year deficit), 2007 (a 4-year deficit), and 2012 (a 4-year deficit) (U.S. Department of the Interior Bureau of Reclamation 2014). The majority of these six drought periods had runoff levels that were classified as "dry" or "critical" under the Sacramento and San Joaquin Valley Water Year Indices, which had important agricultural consequences given the level of agricultural production in the Central Valley (California Department of Water Resources 2018a:12; U.S. Geological Survey 2021:1). On April 21, 2021, Governor Newsom announced a state of emergency due to acute water supply shortages in northern and central areas of California; as of July 2021, the state of emergency includes 50 counties (California Governor's Office 2021). The duration of the dry spell is unknown, but it is highly likely to persist until the next rainy season in October (National Weather Service 2021:1). By 2050, extreme Delta drought conditions are projected to occur five to seven times more frequently (Delta Stewardship Council 2021:5-62). During midcentury droughts, Delta exports are projected to reduce to half of the quantity compared to historical droughts exports (California Department of Water Resources 2018a:41). Over the next several decades, dry years will become drier (California Governor's Office of Planning and Research, Scripps Institution of Oceanography et al. 2018:19). Meanwhile in the southwest regions, the likelihood of a long-lasting "mega-drought" is becoming greater (California Governor's Office of Planning and Research, Scripps Institution of Oceanography et al. 2018:24).

3.6.3.3 Application of California Climate Projections to Alternatives Analysis

Over the last 14 years, the Delta Conveyance Project and its predecessor projects proposing new north Delta intakes were studied extensively under a range of projected climate change futures under Climate Model Intercomparison Project (CMIP)3 and CMIP5 including extreme scenarios. In addition, there were comprehensive climate change studies conducted by the applicant and Delta Stewardship Council to understand the potential effects on the overall SWP and CVP system, which considered increased inter-annual variability and potential increased drought frequency. Based on these extensive analyses over more than a decade, climate change is expected to have significant effects on the overall SWP and CVP operations, upstream tributaries, and the Bay-Delta. The degree of impacts on SWP and CVP would vary based on the assumed climate change projection for the future and as we go further into the future. However, for proposed new intakes in the north Delta, key climate change effects that need to be addressed include shift in timing and quantity of flows, increasingly variable hydrology, increased water levels, and potentially greater salinity intrusion, irrespective of the impacts on the overall SWP and CVP operations. This analysis appropriately considered these climate change effects and disclosed how the proposed intakes would perform under these projected future changes.

Future temperature, precipitation, and sea level rise conditions were simulated for the action alternatives using CalSim 3. The simulations were used to understand salinity changes and investigated the response of water quality of seven sea level rise scenarios, ranging in severity of sea level assumptions, including a base condition with no sea level rise, compared to recent historical conditions. For this analysis, the CalSim 3 model was run with inputs based on year 2040 (climate period 2026–2055) anticipated conditions, as described in Delta Conveyance Project Draft EIR Appendix 5A, *Modeling Technical Appendix*. Ten CMIP5 global climate models and two GHG concentration scenarios (RCP 4.5 and RCP 8.5) were used to develop 20 climate model projections, which were then downscaled using the Localized Constructed Analogs method to develop the 2040 (2026–2055) central tendency climate change scenario based on temperature and precipitation projections from the 20 model member ensemble. A quantile mapping approach was used to adjust historical daily temperature and precipitation time series based on the climate projections.

The action alternatives' integrated operational analysis used the extreme risk aversion scenario, H++, at San Francisco for 2040 (1.8 feet or 0.55 meter), at the point when the project would become operational. The intakes and water-conveyance facilities are being designed to be maintain functionality under the H++ scenario at 2100 or 10.2 feet (3.11 meters; Delta Conveyance Project Draft EIR Appendix 5A, *Modeling Technical Appendix,* Section B, *Hydrology and Systems Operations Modeling*). Potential impacts of projected sea level rise on water quality were assessed using the Bay-Delta Semi-implicit Cross-scale Hydroscience Integrated System Model. An upper bound to sea level projections analysis is based on 2100 anticipated conditions; the range of sea level rise projections, which are applied in design of the intake locations, for year 2100 are 6.9 to 10.2 feet (2.10 to 3.11 meters), corresponding to Medium High (0.5% probability) and H++ risk aversion scenarios, respectively. The H++ scenario represents an extreme risk aversion scenario that assumes rapid ice mass loss from the West Antarctic ice sheet and accelerated global sea level rise (California Ocean Protection Council 2017). The California Ocean Protection Council recommends the H++ scenario for use on projects that could affect critical infrastructure or critical natural systems in its *State of California Sea-Level Rise Guidance 2018 Update* (California Natural Resources Agency and Ocean Protection Council 2018). While there is no current guidance of the use of specific climate scenarios the H++ scenario is relevant to high-stakes, long-term decisions and for projects with a lifespan beyond 2050 that have a low risk tolerance. This extreme scenario was included given the potential for nonlinear acceleration of sea level rise driven by positive feedbacks of ice-sheet dynamics during the second half of the century. The probability of the H++ scenario is unknown.

3.6.4 Environmental Consequences

3.6.4.1 Effects and Mitigation

Impact CC-1: Effects of Climate Change

No Action Alternative

Based on climate trends on the study area, reduced runoff volume and changes in evapotranspiration in the warm season (April–July) due to climate change may decrease the amount of water in channels and associated infrastructure. However, increases in rain-on-snow events, earlier snowmelt, and increased frequency and severity of flood events that are expected during the cool season (December–March) may exacerbate challenges related to channel and reservoir capacity limits or risks associated with runoff or flood flows. Higher water levels under sea level rise and changes in erosion and sedimentation may compound these effects.

The Delta currently faces significant risks from levee failure partially due to factors that contribute to flooding within the Delta, as described in Section 3.10, *Geology, Soils, and Palaeontological Resources*. Additionally, the Delta faces long-term progressive risks of levee failures and diminishing operational efficiency and supply reliability from sea level rise and changes in Delta inflow hydrology driven by climate change (Delta Stewardship Council 2021:2-9, 5-46, 5-55–5-59). Continuation of existing management and operation of the Delta will increasingly expose Delta water users and those that depend on water exported from the Delta to risks of water supply interruption and diminishing water supply reliability over time.

Delta levees are critical for maintaining flow through the Delta and protecting marsh habitat (Delta Stewardship Council 2021:2-1). The Delta levee system is vulnerable to sea level rise, increased runoff from the Sierra Nevada, and associated flooding (Delta Stewardship Council 2021:2-9, 3-9; California Department of Water Resources 2017:2-4). Higher sea levels will also push ocean waters into fresher waters in the Delta and increase flood potential in areas around the Delta (California Governor's Office of Planning and Research, California Energy Commission et al. 2018a:20).

Sea level rise–driven saltwater intrusion in the Delta may have a variety of effects on soil, groundwater, or infrastructure, particularly affecting water quality for diversions and Delta tidal wetland habitat. Rising groundwater levels and sea levels in the San Francisco Bay Area are associated with increased subsurface salinity; some of this groundwater is used as drinking water (California Governor's Office of Planning and Research et al. 2018b:45). Climate change and sea level rise will continue to make it increasingly difficult for the projects to meet water quality, outflow, and other regulations, such as State Water Board D-1641 agricultural water quality and controlling standards, given that water storage volumes may be reduced, thus impeding releases.

Under the No Action Alternative, warmer water temperatures are also expected to decrease suitable summer habitat of delta smelt, a federally listed threatened species and state listed endangered species, because waters in the lower Delta may be too saline and lack food, and fresh water in the upper Delta may be too warm (National Research Council 2012:167–168). Warming of streams and rivers also facilitates colonization by invasive species that will compete with native species for habitat (Garcia et al. 2018:10993). Growth of nonnative, invasive aquatic plants such as the water hyacinth (*Eichhornia crassipes*) and Brazilian waterweed (*Egeria densa*), has reduced habitat quality and value for many native fishes and raises concerns about the plants' ability to clog waterways (as described in further detail in Section 3.4, *Fisheries and Aquatic Habitat*). Growth of these invasive plants generally is facilitated by warmer temperatures and inhibited by colder conditions (U.S. Fish and Wildlife Service 2018:6–11), and climate change is projected to increase temperatures around the Delta. Interventions that could be taken to mitigate vulnerability of fish and wildlife to climate effects could include habitat restoration and water flow management (Delta Stewardship Council 2021:5-50). These actions would have corresponding tradeoffs because less water would remain in the reservoirs for other uses. Reduced instream water availability would result in difficulty in meeting regulatory standards, given negative effects on upstream aquatic species including coldwater pool resources, that are critical for salmonid rearing. Reduced water availability also could affect reliability for agricultural, municipal, and industrial water supplies and result in associated loss in productivity or other economic costs.

Average annual SWP deliveries would decrease under the No Action Alternative for the long-term average of water years, dry water years, and critical water years due to increasing regulatory and environmental needs and increasing hydrologic conditions under climate change. Long-term average annual and dry and/or critical water years deliveries would decrease 7% and 10%, respectively, as described in further detail in Section 3.22, *Water Supply*.

All Action Alternatives

The action alternatives are designed to meet future hydrological conditions resulting from climate change, thereby accounting for those effects of climate change on the action alternatives. The design considers changing water levels, which were determined to not affect operations under analysis of the No Action Alternative at 2040. While a variety of changes in climate changes described above, including changes in temperature, hydrology, and wildfire risk, may affect the Delta region, the future climate modeling developed for this assessment focuses on projected sea level rise and hydrologic changes (e.g., shifts in surface water, groundwater, runoff, water demands) as they present the most pressing threats to operations and design of the action alternatives (see Delta Conveyance Project Draft EIR Appendix 5A, *Modeling Technical Appendix,* Section B, *Hydrology and Systems Operations Modeling*, for further detail).

The proposed intake areas in the north Delta were found to *not* be vulnerable to sea level rise and salinity intrusion conditions evaluated assuming levee integrity is maintained, under the H++ scenario from 2040 to 2100 (1.8 to 10.2 feet, or 0.55 to 3.11 meters). The mixing processes between saltwater and fresh water that would be exacerbated under sea level rise do not appear to progress above the confluence of Sacramento River, Cache Slough, and Steamboat Slough 14 to 16 miles downstream from the proposed new intake locations. Changing flooding trends, increasing water temperature, and seasonally reduced precipitation and drought (unrelated to the effects of the action alternatives) could result in decreased species populations and quality of species habitat in the study area. In response to decreased species populations and habitat, additional restoration actions could be implemented to support populations of native species populations. Delta Conveyance Project Draft EIR Appendix 5A, *Modeling Technical Appendix*, and Appendix 6A, *Water Supply 2040 Analysis*, provide the detailed results from the climate change sensitivity analysis.

The action alternatives potentially would have negative effects on critical fish habitat and special-status species, including in the north Delta from flow reversal in the Sacramento River and reduced inundation of riparian and wetland bench habitat from the proposed intakes; construction and operation of water supply–reliability projects; and construction and operations of water-conveyance facilities, especially in open parts of the Delta (further described in Section 3.4, *Fisheries and Aquatic Habitat*). Climate change also presents challenges to fish, fish habitat, and food availability, resulting in the action alternatives' potential for effects on species to compound with those driven by climate change. Since riverine habitat is anticipated to continue to be stressed and vulnerable under climate change (California Department of Water Resources et al. 2020:12), operations that affect flows to tidal and channel habitat could have both exacerbating and mitigating effects, given changes to flow and wetted areas from climate change, depending on timing and volume of those flows. However, the effect of operations and maintenance of the action alternatives would be minor with the restoration of tidal and channel habitat. Compensatory mitigation considers effects of sea level rise on species' habitat.

The action alternatives would involve no change in flood management operations in the SWP/CVP system based on the 2-D steady-state Sacramento River system Hydrologic Engineering Center River Analysis System (HEC-RAS) analysis, which incorporates climate change (as described above); reservoir storage would be below the flood control curve, and river flows would not significantly change with respect to channel capacity. The action alternatives would not result in an increase in flood risk (i.e., levee overtopping) or reduce flexibility for flood management in the Delta when compared to existing conditions.

Based on the information presented above, the effect of climate change on all action alternatives and all action alternatives' effect on climate change does not appear to be significant.

3.7 Cultural Resources

This section describes the affected environment for cultural resources and analyzes effects that could occur in the study area from construction, operation, and maintenance of the action alternatives, as well as the No Action Alternative. Minimization and mitigation measures that would avoid, minimize, reduce, resolve, or compensate potentially adverse effects are included as part of each action alternative. Additional information on the affected environment, methods, and the anticipated effects of the action alternatives can be found in Delta Conveyance Project Draft EIR Chapter 19, *Cultural Resources* (California Department of Water Resources 2022).

3.7.1 Affected Environment

The study area for cultural resources is defined as the 0.25-mile area buffer around the project footprint (i.e., the combined footprint of all action alternatives and the compensatory mitigation areas). In addition to the study area, this chapter focuses on the area of impact for built-environment resources (AI-BE) and the area of impact for archaeological resources (AI-A).

The areas of impact encompass the areas directly or indirectly affected by construction of the action alternatives, which is located in a largely rural area. To delineate the areas of impact, the rural setting was taken into consideration, as well as the nature of proposed construction activities, such as temporary effects, temporary and permanent support facilities, temporary transportation features, and direct visual or auditory effects.

3.7.1.1 Area of Effect for Built-Environment Resources

The AI-BE was delineated to capture all potential direct and indirect effects of construction and operation of the action alternatives on built-environment historical resources.

The project components in the AI-BE include above-grade water-conveyance facilities including, but not limited to, intake facilities, tunnel shafts, forebays, pumping plants, compensatory mitigation areas, power and SCADA lines, and transportation features. The AI-BE excludes the length of the tunnels and other below-grade water-conveyance features because the proposed tunnels have no potential to affect built-environment resources.

Typically, the AI-BE extends one parcel around proposed above-grade water-conveyance features to account for potential visual, atmospheric, or audible effects. Where permanent proposed above-grade water-conveyance features are planned within a large parcel, and all water-conveyance features would be more than 1,000 feet from the next parcel boundary, only that parcel with the water-conveyance feature is included in the AI-BE. Where substantial linear features, such as waterways, roadways, or railroad tracks separate water-conveyance features from nearby built-environment resources, forming a logical demarcation point that physically and visually separates the water-conveyance features from resources, the AI-BE does not include the full one parcel extension from the water-conveyance feature and ends at the linear feature boundary.

The footprint of temporary above-grade effects is generally included in the AI-BE, except where the temporary effects would occur within existing roadways. In these areas, the roadway would be restored to pre-construction conditions.

For proposed SCADA and power facilities located below grade within existing roadways, those areas are not included in the AI-BE. There would not be a potential to affect these built-environment resources due to their location beneath the roadways.

Where roadway improvements would affect a small segment of an existing roadway, the AI-BE is limited to the area of permanent effect, even with narrow areas of permanent right-of-way takes from adjacent parcels. Where existing transportation features would be modified along the length of a property, the entire parcel adjacent to those roadway improvements is generally included in the AI-BE. The exception is where parcels are exceptionally large: in these instances, the AI-BE follows existing manmade and natural features (e.g., tree lines, crop lines, or farm lanes) that would be at least 1,000 feet away from the water-conveyance features. Similarly, for very large parcels made of composite polygons, like an L pattern or a series of rectangles, the AI-BE includes the topography and natural features that make logical sense to create a buffer of at least 1,000 feet around water-conveyance features, as this is a sufficient distance to account for visual effects within a large, flat landscape such as the Delta.

Where water-conveyance features would require modifications to existing berms or levees, the AI-BE includes a one-parcel area around the action alternatives spanning the waterway. In compensatory mitigation areas, there would be no potential for visual effects because the changes would be at grade level and do not introduce new types of features to the setting; therefore, only the limits of disturbance were included in the AI-BE.

For the future field investigations, which could include geotechnical, hydrogeological, agronomic, and construction test projects (i.e., geotechnical investigations), these activities have no potential to affect built-environment historical resources; therefore, these areas are not included in the AI-BE. The small-scale ground-disturbing activities associated with field investigations likely would not physically affect any buildings or structures. Furthermore, the small-scale ground-disturbing activities would be restored to pre-investigation conditions, with no potential for visual effects.

3.7.1.2 Area of Effect for Archaeological Resources

The AI-A is the area of potential direct effects, from future field investigations, construction, and operations, that the combined footprint of the action alternatives and compensatory mitigation areas could cause to archaeological resources for all action alternatives. The AI-A was delineated to capture all potential direct effects from construction and operation of the action alternatives on archaeological resources. The AI-A is composed of above-grade water-conveyance facilities including, but not limited to, intake facilities, tunnel shafts, forebays, pumping plants, compensatory mitigation areas, and transportation features such as road improvements. The tunnels themselves are not included in the AI-A because they would be conducted at a depth that is below the level at which archaeological deposits have the potential to occur, as explained in the geoarchaeological and buried site sensitivity analysis included in Delta Conveyance Project Draft EIR Appendix 19B, *Archeological Sensitivity Analysis Report* (California Department of Water Resources 2022).[19]

3.7.1.3 Archaeological Resources

A total of 34 previously recorded archaeological resources have been identified within the study area. Of these 34 resources, 10 are early Native American resources and 24 are post-contact

[19] The Archeology Sensitivity Analysis Report is confidential.

resources. Of the 34 archaeological resources, 3 have been evaluated for listing on the National Register of Historic Places (NRHP) based on their integrity and ability to exhibit the evaluation criteria, as discussed in further detail in Delta Conveyance Project Draft EIR Appendix 19A, *Historical Resources Survey and Evaluation Report* (California Department of Water Resources 2022). Site P-39-00323 was recommended as eligible for listing under Criteria A and C. Sites P-39-000330 and P-39-000334 were evaluated as contributors to the Bacon Island Historic District, which was recommended eligible for inclusion in the NRHP. The other 31 previously recorded archaeological resources have not been evaluated for listing on the NRHP.

3.7.1.4 Built-Environment Resources

Delta Conveyance Project Draft EIR Appendix 19A, *Historical Resources Survey and Evaluation Report* (California Department of Water Resources 2022), identifies the built-environment historical resources located in the AI-BE; the results of this survey are summarized in Delta Conveyance Project Draft EIR Chapter 19, *Cultural Resources*, Section 19.1.4, *Built-Environment Resources* (California Department of Water Resources 2022). These resources were identified through record searches for previous studies and resource evaluations on file at the various regional offices of the California Historical Resources Information System (CHRIS), as well as through technical studies that were conducted in support of the Delta Conveyance Project. Delta Conveyance Project Draft EIR Appendix 19C, *Impact Analysis of Project Alternatives on Built-Environment Historical Resources*, Tables 19C-1 through 19C-3 (California Department of Water Resources 2022), identify which resources occur in each of the action alternatives, and resources that are unique to specific action alternatives.

The Delta Conveyance Project Draft EIR Chapter 19, *Cultural Resources*, Section 19.1, *Environmental Setting* (California Department of Water Resources 2022), presents a detailed description of cultural resources including Eligible Archaeological Sites, National Register of Historic Places: Buildings and Structures, and National Register of Historic Places: Districts and Landscapes known to be present in the study area. Section 19.1.2, *Methods for Resource Identification*, describes identification of cultural resources in the study area.

3.7.1.5 Confidentiality Considerations

Information concerning the nature and location of cultural resources is confidential and is not subject to public disclosure per Public Law 94-456 (16 USC 470 sec. 9 (a)(1)(2)). The National Historic Preservation Act (NHPA) provides that the location of historic properties is exempt from public disclosure. This exemption protects historic properties from vandalism and looting and protects properties culturally significant to American Indians (FSH 6209.13 11.22). In turn, California Government Code Section 6254 of the California Public Records Act lists as exempt from public disclosure any records "of Native American graves, cemeteries, and sacred places and records of Native American places, features, and objects described in Sections 5097.9 and 5097.993 of the [California] Public Resources Code maintained by, or in the possession of, the Native American Heritage Commission, another state agency, or a local agency" (Government Code § 6254(r)]).

USACE is conforming to NHPA guidelines concerning confidentiality in this Draft EIS. As a result, specific descriptions of certain archeological, cultural, and historic resources are not provided in this section. Site-specific content and location information will be reviewed by appropriate agency officials on a need-to-know basis, thereby protecting the confidential information regarding location and content of the sites. USACE believes protecting the confidentiality of certain information concerning the location and nature of the resources from public disclosure is the best way to preserve the integrity of the valuable resources within the Delta region.

3.7.2 Environmental Consequences

This section describes the assessment methods used to analyze potential environmental effects and identifies the direct, indirect, and cumulative effects associated with cultural resources during construction, operation, and maintenance of the action alternatives and compensatory mitigation. Measures to mitigate (i.e., avoid, minimize, rectify, reduce, eliminate, or compensate for) effects are provided.

3.7.2.1 Methods for Analysis

The information used to conduct the environmental consequences analysis came primarily from the following sources.

- Information about historic and cultural resources gained in the course of consultation with federally recognized Native American tribes and other interested parties in the course of developing a programmatic agreement (PA) to resolve potential adverse effects under Section 106 of the National Historic Preservation Act (36 CFR Part 800.14). Development of the Section 106 PA is actively occurring in parallel with the NEPA process, with execution of the PA anticipated prior to execution of the ROD.
- Technical reports to identify cultural resources in the AI-BE and AI-A that are included in Delta Conveyance Project Draft EIR Appendix 19A, *Historical Resources Survey and Evaluation Report*, and Appendix 19B, *Archaeological Sensitivity Analysis Report* (California Department of Water Resources 2022). These technical reports included the following:
    - Identification of the study area and the AI-BE and AI-A.
    - Identification of previously identified NRHP-eligible and listed built-environment historical resources in the study area and areas of impact.
    - Identification of previously identified archaeological sites and archaeological site sensitivity of the study area and areas of impact.
- Project description and Engineering Project Reports (EPRs) the Delta Conveyance Final Draft Engineering Project Report—Central and Eastern Options (C-E EPR) and Delta Conveyance Final Draft Engineering Project Report—Bethany Reservoir Alternative (Bethany EPR) prepared for the project (Delta Conveyance Design and Construction Authority 2022a, 2022b).
- GIS data layers of proposed water-conveyance facilities provided by the applicant.
- Analysis of the proposed construction and operational activities for potential to affect cultural resources in the vicinity of that construction, using field visits, aerial mapping, GIS, and/or project engineering.
- Application of thresholds to determine if the field investigations, construction, or compensatory mitigation activity has the potential to cause adverse effects on cultural resources.
- Appropriate avoidance, minimization, and mitigation measures where adverse effects are identified.

Delta Conveyance Project Draft EIR, Chapter 19, *Cultural Resources*, Section 19.3.1, *Methods for Analysis* (California Department of Water Resources 2022), provides additional details on the methods used to analyze potential environmental effects associated with cultural resources during construction of the action alternatives.

No Action Alternative

The No Action Alternative takes into account projects, plans, and programs that would be reasonably expected to occur in the foreseeable future if none of the action alternatives were approved, based on current plans and consistent with available infrastructure and community services. The project is a water reliability project; therefore, it can be assumed that in the absence of the action alternatives, participating water agencies would seek to bolster water reliability through other projects. These projects would likely be in the same vein of other water reliability projects that are already being developed.

Water agencies participating in the project have been grouped into four geographic regions. The water agencies within each geographic region would likely pursue a similar suite of water supply projects under the No Action Alternative. Construction of water supply projects under the No Action Alternative would result in construction of new or expanded facilities (e.g., desalination plants, water recycling facilities, groundwater recharge and recovery systems, etc.) that could result in ground-disturbing activities and construction of above-ground facilities that could destroy cultural resources. Table 3.7-1 provides examples of how cultural resources could be affected.

Table 3.7-1. Examples of Effects on Cultural Resources from Construction and Operation of Projects in Lieu of the Project

Project Type	Potential Cultural Effects	Region(s) in Which Effects Would Likely Occur [a]
Desalination	Grading and excavation would be necessary for construction of foundations and trenching would occur. Ground-disturbing activities in these types of units could unearth, expose, or destroy archaeological resources. The construction of above ground facilities could add new features to the setting of built-environment resources	Northern coastal, southern coastal
Groundwater management	Groundwater management projects would occur in association with an underlying aquifer but could occur in a variety of locations and therefore affected a variety of geologic units. Construction activities for each project could require excavation for the construction of the recharge basins, conveyance canals, and pipelines and drilling for the construction of recovery wells (with completion intervals between approximately 200 and 900 feet below ground surface). Construction activities would include site clearing; excavation and backfill; and construction of basins, conveyance canals, pipelines, pump stations, and the turnout. Grading activities associated with the construction of recharge basins would involve earthmoving, excavation, and grading. Canals and pipelines would likely be constructed using typical open trench construction methods. In some cases where siphons would be installed, jack and bore methods could be used to tunnel under and avoid disruption of surface features. Ground-disturbing activities in these types of units could unearth, expose, or destroy archaeological resources. The construction of above	Northern coastal, southern coastal

Project Type	Potential Cultural Effects	Region(s) in Which Effects Would Likely Occur [a]
	ground facilities could add new features to the setting of built-environment resources.	
Groundwater recovery	Grading and excavation would be necessary for construction of foundations and trenching would occur. Ground-disturbing activities in these types of units could unearth, expose, or destroy archaeological resources. The construction of above ground facilities could add new features to the setting of built-environment resources	Northern inland, southern coastal, southern inland
Water recycling	Construction of water recycling facilities could unearth, expose, or destroy archaeological resources. The construction of above ground facilities could add new features to the setting of built-environment resources.	Northern coastal, northern inland, southern coastal, southern inland
Water use efficiency measures	These projects could occur anywhere in the regions, and most would involve little ground disturbance or would occur in previously disturbed areas. However, many of these canal systems are cultural resources themselves, and could be affected by these activities.	Northern coastal, northern inland, southern coastal, southern inland

[a] See Chapter 2, *Project Description and Alternatives*, Section 2.5, *No Action Alternative*, for a complete definition of the geographic regions.

3.7.2.2 Effects and Mitigation

A total of 31 eligible built-environment resources and 34 archaeological resources have been identified to date. However, only a portion of the study area has been surveyed due to restricted access to properties. After access is granted and all areas are surveyed, additional resources may be identified. The identified 31 eligible built-environment resources and 34 archaeological resources, as well as potential unidentified resources, all have the potential to be directly affected by construction activities.

Impact CUL-1: Effects on Eligible Historic Built-Environment Resources Resulting from Construction of the Project

No Action Alternative

Projects under consideration in the study area have the potential to adversely affect historic properties. Construction of these projects involve excavation and dredging that could affect historic properties including built-environment resources. However, because each of the projects implemented under the No Action Alternative would likely be required to undergo an environmental compliance review (i.e., pursuant to NEPA and/or CEQA), it is assumed that these projects would comply with applicable laws and regulations related to cultural resources and implement standard best management practices, which would further reduce the potential for effects on historic properties.

All Action Alternatives

There are 31 identified built-environment historical resources within the area of impact for all action alternatives. Each of the activities listed in Delta Conveyance Project Draft EIR Chapter 19, *Cultural Resources*, Section 19.3.1.1, *Impact Mechanisms* (California Department of Water Resources 2022), has the potential to affect built-environment historical resources through the construction of new features within the setting of built-environment resources, the alteration of existing features within the setting of built-environment resources, or the physical alteration of existing features within the boundaries of built-environment resources. The specific construction activity that would cause an effect on each built-environment resource is described in Delta Conveyance Project Draft EIR Appendix 19C, *Impact Analysis of Project Alternatives on Built-Environment Historical Resources* (California Department of Water Resources 2022). For example, the installation of new outlet structures on the Delta-Mendota Canal, which is a built-environment historical resource, could cause a direct effect on the historical resource by altering the resource's integrity of workmanship and design. Additions or alterations to the Sacramento River or Bouldin Island levees (both historic resources) could cause a loss of integrity that would result in an adverse change to built-environment historical resources.

The construction of features within the AI-BE has the potential to damage fragile built-environment historical resources that are susceptible to vibration damage. Damage to these resources may occur when the single-event source vibration generates a peak particle velocity (PPV) in inches per second of 0.3 PPV, or when a continuous source causes vibration at 0.12 PPV (Federal Transit Authority 2006:184–187; Johnson and Hannen 2015:2–10). The pile drivers and the vibratory rollers have the potential to affect built-environment historical resources, depending on the distance of the construction activity from the built features within the historical resource boundaries.

All action alternatives would result in loss of setting for built-environment historical resources from construction of intakes; loss of setting and physical damage to built-environment resources from construction of launch, reception, and maintenance shafts and shaft pads; physical damage to or impairment of setting from construction of roadways or utilities; and physical damage to or impairment of setting for historic built resources from construction of water-conveyance features.

All action alternatives would result in direct effects on NRHP-eligible built-environment historical resources or historic properties. These alterations may diminish the integrity of these resources. A total of 31 eligible built-environment resources have been identified in the AI-BE. Construction of the action alternatives may require the physical alteration of 9 historic built-environment resources. Construction may also result in changes to the setting of 22 historic built-environment resources. Both physical alterations and changes to the integrity of setting, feeling, or association would materially alter the historical resource by removing character-defining features of the resource or altering the resource's character, resulting in an impairment of the resource's ability to convey its significance. Mitigation Measure CUL-1: *Prepare and Implement a Built-Environment Treatment Plan in Consultation with Interested Parties,* may mitigate these effects, but cannot guarantee that effects would be entirely avoided. The scale of the action alternatives and the constraints imposed by other environmental resources would make avoidance of all effects unlikely.

Table 3.7-2. Number of Built-Environment Resources Affected by Action Alternative

	Action Alternative				
Built-Environment Resource	1	2b	3	4b	5
Material Alteration of Setting	20	5	7	5	7
Material Alteration of Setting, Design, Materials, and Workmanship	6	20	12	13	10

The action alternatives include compensatory mitigation that includes the creation of habitat restoration areas. The three ponds along I-5 would have no effects on built-environment historical resources. Construction of the compensatory mitigation areas on Bouldin Island has the potential to affect the Bouldin Island Rural Cultural Landscape District. In addition, the construction of the compensatory mitigation areas on Bouldin Island would be visible from, but not detract from the setting of, three additional built-environment resources.

Some mitigation measures would involve the use of heavy equipment such as graders, excavators, dozers, and haul trucks that would have the potential to result in effects on eligible built-environment historical resources. Mitigation Measures BIO-2c: *Electrical Power Line Support Placement*; AG-2: *Replacement or Relocation of Affected Infrastructure Supporting Agricultural Properties*, AES-1c: *Implement Best Management Practices to Implement Project Landscaping Plan,* and AQ-9: *Develop and Implement a GHG Reduction Plan to Reduce GHG Emissions from Construction and Net CVP Operational Pumping Emissions to Net Zero*, have the potential to result in effects on historical resources.

Permanent effects on eligible built-environment historical resources resulting from the replacement or relocation of infrastructure would contribute to historical resource impacts by causing a material alteration to a resource's integrity resulting in a significant impact. Mitigation Measure CUL-1: *Prepare and Implement a Built-Environment Treatment Plan in Consultation with Interested Parties* requires resource-specific treatments to minimize effects on built-environment resources.

Temporary effects on eligible built-environment historical resources resulting from implementation of mitigation measures would be similar to construction effects of the action alternatives in certain construction areas and would contribute to historical resource effects from the action alternatives. Depending on the construction techniques used in the vicinity of resources, damage to historical resources from implementation of mitigation measures and associated construction vibration would occur if vibration exceeded 0.12 PPV. Because temporary work areas are planned within the boundaries of historical resources, those resources could sustain damage as a result of construction activities associated with the mitigation measures, and the resource's integrity of design, materials, and workmanship could be materially altered, causing a significant impact. Mitigation Measure CUL-1: *Prepare and Implement a Built-Environment Treatment Plan in Consultation with Interested Parties* requires vibration monitoring for buildings determined to be susceptible to vibration damage that are close to construction activities or machinery that cause excessive vibrations. Some mitigation measures would result in the permanent material alteration of settings of built-environment historical resources, while other effects would be temporary. Therefore, other mitigation measures would have an adverse effect on eligible built-environment historical resources.

Based on the information presented above, even with implementation of proposed mitigation measures and environmental commitments, the effects all action alternatives would have on eligible historic built-environment resources may be significant.

Impact CUL-2: Effects on Unidentified and Unevaluated Historic Built-Environment Resources Resulting from Construction of the Project

No Action Alternative

Projects under consideration in lieu of the action alternatives in the study area could have effects related to cultural resources. Construction of these projects involve excavation and dredging that could affect cultural resources including built-environment resources. However, because each of the projects implemented under the No Action Alternative would likely be required to undergo an environmental compliance review (i.e., pursuant to NEPA and/or CEQA), it is assumed that these projects would comply with applicable laws and regulations related to cultural resources and implement standard best management practices, which would further reduce the potential for effects on cultural resources.

All Action Alternatives

All action alternatives could result in direct modification of or indirect changes to the setting for currently unidentified NRHP-eligible built-environment resources. These changes may diminish the integrity of these resources. The AI-BE is sensitive for built-environment resources that have not yet been recorded and evaluated because the majority of the area is legally inaccessible. Inventory efforts have not gathered complete information in these inaccessible areas. Many of these resources are likely to be associated with important historical themes or persons, or possess high creative values; therefore, they are likely to have significance under NRHP criteria. Because many of these resources remain intact and retain their rural agricultural setting, they are also likely to retain their historical integrity. Therefore, many are likely to qualify as historic properties or historic resources under the NHPA. Construction of facilities may require demolition of historic built-environment resources. Construction may also result in permanent direct effects such as changes to the integrity of feeling, setting, or association. Demolition of or changes to the setting would be material alterations because they would either remove the resource or alter the resource's character, thus diminishing the resource's ability to convey its significance. Mitigation Measure CUL-2: *Conduct a Survey of Inaccessible Properties to Assess Eligibility, Determine If These Properties Will Be Adversely Affected by the Project, and Develop Treatment to Resolve or Mitigate Adverse Impacts* may mitigate these effects, but cannot guarantee they would be entirely avoided. The scale of the action alternatives and the constraints imposed by other environmental resources make avoidance of all effects unlikely.

The action alternatives include compensatory mitigation that involved the creation of habitat restoration areas. Based on fieldwork and an analysis of historic aerial photographs as part of the technical report prepared for the project (ICF 2021), no extant unidentified historic built-environment resources are anticipated to be affected by the compensatory mitigation areas.

As discussed under Impact CUL-1, some mitigation measures would involve the use of heavy equipment such as graders, excavators, dozers, and haul trucks. Effects on unidentified and unevaluated built-environment historical resources are expected to be similar to those described under CUL-1 and the same mitigation measures would reduce potential effects on unidentified and unevaluated built-environment historical resources; however, implementation of mitigation measures could still have an effect.

Based on the information presented above, even with implementation of proposed mitigation measures and environmental commitments, the effects all action alternatives would have on unidentified and unevaluated historic built-environment resources may be significant.

Impact CUL-3: Effects on Identified Archaeological Sites Resulting from Project Construction

No Action Alternative

Effects resulting from the No Action Alternative for this impact would be the same as described for Impact CUL-2.

All Action Alternatives

Construction may disturb NRHP-eligible archaeological resources and damage these resources. This damage may impair the integrity of these resources and, thus, reduce their ability to convey their significance. Construction of water-conveyance facilities would affect identified archaeological resources that occur in the footprint of the action alternatives. This effect could materially alter or destroy their ability to convey significant associations with historic trends or people, or the potential of these resources to yield information useful in archaeological research, through excavation and disruption of the spatial associations between cultural materials. Identified but currently inaccessible resources may also be significant under other register criteria; indirect effects such as introduction of new elements that result in inconsistent changes to the setting may also diminish the significance of these resources. Mitigation Measures CUL-3a: *Prepare and Implement an Archaeological Resources Management Plan*, CUL-3b: *Conduct Cultural Resources Sensitivity Training*, and CUL-3c: *Implement Archaeological Protocols for Field Investigations* would mitigate this effect by identifying resource-specific treatments for reducing or compensating for the disruption of the spatial associations of the cultural materials and ensuring that archaeological materials are identified either prior to or during construction, when options to avoid effects might still be feasible. These measures would not guarantee that the significant qualities of the site would be protected because the archaeological site may remain disturbed or destroyed after treatment.

The action alternatives include compensatory mitigation that include the creation of habitat restoration areas. The construction of the compensatory mitigation on Bouldin Island has the potential to cause effects on 13 identified archaeological resources.

As discussed under Impact CUL-1, some mitigation measures would involve the use of heavy equipment such as graders, excavators, dozers, and haul trucks. Effects on identified archaeological resources are expected to be similar to those described under Impact CUL-1 and the same mitigation measures would reduce potential effects on identified archaeological resources; however, implementation of mitigation measures could still have an effect.

Based on the information presented above, even with implementation of proposed mitigation measures and environmental commitments, the effects all action alternatives would have on identified archaeological sites may be significant.

Impact CUL-4: Effects on Unidentified Archaeological Sites Resulting from Construction

No Action Alternative

Effects resulting from the No Action Alternative for this impact would be the same as described for Impact CUL-2.

All Action Alternatives

All of the action alternatives have the potential to damage previously unidentified archaeological sites or human remains that may not necessarily be identified prior to construction. While cultural resource inventories will be completed once legal access is secured, no inventory can ensure that all resources are identified prior to construction. Similarly, the scale of construction makes it technically and economically infeasible to perform the level of sampling necessary to identify all such buried human remains prior to construction.

Because sites encountered during construction may be eligible for listing in the NRHP or California Register of Historical Resources (CRHR), damage to these sites may diminish their integrity. Construction has the potential to disturb previously unidentified archaeological sites qualifying as historical resources, historic properties, or unique archaeological resources. Because direct excavation, compaction, or other disturbance may disrupt the spatial associations that contain scientifically useful information it would alter the potential basis for eligibility, thus materially altering the resource and resulting in an effect. Because these resources would not be identified prior to construction, they cannot be recorded and effects cannot be managed through construction treatment. Similarly, buried human remains may be damaged by the action alternatives because such remains may occur either in isolation or as part of identified and previously unidentified archaeological resources where construction would occur.

Implementation of Mitigation Measures CUL-3a: *Prepare and Implement an Archaeological Resources Management Plan*, CUL-3b: *Conduct Cultural Resources Sensitivity Training*, CUL-3c: *Implement Archaeological Protocols for Field Investigation,* and *CUL-4: Follow State and Federal Law Governing Human Remains if Such Resources are Discovered During Construction* would reduce the potential for this effect by implementing construction worker training, monitoring, and discovery protocols. The management plan and training measures will consider the potential for indigenous and non-indigenous human remains and provide for different protocols necessary for these types of human remains, in addition to considering them under the NRHP. However, because archaeological resources and human remains may not be identified prior to disturbance through these measures, the effect cannot be entirely avoided.

The action alternatives include compensatory mitigation that includes the creation of habitat restoration areas. Construction of the compensatory mitigation on Bouldin Island has the potential to cause effects on archaeological resources similar to the action alternatives.

As discussed under Impact CUL-1, some mitigation measures would involve the use of heavy equipment such as graders, excavators, dozers, and haul trucks. Effects on unidentified archaeological resources are expected to be similar to those described under Impact CUL-1 and the same mitigation measures would reduce potential effects on unidentified archaeological resources; however, implementation of mitigation measures could still have an effect.

Based on the information presented above, even with implementation of proposed mitigation measures and environmental commitments, the effects all action alternatives would have on unidentified archaeological sites may be significant.

3.7.2.3 Cumulative Analysis

The cumulative effects analysis considers projects that could affect the same resources and, where relevant, in the same time frame as the Delta Conveyance Project, resulting in a cumulative effect. Cultural resources are expected to be affected as a result of past, present, and reasonably foreseeable future projects.

Proposed plans, policies, and programs that have the potential to contribute to cumulative effects on cultural resources in the vicinity of the action alternatives are summarized in Table 3.7-3, along with their anticipated effects regarding cultural resources.

Table 3.7-3. Plans, Policies, and Programs Included in the Cumulative Analysis

Program/Project	Agency	Status	Description of Program/ Project	Effects on Cultural Resources
Delta Dredged Sediment Long-Term Management Strategy	USACE	Ongoing	Maintaining and improving channel function, levee rehabilitation, and ecosystem restoration.	Potential to encounter cultural resources during excavation.
Delta Levees Protection Program	DWR	Ongoing	Strengthening of existing levees and construction of embankments inside some levees.	Involves soil excavation in some areas. High potential to encounter cultural resources.
Dutch Slough Tidal Marsh Restoration Project	DWR	Ongoing, Phase 3 scheduled for 2022	Restoring a 1,178-acre site in the south Delta to tidal marsh habitat.	Involves major landform recontouring and soil excavation. Potential to encounter cultural resources.
West Sacramento Levee Improvements Program	WSAFCA Agency and USACE	Completed	Improvements to levees protecting West Sacramento to meet local and federal flood protection criteria.	Involves soil excavation in some areas. High potential to encounter cultural resources.
California EcoRestore	CNRA	Launched in 2015, ongoing	Implementation of a suite of Delta restoration actions for up to 30,000 acres of fish and wildlife habitat. Construction projects are ongoing through 2021, and habitat operations and maintenance will continue long-term.	Projects would require varying degrees of soil excavation and dredging. Potential to encounter cultural resources.
SRWTP facility upgrade project (EchoWater)	Regional San	Planning phase	Regional San is updating its existing facilities to meet new NPDES permit requirements.	May require soil excavation and dredging. Potential to encounter cultural resources.
Ecosystem Restoration Program	CDFW	Ongoing	Site-specific habitat restoration projects.	Individual projects may require minor soil excavation and dredging. Potential to encounter cultural resources.

USACE = U.S. Army Corps of Engineers; DWR = California Department of Water Resources; SRWTP = Sacramento Regional Wastewater Treatment Plant; CDFW = California Department of Fish and Wildlife; CNRA = California Natural Resources Agency; WSAFCA = West Sacramento Area Flood Control Agency.

Cumulative projects include those within and in proximity to the areas of impact. Projects that lie outside of the areas of impact (e.g., projects occurring in the Upper Sacramento Valley, Lower San Joaquin Basin, and further south) are not included. Only projects that would result in changes to the integrity of built-environment resources or ground-disturbing activities that could disturb archaeological resources are included in this section.

3.8 Environmental Justice

This section describes the affected environment for environmental justice and analyzes effects that could occur in the study area from construction, operation, and maintenance of the action alternatives, as well as the No Action Alternative. Mitigation and minimization measures that would avoid, minimize, rectify, reduce, or compensate potentially adverse effects are included as part of each action alternative. Additional information on the affected environment, methods, and the anticipated effects of the action alternatives can be found in Delta Conveyance Project Draft EIR Chapter 29, *Environmental Justice* (California Department of Water Resources 2022).

3.8.1 Affected Environment

This section provides the background for environmental justice analysis and describes the study area for the environmental justice analysis for the action alternatives. Consistent with USACE requirements, an analytical methodology was used for determining the potential for the action alternatives to cause disproportionately high and adverse environmental effects on minority and low-income populations based on federal requirements under EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (59 *Federal Register* 7629). EO 12898 requires federal agencies to develop environmental justice plans to analyze federal actions that have the potential to result in disproportionately high and adverse environmental effects (including human health, economic, and social effects) on minority and low-income populations, including Tribal populations (U.S. Department of Energy 2012:1).

CEQ issued *Environmental Justice Guidance Under the National Environmental Policy Act* in 1997(CEQ Guidance) (Council on Environmental Quality 1997) to provide guidance for complying with EO 12898 and evaluating the equity of effects imposed on minority and low-income populations, including tribal populations, relative to the benefits of a federal action.

The study area for environmental justice consists of the census tracts and block groups intersected by the footprint of the action alternatives—The project footprint is the area in which temporary or permanent physical effects of the action alternatives may occur—intakes, tunnel shaft pad sites, RTM treatment and storage areas, and Southern Complex or Bethany Complex facilities, along with parking areas, power and SCADA lines, new or modified roads and railroad facilities, and compensatory mitigation areas (Figure 3.8-1). The tunnel itself would have no permanent footprint at the ground surface. The path of the tunnel, where there is potential to cause effects, is also part of the study area and effects during construction of both surface and subsurface facilities are considered. Waterways within the census tracts and block groups affected by the action alternatives are part of the study area.

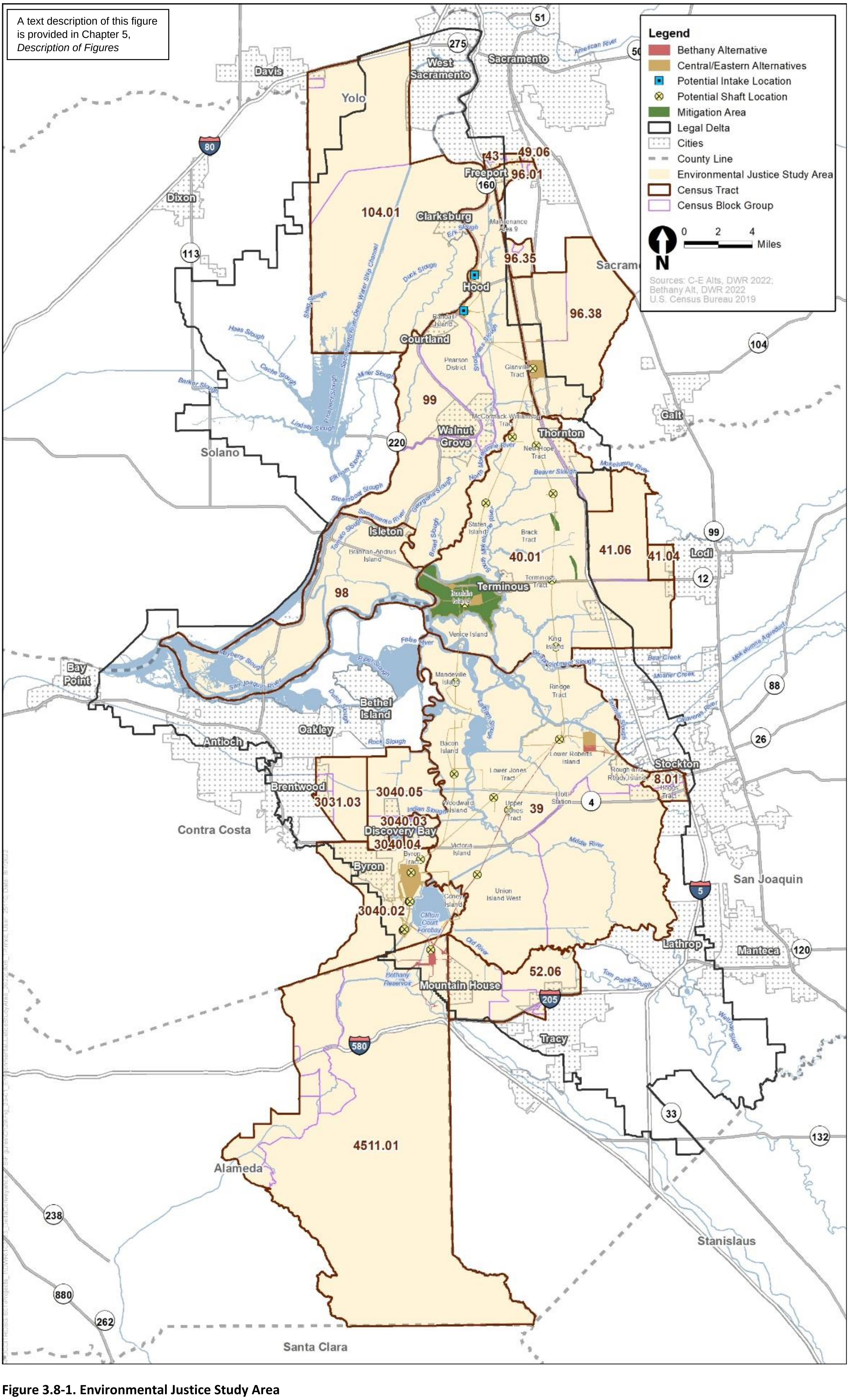


Figure 3.8-1. Environmental Justice Study Area

3.8.1.1 Environmental Justice Populations in the Study Area

This section identifies the minority and low-income populations in the study area based on data from the U.S. Census. The U.S. Census Bureau collects comprehensive demographic data every 10 years during the decennial census. The Notice of Intent for this Draft EIS was published in 2020, when the 2020 census data were being collected and tabulation had not yet been completed or published for all geographies. Therefore, this analysis uses the most recent data available from the U.S. Census American Community Survey, 2018 5-year estimates. The American Community Survey conducts monthly surveys of a sample of addresses in all 50 states, the District of Columbia, and Puerto Rico and publishes yearly and 5-year estimates to help decision makers understand changes in their communities (U.S. Census Bureau 2021).

The U.S. Census Bureau collects demographic information on ethnicity at the level of census blocks (the smallest geographic unit used by the U.S. Census Bureau). Generally, several census blocks make up block groups, which make up census tracts. The population of a census block can vary, depending on the urban or rural nature of the area. Hispanic status is considered a geographic place of origin, rather than ethnicity or race, by the U.S. Census Bureau and is collected at the block level.

This section first identifies the census tracts with total minority populations of 50% or more, then describes places where low-income households compose 20% or more of the population. As Figures 3.8-2 and 3.8-3 illustrate, minority and low-income populations occur widely throughout the study area. The presence of minority and low-income populations within the study area is extensive enough that the entire Delta is considered an environmental justice community. Given the wide distribution of minority and low-income populations throughout the Delta, adverse effects on environmental justice populations from activities associated with the action alternatives are unavoidable.

Minority Populations

This analysis uses the definitions of minority populations provided in Appendix A of the CEQ Guidance (Council on Environmental Quality 1997), consistent with practices of USACE.

Minority individuals are defined as members of the following population groups, defined by the U.S. Census in accordance with the 1997 Office of Management and Budget standards on race and ethnicity (U.S. Census Bureau 2020).

- American Indian or Alaskan Native: A person having origins in any of the original peoples of North and South America (including Central America) and who maintains tribal affiliation or community attachment.
- Asian or Pacific Islander: A person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent including, for example, Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, the Philippine Islands, Thailand, and Vietnam. Native Hawaiian or Other Pacific Islander is defined as a person having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands.
- Black, not of Hispanic origin: A person having origins in any of the Black racial groups of Africa.
- Hispanic: "Hispanic or Latino" is a person of Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin regardless of race. Census respondents may

categorize themselves as “Mexican, Mexican Am., Chicano”; “Puerto Rican”; “Cuban”; and “another Hispanic, Latino, or Spanish origin” or write in a different answer.

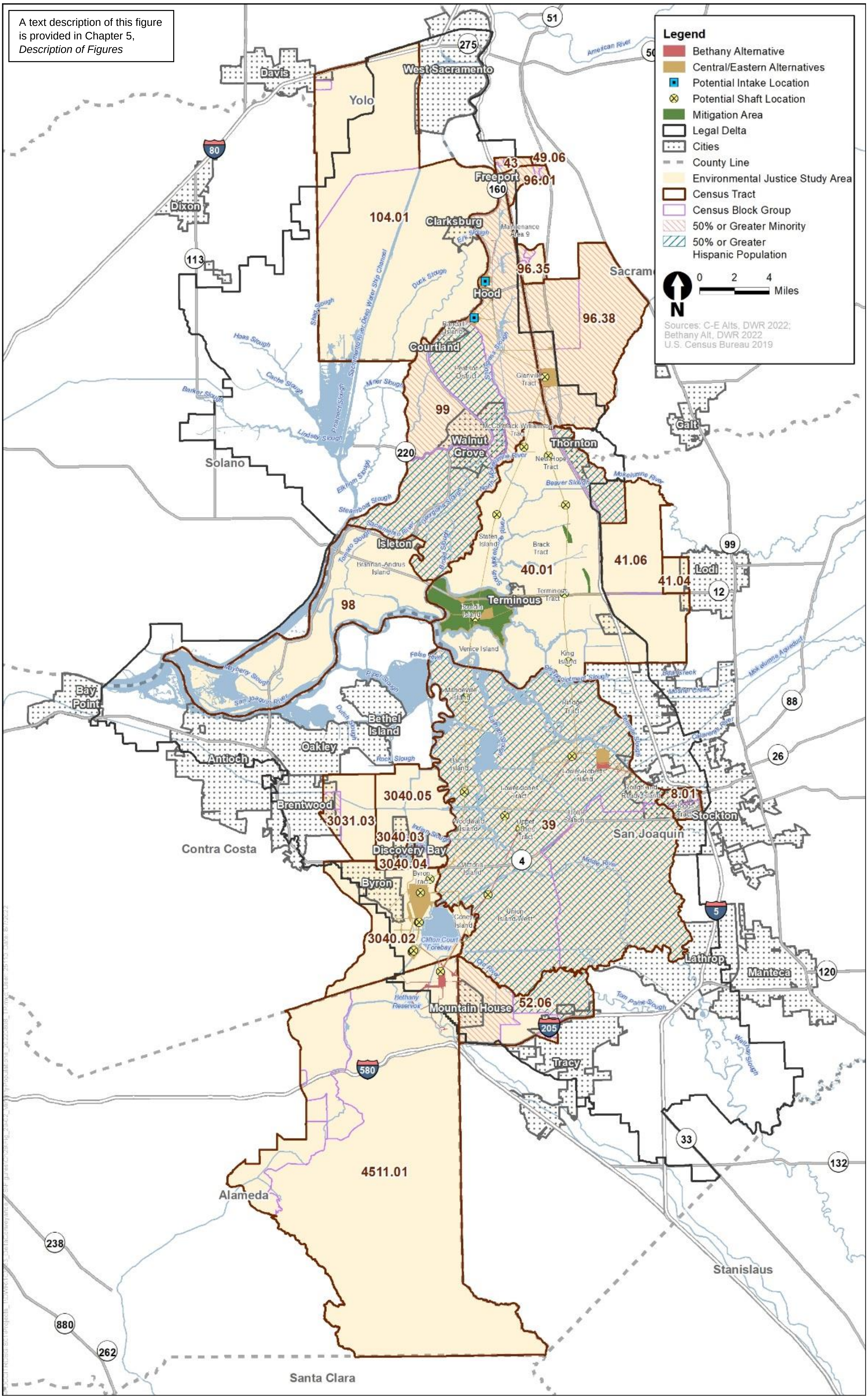
Minority populations are identified by either of the following factors.

- Where the minority population of the affected area exceeds 50%.
- Where the minority population percentage of the affected area is meaningfully greater than the minority population percentage of the general population or other appropriate unit of geographical analysis. Agencies may consider as a community either a group of individuals living in geographic proximity to one another, or a geographically dispersed/transient set of individuals (such as migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effect.

A minority population also exists if there is more than one minority group present and the minority percentage, as calculated by aggregating all minority persons, meets one of the above-stated thresholds.

Figure 3.8-2 depicts the places and census blocks with greater than 50% minority populations within the study area. These data were generated based upon census data collected for all minority populations within the study area. Minority populations are widely distributed in the study area. Areas exhibiting high proportions of minority residents are present in both urban and rural areas, with many agricultural areas in the interior Delta exhibiting high proportions of minority residents.

Overall, the study area is 61% minority, which includes the 26% of the population that is Hispanic. Areas with 50% or more minority residents occur in and around Clarksburg, Franklin, Hood, Courtland, Walnut Grove, Thornton, Isleton, parts of Stockton and Tracy, and Mountain House. Large rural areas outside designated communities, such as the Delta islands comprising most of Census Tract 39, are about 74% minority, nearly all Hispanic. Adjacent block groups in the more urban Census Tract 8.01, part of Stockton west of I-5 and south of the Port of Stockton, is more than 93% minority and more than two-thirds Hispanic. Hispanic individuals are a substantial portion of the minority population even where they do not account for 50% or more of the population.



1
2 **Figure 3.8-2. Minority and Hispanic Population in the Study Area**

Low-Income Populations

A low-income population is one in which median household income (MHI) is at or below the Department of Health and Human Services poverty guidelines, or a locally developed threshold that is at least as inclusive as the poverty guidelines. A low-income population means any readily identifiable group of low-income people who live in geographic proximity and, if circumstances warrant, geographically transient persons (such as migrant workers, students, or Native Americans) who could be affected by a proposed program, policy, or activity.

This analysis uses a locally developed standard, defining *low income* in accordance with the California Pub. Resources Code, Section 75005(g) definition of a *disadvantaged community* as a community with an MHI less than 80% of the "statewide average." This definition of low income also captures the *severely disadvantaged community*, defined as a community with MHI less than 60% of the statewide average. "Average" for this purpose is interpreted as the 5-year statewide MHI of $75,235 for a four-person household for 2015–2019 as reported by the U.S. Census.[20] Accordingly, a low-income household would have an income less than $60,188. The mapped data is based on U.S. Census American Community Survey 5-Year estimates for 2014–2018, displayed on Figure 3.8-3 and uses an upper median income boundary of $60,000 because of the brackets used in the census data.

Low-income residents are spread throughout the study area. Figure 3.8-3 shows study area census block groups where 20% or more households have an MHI below $60,000. Table 3.8-1 shows that even census tracts with relatively high MHIs contain block groups with 20% or more low-income households. An example of these is Census Tract 4511.01, east of Mountain House in Alameda County, in which 23.1% of households in Block Group 1 have MHI of less than $60,000, while the MHI of the entire block group is $175,230 and the total percent of low-income households in the census tract is only 14%. Similarly, all the study-area tracts in Contra Costa County contain one or more block groups that exceed 20% low-income households even though the MHI for those tracts averages $97,699. In those tracts together, 29% of households have MHI less than $60,000. In Contra Costa County, these low-income pockets occur in Isleton; on Brannan, Sherman, and Twitchell Islands; in the eastern portion of Brentwood; in Knightsen, Byron, and portions of Discovery Bay; and in adjacent unincorporated areas.

In Sacramento County, low-income census tracts encompass the towns of Freeport, Clarksburg, Hood, Courtland, Walnut Grove, and Locke. In San Joaquin County, low-income communities are found in Thornton, Terminous, southwest portions of Stockton, and the interior Delta islands.

[20] Median household income for 2019 was used because the coronavirus pandemic in 2020 caused high levels of unemployment and severely reduced incomes statewide. Lower-income people in services sectors were particularly hard hit.

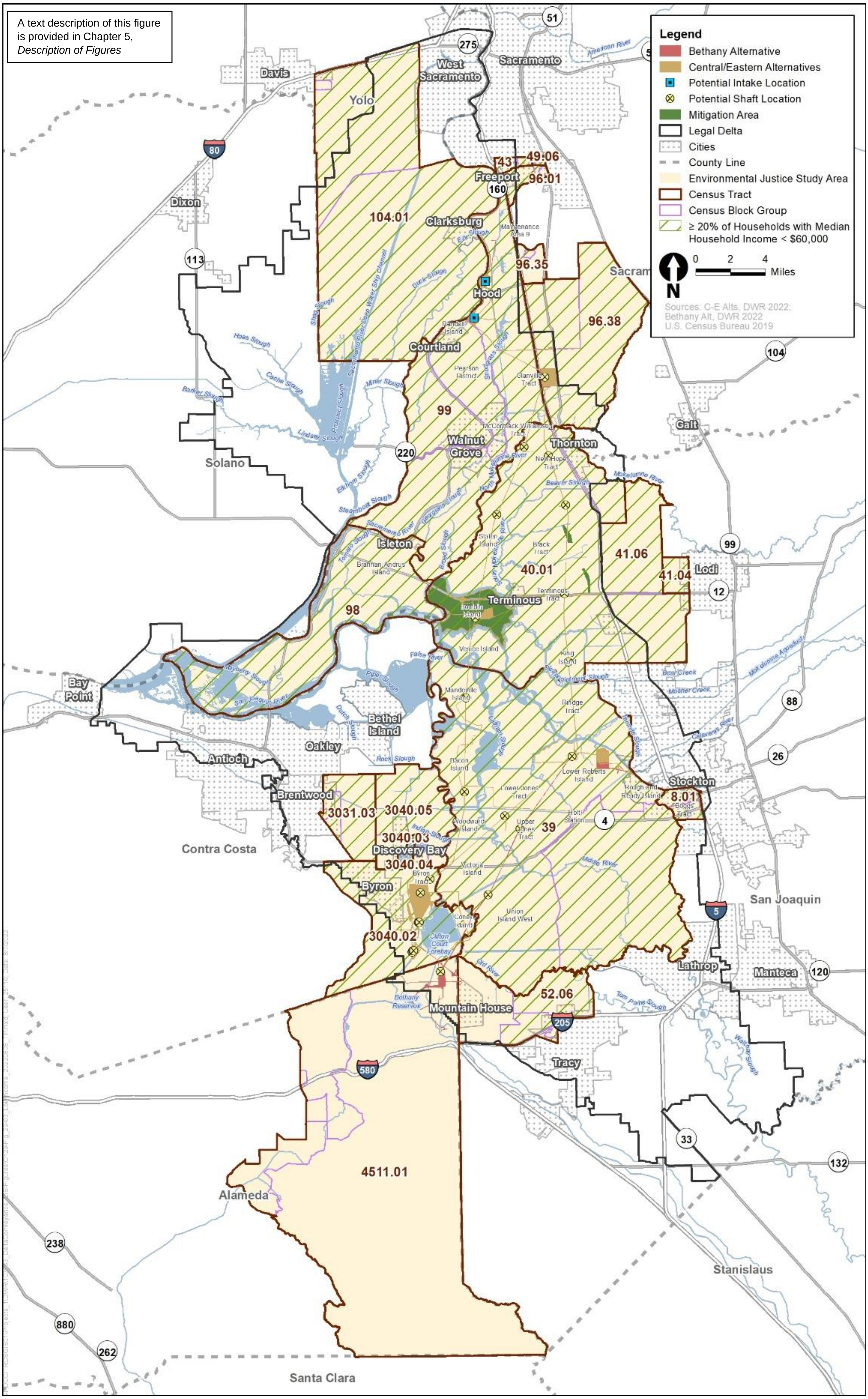


Figure 3.8-3. Census Tracts with 20% or More Households with Median Household Income Less Than $60,000

1 **Table 3.8-1. Median Household Income in Study Area Census Block Groups 2018**

County/Census Tract/Block Group	Median Household Income	Total Number of Households	Number of Households below $60,000	Percent of Households below $60,000
Alameda County				
Census Tract 4511.01				
Block Group 1	$175,230	803	171	21.3%
Block Group 2	$141,667	780	52	6.7%
Block Group 3	$100,714	364	41	11.3%
Block Group 4	0	0	0	0.0%
Block Group 5	$229,612	447	81	18.1%
Census Tract 4511.01 Average MHI	$161,806	2,394	345	14%
Total Alameda County Average MHI	$161,806	2,394	345	14%
Contra Costa County				
Census Tract 3031.03				
Block Group 1	$83,571	758	289	38.1%
Block Group 2	$66,350	969	459	47.4%
Block Group 3	$65,208	1,197	549	45.9%
Block Group 4	$96,875	1,199	373	31.1%
Census Tract 3031.03 Average MHI	$78,001	4,123	1,670	41%
Census Tract 3040.02				
Block Group 1	$69,097	463	191	41.3%
Census Tract 3040.02 Average MHI	$69,097	463	191	41%
Census Tract 3040.03				
Block Group 1	$104,896	927	248	26.8%
Block Group 2	$86,705	149	42	28.2%
Block Group 3	$133,672	489	96	19.6%
Census Tract 3040.03 Average MHI	$108,424	1,565	386	25%
Census Tract 3040.04				
Block Group 1	$122,885	1,054	120	11.4%
Block Group 2	$111,193	564	137	24.3%
Census Tract 3040.04 Average MHI	$117,039	1,618	257	16%
Census Tract 3040.05				
Block Group 1	$104,848	1,459	272	18.6%
Block Group 2	$127,083	933	193	20.7%
Census Tract 3040.05 Average MHI	$115,966	2,392	465	19%
Contra Costa County Average MHI	$97,699	10,161	2,969	29%
Sacramento County				
Census Tract 43				
Block Group 1	$29,688	576	422	73.3%
Block Group 2	$47,409	687	461	67.1%
Block Group 3	$54,318	652	414	63.5%
Block Group 4	$37,143	538	324	60.2%
Census Tract 43 Average MHI	$42,140	2,453	1,621	66%

County/Census Tract/Block Group	Median Household Income	Total Number of Households	Number of Households below $60,000	Percent of Households below $60,000
Census Tract 49.06				
Block Group 1	$54,400	520	305	58.7%
Block Group 2	$54,018	363	198	54.5%
Census Tract 49.06 Average MHI	$54,209	883	503	57%
Census Tract 96.01				
Block Group 1	$53,462	258	164	63.6%
Block Group 2	$52,174	680	397	58.4%
Block Group 3	$47,983	887	514	57.9%
Census Tract 96.01 Average MHI	$51,206	1,825	1,075	59%
Census Tract 96.35				
Block Group 1	$128,640	841	157	18.7%
Block Group 2	$103,281	969	203	20.9%
Block Group 3	$74,118	34	6	17.6%
Census Tract 96.35 Average MHI	$102,013	1,844	366	20%
Census Tract 96.38				
Block Group 1	$99,141	2,788	930	33.4%
Block Group 2	$75,625	476	150	31.5%
Census Tract 96.38 Average MHI	$87,383	3,264	1,080	33%
Census Tract 98				
Block Group 1	$36,420	719	453	63.0%
Census Tract 98 Average MHI	$36,420	719	453	63%
Census Tract 99				
Block Group 1	$55,417	456	301	66.0%
Block Group 2	$59,231	342	179	52.3%
Block Group 3	$51,625	229	143	62.4%
Block Group 4	$58,651	297	169	56.9%
Census Tract 99 Average MHI	$56,231	1,324	792	60%
Sacramento County Average MHI	$61,723	12,312	5,890	48%
San Joaquin County				
Census Tract 39				
Block Group 1	$46,136	184	166	90.2%
Block Group 2	$66,563	232	96	41.4%
Census Tract 39 Average MHI	$56,350	416	262	63%
Census Tract 40.01				
Block Group 1	$52,868	341	208	61.0%
Block Group 2	$38,750	360	244	67.8%
Census Tract 40.01 Average MHI	$45,809	701	452	64%
Census Tract 41.04				
Block Group 1	$100,437	1,296	326	25.2%
Census Tract 41.04 Average MHI	$100,437	1,296	326	25%
Census Tract 41.06				
Block Group 1	$57,125	235	122	51.9%
Block Group 2	$95,938	336	89	26.5%

County/Census Tract/Block Group	Median Household Income	Total Number of Households	Number of Households below $60,000	Percent of Households below $60,000
Census Tract 41.06 Average MHI	$76,532	571	211	37%
Census Tract 52.06				
Block Group 1		194	59	30.4%
Block Group 2		248	77	31.0%
Block Group 3	$130,014	4,401	444	10.1%
Block Group 4	$86,136	1,254	409	32.6%
Block Group 5	$125,597	480	89	18.5%
Census Tract 52.06 Average MHI	$113,916	6,577	1,078	16%
Census Tract 8.01				
Block Group 1	$50,809	357	229	64.1%
Block Group 2	$57,500	904	463	51.2%
Block Group 3	$56,250	493	266	54.0%
Census Tract 8.01 Average MHI	$54,853	1,754	958	55%
San Joaquin County Average MHI	$74,163	11,315	3,287	29%
Yolo County				
Census Tract 104.01				
Block Group 1	$124,688	274	61	22.3%
Block Group 2	$99,289	1,019	282	27.7%
Block Group 3	$82,596	447	168	37.6%
Census Tract 104.01 Average MHI	$102,191	1,740	511	29%
Yolo County Average MHI	$102,191	1,740	511	29%
Study Area Average MHI	$83,589	37,922	13,002	34%

Source: U.S. Census Bureau 2018.
MHI = median household income.
Note: Low income is defined as 20% or more of population with household income of less than 80% of 2015–2019 statewide median household income, or approximately $60,000 (yellow highlighted cells).

Overall, 34% of households in the study area census tracts have an MHI less than $60,000, and nearly all study area census tracts contain 20% or more low-income households.

Low-income residents are anticipated to be tied socially and economically to the larger nearby urban areas on the periphery of the Delta including Tracy, Stockton, and the urban centers in the western end of the Delta because nearby urban centers are expected to provide employment opportunities, goods, services, and entertainment otherwise unavailable in rural agricultural areas. Delta Conveyance Project Draft EIR Chapter 17, *Socioeconomics* (California Department of Water Resources 2022), discusses geographic distribution and community and economic characteristics in the Delta.

3.8.2 Environmental Consequences

This section describes the assessment methods used to analyze potential environmental effects and identifies the direct, indirect, and cumulative effects on environmental justice (minority and low-income) populations associated with the action alternatives, as well as the No Action Alternative.

3.8.2.1 Methods for Analysis

The environmental justice analysis follows guidance in the CEQ Guidance and *Promising Practices for EJ Methodologies in NEPA Reviews* (Interagency Working Group on Environmental Justice & NEPA Committee 2016). Data were acquired from the U.S. Census and other government sources. Findings of adverse effects in the resource analyses inform the evaluation of disproportionate adverse effects on environmental justice for minority and low-income communities.

The study area consists of the census tracts and block groups intersected by the project footprint. The minority and low-income populations in the study area were defined using minority and income data from the U.S. Census Bureau American Community Survey 5-Year Estimates for 2014–2018. These data were processed in GIS to determine where these populations occur in the study area (Figures 3.8-1 and 3.8-2). The environmental justice analysis also captures impacts found for resource topics that were analyzed on a broader or regional scale (e.g., air quality, water quality) that may extend beyond the environmental justice study area.

Public outreach is central to the principles of environmental justice, and an important component of meeting the goals identified in EO 12898. Delta Conveyance Project Draft EIR Chapter 34, *Public Involvement* (California Department of Water Resources 2022), provides a summary of all public involvement and outreach activities conducted for the action alternatives and a summary of some of the public involvement, consultation, and coordination activities conducted as part of the larger project program independent of the EIS process. In addition to outreach to the general public, the applicant engaged specifically with disadvantaged, historically burdened, underrepresented, people of color, and low-income communities of interest that may be disproportionately affected by the proposed Delta Conveyance Project. These outreach efforts have included engagement and consultation with Tribes and outreach to minority and low-income communities via a public online survey conducted in fall/winter 2020. Details on the applicant's outreach efforts to minority and low-income communities is presented in Delta Conveyance Project Draft EIR Chapter 29, *Environmental Justice*, and Draft EIR Appendix 29A, *Environmental Justice Community Survey Report* (California Department of Water Resources 2022).

CEQ guidance identifies the following three factors to be considered to the extent practicable when determining whether environmental effects are disproportionately high and adverse (Council on Environmental Quality 1997:26–27).

- Whether there is or would be an effect on the natural or physical environment that adversely affects a minority population, or low-income population. Such effects may include ecological, cultural, human health, economic, or social effects on minority communities, low-income communities, or Indian tribes when those effects are interrelated to effects on the natural or physical environment.
- Whether the environmental effects may have an adverse effect on minority populations, or low-income populations, which appreciably exceeds or is likely to appreciably exceed those on the general population or other appropriate comparison group.
- Whether the environmental effects occur or would occur in a minority population or low-income population affected by cumulative or multiple adverse exposures from environmental hazards that appreciably exceed the cumulative or adverse exposure of the population at large.

Section 3.8.3.1, *Effects and Mitigation*, identifies specific resources where analysis of physical environmental effects found potential adverse effects of implementing an action alternative and discusses whether the mitigation measures proposed for that resource reduce the adverse effect. Where mitigation would not sufficiently reduce an environmental effect, this section assesses whether the physical change would have a *disproportionately high and adverse* effect on a minority and low-income community, and how. Mitigation measures, environmental commitments, and best management practices (Appendix C1, *Environmental Commitments and Best Management Practices*) were also examined to determine if they had potential to result in a disproportionately high and adverse effect on a minority and low-income population.

Adverse environmental effects would be disproportionate if they occur in census tracts or blocks with greater than 50% total minority populations (Figure 3.8-2) or in census block groups where low-income households (i.e., below the defined income threshold) constitute 20% or more of the total population (Figure 3.8-3). The 20% threshold for low-income households was used because the cost of living in California is higher than elsewhere in the country (Public Policy Institute of California 2019), and the use of a 50% threshold might incorrectly under-identify low-income populations in the study area.

For effects that were determined not adverse, no additional evaluation is needed because those effects would not result in disproportionate high and adverse effects on minority and low-income populations.

3.8.2.2 Effects and Mitigation

No Action Alternative

Under the No Action Alternative, none of the Delta Conveyance Project's proposed facilities would be constructed and the applicant would continue to operate the SWP to divert, store, and convey SWP water consistent with applicable laws and contractual obligations. The applicant would also remain subject to the current take prohibition for listed species and other current ESA requirements. The No Action Alternative considers the water supply projects that may be implemented if the Delta Conveyance Project was not constructed. Examples of such projects are shown in Table 3.8-2.

Table 3.8-2. Types of Water Supply Projects Considered under the No Action Alternative and Resulting Effects on Minority and Low-income Populations

Project Type	Potential Effects on Minority and Low-Income Populations
Desalination	Temporary construction effects on noise, traffic, air quality, public health. Potential permanent damage, destruction, or obstruction of access to coastal cultural resources. Temporary or permanent obstruction of recreational resources. Potential permanent alterations in marine biological resources, aesthetic values. Some mitigation would be available to reduce effects.
Water recycling	Temporary construction effects on noise, traffic, air quality, and public health. Potential aesthetic, biological, water quality, and cultural resources effects, depending on project location. Mitigation would reduce effects.
Groundwater recovery (brackish water desalination)	Farmland conversion and resulting employment losses within the agriculture sector. Benefits such as more reliable water supply.

Project Type	Potential Effects on Minority and Low-Income Populations
Groundwater management	Beneficial effects. Could enhance groundwater quality by giving water providers ability to blend cleaner recharge water with local contaminated groundwater to improve water quality for households dependent on well water. Decrease groundwater overdraft.
Water use efficiency	Reduced or enhanced employment or business opportunities. Possible economic benefits if reduced water use results in lower water bills.

Water projects implemented in lieu of the action alternatives would generally be intended to benefit water quality or water supply. Such improvements would benefit both the general population and minority and low-income communities. Construction of local water supply–reliability projects such as desalination plants, groundwater storage, or water recycling facilities could result in disproportionate effects on low income or minority communities from construction noise and traffic; air quality effects; damage or destruction to archaeological resources or traditional use sites; obstruction or loss of recreational resources; and adverse effects on agricultural land and biological resources used for food, income-generating activities, or traditional uses. Large infrastructure could permanently change the aesthetic values in the immediate project vicinity.

Construction effects on noise, traffic, and air quality would be temporary and projects would be required to mitigate adverse effects, where feasible. Effects on aesthetic values could be temporary or permanent and are often mitigable. Temporary adverse effects would likely affect both the general and environmental justice populations equally.

Desalination plants in coastal areas could temporarily or permanently obstruct access to coastal recreational and cultural resources. Coastal cultural resources such as archaeological sites could be damaged or destroyed, and access to traditional use areas could be restricted or entirely prohibited. These would be adverse effects on environmental justice populations if they are present in or use the study area.

Wastewater recycling or reclamation projects would be located near water treatment facilities. Construction techniques for water recycling projects would vary depending on the type of project (e.g., landscape irrigation, groundwater recharge, dust control, industrial processes). Such projects would have the same or similar adverse effects during construction as described above, which would be mitigated. The public health and safety benefits of such projects, however, would accrue equally to general and environmental justice populations. Benefits could include a contribution to the total water supply available to the community and sufficient wastewater treatment capacity to ensure compliance with existing and anticipated regulatory requirements.

Groundwater recharge or management projects could result in farmland conversion with temporary or permanent loss of crop production. This could have an adverse effect on low-income farmworkers. New potable water supplies created where existing water supply limits growth could induce growth and affect housing availability and affordability for lower income residents. Beneficial effects would include more reliable, better quality water supply and potentially less groundwater overdraft, which would benefit all populations.

Water efficiency projects could have adverse or beneficial effects. Effects could be adverse for minority or low-income individuals or businesses if projects limit water uses in a way that reduces employment opportunities, such as by taking agricultural land out of production. Effects could be beneficial if projects lead to increased employment opportunities, such as installing water-efficient building fixtures or upgrades to waterwise infrastructure. Benefits of water efficiency projects would likely be similar for the general and environmental justice populations.

All project types would involve relatively typical construction techniques (i.e., no large-scale tunnels) and would be required to conform with state and local regulations and with NEPA when a federal nexus exists. Measures developed to protect resources from project effects could have incidental effects on environmental justice populations; because specific projects, effects, and mitigation measures are unknown, estimating these effects would be speculative and, as such, are not addressed in this discussion.

Future Environmental Justice Conditions

Future conditions of environmental resources that affect environmental justice populations are likely to change whether or not the proposed action (or action alternatives) proceeds. Direct and indirect effects on minority and low-income communities within the Delta may occur under the No Action Alternative as the result of climate change, changes in upstream hydrologic conditions, sea level rise, rising temperatures, and continuing seismic risk to Delta levees. Minority and low-income communities are generally more vulnerable to harm from adverse environmental events than the general population. It is too speculative, however, to assess how such environmental changes would affect environmental justice populations because the type and extent of changes that might occur in any given region and the individual and institutional responses to such changes are wide-ranging and uncertain.

All Action Alternatives

This section describes resource topics and action alternatives that could have disproportionate effects on environmental justice populations. Resource topics identified as having adverse effects both before or after mitigation were considered and analyzed to determine if they could result in a disproportionately high and adverse effect on an environmental justice population. Resources found to have no adverse effects (i.e., water quality, geology and seismicity, land use, recreation, public services and utilities, energy, and mineral resources), are assumed to not have a disproportionately high and adverse effect on environmental justice and are not evaluated here.

Full descriptions of the resources' effects and mitigation measures listed in this section are included in the resource sections of this Draft EIS. Appendix C2, *Mitigation Measures*, includes full descriptions of the general mitigation measures listed in this section.

Impact EJ-1: Disproportionate Effect on Minority or Low-Income Populations/Communities from Agricultural Resources Effects

No Action Alternative

Some local plans call for Important Farmland to be converted to nonagricultural uses. The loss of Important Farmland could lead to loss of agricultural jobs and therefore be a disproportionately high and adverse environmental justice effect on low-income or minority workers and agricultural business owners. Some local plans call for restoring Prime Farmland, which could benefit minority or low-income populations by preserving or creating agricultural jobs.

Projects could have adverse or beneficial effects. If projects convert farmland to nonagricultural uses, low-income agricultural workers or minority agricultural business owners might lose employment and income. If projects limit water uses in a way that reduces employment opportunities, such as by taking agricultural land out of production, effects could be adverse for minority or low-income individuals or businesses. Projects intended to conserve agricultural land would benefit these workers by retaining or expanding opportunities in agriculture. Reliable water supplies to farms would also be a benefit because it helps maintain or expand agricultural employment.

All Action Alternatives

The loss of productive agricultural land would change agricultural production and result in loss of full-time and seasonal agricultural employment (Section 3.17, *Socioeconomics*). Implementing Mitigation Measures AG-1: *Preserve Agricultural Land*, would not avoid a net loss of Important Farmland, Williamson Act, or Farmland Security Zone lands in the study area. Even if conservation easements on agricultural lands or replacement lands were acquired as mitigation, these lands could be outside the Delta and difficult or more costly (in time and expense) for workers in the study area to access or might not require the same amount of labor as the converted lands.

Low-income and minority agricultural workers comprise a substantial proportion of the environmental justice communities of the Delta. In California, a full-time agricultural employee would have earned $30,300 per year in 2015. However, few workers are employed full time year-round, resulting in an average annual wage of $20,500 for workers with at least one farm job in 2015 (Martin et al. 2017:1). The median annual wage for farm laborers, including crop, nursery, and greenhouse workers, in 2021 was $29,379 (California Employment Development Department 2022). Minorities compose about 95% of agricultural workers (California Research Bureau 2013). Accordingly, the loss of productive agricultural land would potentially have a disproportionately high and adverse effect on environmental justice populations.

Effects on agricultural resources also would include effects on local infrastructure supporting agricultural properties including drainage and irrigation facilities. This effect would be reduced by implementation of Mitigation Measure AG-3: *Replacement or Relocation of Impacted Infrastructure Supporting Agricultural Properties*, by fully compensating affected landowners for any financial losses resulting from the disruption. The effects on minority and low-income populations from effects on local infrastructure supporting agricultural properties would not exceed the effects on the general population and is, therefore, not considered a disproportionately adverse effect on environmental justice.

Based on the information presented above, including the effect of Mitigation Measures AG-1: *Preserve Agricultural Land*, the loss of productive agricultural land under all action alternatives would potentially have a disproportionately high and adverse effect on minority and low-income populations. Therefore, this effect may be significant.

Impact EJ-2: Disproportionate Effect on Minority or Low-Income Populations/Communities from Aesthetic and Visual Resources Effects

No Action Alternative

Projects could result in visual effects from the construction of water facilities and associated infrastructure. The effect on scenic resources could have a disproportionate effect on environmental justice if projects occur where minority or low-income populations are present.

Development of water infrastructure facilities could potentially have adverse effects on scenic resources that minority or low-income communities value. Potential visual alterations could permanently change the aesthetic values, thus resulting in a disproportionate effect on minority and low-income populations.

All Action Alternatives

Construction and operation of the action alternatives would introduce visual elements such as construction equipment and large industrial structures that would reduce the scenic quality throughout the study area. These elements would alter the visual experience of the surrounding area and along SR 160 (a designated state scenic highway) by conflicting with the forms, patterns, and colors of the existing landscape and by dominating riverfront views and altering the broad views presently available. Furthermore, the size of the study area and the nature of changes introduced by the action alternatives would result in permanent changes to the regional landscape such that there would be noticeable changes that would not blend with the existing visual environment. The action alternatives would also introduce light and glare.

The applicant has proposed the following mitigation measures to address aesthetics and visual resources effects for all action alternatives.

- Mitigation Measure AES-1a: *Install Visual Barriers between Construction Work Areas and Sensitive Receptors*
- Mitigation Measure AES-1b: A*pply Aesthetic Design Treatments to All Structures to the Extent Feasible*
- Mitigation Measure AES-1c: *Implement Best Management Practices to Implement Project Landscaping Plan*
- Mitigation Measure AES-4a: *Limit Construction Outside of Daylight Hours within 0.25 Mile of Residents at the Intakes*
- Mitigation Measure AES-4b: *Minimize Fugitive Light from Portable Sources Used for Construction*
- Mitigation Measure AES-4c: *Install Visual Barriers along Access Routes, Where Necessary, to Prevent Light Spill from Truck Headlights toward Residences*
- Mitigation Measure AES-4d: *Avoid the Use of Blue Rich White Light LED Lighting*

While implementing Mitigation Measures AES-1a through AES-1c would help reduce the effects on aesthetics and visual resources, these effects would remain. However, implementation of Mitigation Measures AES-1a through AES-1c and AES-4a through AES-4c would mitigate the introduction of light and glare.

Low-income and minority respondents to the environmental justice survey indicated that the region's beauty, ambiance, and small-town feel were very important to them. Comments from the survey expressed concern to preserve the Delta's quality of life and scenic beauty. The action alternatives' visual effects identified in the study area would disproportionately affect low-income and minority populations because of their substantial presence throughout the study area. Accordingly, visual effects from construction and operation of the action alternatives would have a disproportionately high and adverse effect on environmental justice populations within the study area.

Based on the information presented above, even with implementation of proposed mitigation measures, the effects on minority or low-income populations/communities from aesthetic and visual resources effects for all action alternatives may be significant.

Impact EJ-3: Disproportionate Effect on Minority or Low-Income Populations/Communities from Cultural Resources Effects

No Action Alternative

Development of program water infrastructure facilities could potentially have adverse effects on cultural resources that minority communities value. Effects on cultural resources that are associated with ethnic minority groups present in high proportions could potentially result in a disproportionate effect on these populations in the study area.

Projects in coastal areas could temporarily or permanently obstruct access to coastal cultural resources. Coastal cultural resources such as archaeological sites could be damaged or destroyed, and access to traditional use areas could be restricted or entirely prohibited. These would be disproportionate effects on minority communities if they are present in or use the project area.

All Action Alternatives

Adverse effects on historic built-environment resources, previously identified or unknown historic archaeological sites, precontact archaeological resources, and unidentified buried human remains could occur during construction. Some resources potentially subject to adverse effects have not been comprehensively analyzed because they are on private properties that have not granted access for evaluation, or because the locations have not been previously surveyed, and the presence of sites is unknown. The current location and extent of archaeological sites recorded in the early and mid-twentieth century and potentially subject to adverse effects cannot be verified for similar reasons, or because subsequent land disturbance has disrupted or destroyed them and additional surveys are necessary. Because the nature of the sites and the effects are currently unknown, disproportionately high and adverse effects on environmental justice populations cannot be determined.

Indirect effects such as introduction of new elements or inconsistent changes to the setting may diminish the significance of cultural resources. Implementing Mitigation Measures CUL-1a through CUL-3c and CUL-4 would help reduce the impacts of Impacts CUL-1 through CUL-4; however, effects on each of these resources would remain adverse.

Historic built and archaeological resources may reflect the heritage of various ethnic communities present in the study area. While built environment and historic and archaeological cultural resources can be of interest to the general public (including low-income populations), the importance to the general public is typically limited to the scientific or historic value of the resources. Precontact resources, especially sites containing human remains, are of special significance to the Native American community. These resources are an important link to the Native American community's past, and sites containing human remains are a resting place for their ancestors. The number of known resources affected in the study area and the geographic distribution of their sites is described in Section 3.7, *Cultural Resources,* and Delta Conveyance Project Draft EIR Chapter 19, *Cultural Resources* (California Department of Water Resources 2022). Effects on resources that are associated with the heritage of Native Americans or other ethnic minority groups present in high proportions could potentially result in a disproportionately high and adverse effect on these populations in the study area.

Implementing the following mitigation measures would help reduce the effects of Impacts CUL-1 through CUL-3b; however, potential effects on each of these resources would remain.

- Mitigation Measure CUL-1: *Prepare and Implement a Built-Environment Treatment Plan in Consultation with Interested Parties*
- Mitigation Measure CUL-2: *Conduct a Survey of Inaccessible Properties to Assess Eligibility, Determine If These Properties Will Be Adversely Affected by the Project, and Develop Treatment to Resolve or Mitigate Adverse Impacts*
- Mitigation Measure CUL-3a: *Prepare and Implement an Archaeological Resources Management Plan*
- Mitigation Measure CUL-3b: *Conduct Cultural Resources Sensitivity Training*
- Mitigation Measure CUL-3c: *Implement Archaeological Protocols for Field Investigations*
- Mitigation Measure CUL-4: *Follow State and Federal Law Governing Human Remains If Such Resources Are Discovered during Construction*

Based on the information presented above, even with implementation of proposed mitigation measures, the effects on minority or low-income populations/communities from cultural resources effects for all action alternatives may be significant.

Impact EJ-4: Disproportionate Effect on Minority or Low-Income Populations/Communities from Transportation Effects

No Action Alternative

Construction of local water supply–reliability projects could result in effects on traffic congestion. Effects would be disproportionate if construction notices of detours and delays are not provided in appropriate languages spoken in local communities because minority and low-income residents with limited English proficiency or limited internet access would not have equal access to the information. Added construction traffic could potentially increase safety hazards or conflict with emergency vehicle access at and near construction sites. Effects on the circulation system would be temporary and would depend on the size and location of the water supply facility being constructed. All residents would be equally affected. Effects could be reduced or avoided by developing transportation demand management (TDM) plans and traffic management plans (TMPs) to reduce the reliance on single-occupancy vehicles and increase employee carpooling and alternative travel modes (e.g., transit, bicycling, and walking). Operation and maintenance of these new water supply facilities would not create substantial changes in vehicle miles traveled (VMT) or roadway conditions because of the limited personnel normally required to operate water facility infrastructure.

All Action Alternatives

Construction of the action alternatives would result in additional vehicle miles traveled on the regional and local transportation system and increase the total amount of driving and distances traveled over the course of the construction period. The added construction traffic could potentially affect bicycle and pedestrian routes, increase safety hazards, or conflict with emergency vehicle access at ingress and egress locations at construction sites. Construction and operation of the park-and-ride lots for all action alternatives would reduce employee VMT on Delta roadways and reduce the severity of the action alternatives' increase in the average employee VMT but would not fully offset construction VMT.

Prior to construction, the applicant would be responsible for verifying that the site-specific construction TDM plan and TMPs are implemented, as described for Mitigation Measure TRANS-1: *Implement Site-Specific Construction Transportation Demand Management Plan and Transportation Management Plan*. This mitigation measure would reduce potential traffic-related effects. However, the effectiveness of Mitigation Measure TRANS-1 to fully reduce VMT impacts of the action alternatives is uncertain because the effectiveness of the specified measures, such as incentivizing carpooling and alternative travel modes, would vary depending on specific construction sites and employment conditions. Public signage and notifications of construction delays and detours would be provided in multiple languages spoken in the Delta and notices would be published in appropriate foreign-language and other targeted media sources (e.g., radio and community newsletters) to provide equal access to the information for minority and low-income residents with limited English proficiency or limited internet access. The TMP would also provide specific actions and coordination with emergency responders at construction sites to maintain adequate emergency access in the vicinity of construction sites so that emergency access would not be compromised in any local communities. Construction of the proposed action would not result in direct or discernible indirect effects on environmental justice populations greater than those on the general population.

Based on the information presented above, and considering the proposed mitigation measures and environmental commitments, the effect on minority or low-income populations/communities from transportation effects for all action alternatives does not appear to be significant.

Impact EJ-5: Disproportionate Effect on Minority or Low-Income Populations/Communities from Air Quality and Greenhouse Gases Effects

No Action Alternative

Localized emissions of toxic air contaminants or diesel particulate matter during construction of individual projects would affect air quality and public health in the immediate vicinity of the construction. Low-income and minority populations often live in places where pollutant concentrations already exceed regulatory standards and suffer with respiratory conditions and lack of access to health care. Where regulations, best management practices, and mitigation, avoidance, and minimization measures reduce adverse effects on resources, minority or low-income populations would generally benefit proportionally. Construction effects on air quality would be temporary and projects would be required to mitigate adverse effects, where feasible. If air emissions are not minimized sufficiently by implementation of required measures, they could have a disproportionate adverse effect on minority or low-income populations, if present.

All Action Alternatives

Construction could result in exceedances of Sacramento Metropolitan Air Quality Management District's, San Joaquin Valley Air Pollution Control District's, and Bay Area Air Quality Management District's maximum daily criteria pollutant thresholds before mitigation. Mitigation Measures AQ-1: *Offset Construction Generated Criteria Pollutants in the Sacramento Valley Air Basin,* AQ-2: *Offset Construction-Generated Criteria Pollutants in the San Joaquin Valley Air Basin*, and AQ-3: *Offset Construction Generated Criteria Pollutants in the San Francisco Bay Area Air Basin,* and Environmental Commitments EC-7: *Off-Road Heavy-Duty Engines*, EC-8: *On-Road Haul Trucks,* EC-9*: On-Site Locomotives*, EC-10: *Marine Vessels*, EC-11: *Fugitive Dust Control,* EC-12: *On-Site Concrete*

Batching Plants, EC-13: *DWR Best Management Practices to Reduce GHG Emissions*, would be implemented to reduce these effects.

Project construction would result in exposing sensitive receptors to substantial localized criteria pollutant emissions and to substantial toxic air contaminant emissions. While Mitigation Measures AQ-5: *Avoid Public Exposure to Localized Particulate Matter Concentrations,* and AQ-6: *Avoid Residential Exposure to Localized Diesel Particulate Matter*, and the environmental commitments listed above would be implemented to lower receptor exposure to project-generated air pollution, it may not be feasible to completely eliminate all localized exceedances of criteria pollutants or receptors may not elect to accept the applicant's assistance.

Construction of the action alternatives would generate greenhouse gas emissions. Greenhouse gas emissions are global pollutants and disperse widely in the atmosphere; therefore, these emissions have global effects and cannot be analyzed at the level of the air district as done for criteria pollutants and ozone precursors, nor can effects of greenhouse gas emissions be quantified at the level of census tracts, as the environmental justice study area is defined. Implementation of Mitigation Measure AQ-9: *Develop and Implement a GHG Reduction Plan to Reduce GHG Emissions from Construction (Including Land Use Change) and Net CVP Operational Pumping to Net Zer*o, environmental commitments, and extended habitat creation would reduce greenhouse gas emissions to net zero through the development and implementation of a GHG mitigation program. This measure ensures net additional construction emissions would not result in an adverse greenhouse gas effect.

Mitigation measures and environmental commitments would be available to reduce air quality effects; however, it is not anticipated that feasible measures would be available in all situations to reduce effects to an acceptable level. Although mitigation measures are available to address these temporary effects, the air quality effects would occur in areas with meaningfully greater minority and low-income populations and, therefore, represents a disproportionately high and adverse effect.

Based on the information presented above, even with implementation of proposed mitigation measures, the effect on minority or low-income populations/communities from air quality and greenhouse gases effects for all action alternatives may be significant.

Impact EJ-6: Disproportionate Effect on Minority or Low-Income Populations/Communities from Noise Effects

No Action Alternative

Construction effects on noise would be temporary and projects would be required to mitigate adverse effects, where feasible. Temporary adverse effects would likely affect both the general and minority or low-income populations equally, although effects that occur in areas with meaningfully greater minority and low-income populations would represent a disproportionately high and adverse effect.

All Action Alternatives

Construction would involve the use of heavy equipment at associated construction sites for up to 14 years, as the tunnels, intakes and Southern or Bethany Complex facilities are built. Heavy equipment noise levels at these construction sites could exceed daytime and nighttime noise thresholds under all action alternatives, but the number of receptors affected would vary.

Although Mitigation Measure NOI-1: *Develop and Implement Noise Control Plan Including Site-Specific Measures,* would be available to reduce these effects, it is not anticipated that feasible measures would be available in all situations to reduce construction noise to acceptable levels. Because effects would occur in areas with meaningfully greater minority and low-income populations, this represents a disproportionately high and adverse effect.

Based on the information presented above, even with implementation of the proposed mitigation measure, the effect on minority or low-income populations/communities from noise effects for all action alternatives may be significant.

Impact EJ-7: Disproportionate Effect on Minority or Low-Income Populations/Communities from Public Health Effects

No Action Alternative

Project construction would result in highly localized effects such as emissions of toxic air contaminants or diesel particulate matter that could affect public health in areas with meaningfully greater minority and low-income populations. Low-income and minority populations often live in places where pollutant concentrations already exceed regulatory standards and suffer with respiratory conditions and lack of access to health care. If air emissions are not minimized sufficiently by implementation of mitigation measures or regulatory requirements, they could have a disproportionate adverse effect on the health of minority or low-income populations, if present.

Construction could also create temporary areas of standing water that could attract mosquitoes carrying vector-borne diseases. If mosquito control measures are not implemented, exposure could result in a disproportionately high and adverse effect on the health of minority or low-income populations if they are present in meaningfully greater proportions in the study area.

All Action Alternatives

Under all of the action alternatives, ponding in construction and staging areas, as well as at sites where future preconstruction field investigations are performed, could develop after heavy precipitation events and temporarily create areas conducive to mosquito breeding, which may temporarily increase the public's exposure to vector-borne diseases in the study area. With implementation of Mitigation Measure PH-1a: *Avoid Creating Areas of Standing Water During Preconstruction Future Field Investigations and Project Construction*, standing water will be eliminated to reduce potential suitable mosquito breeding areas at field investigation sites and construction sites. Mitigation Measure PH-1b: *Develop and Implement a Mosquito Management Plan for Compensatory Mitigation Sites on Bouldin Island and at I-5 Ponds* would reduce the effects of an increase in mosquito-breeding habitat at compensatory mitigation sites by implementing a vector control plan in coordination with local mosquito and vector-control districts. The effect on environmental justice populations would not exceed those on the general population.

Based on the information presented above, and considering the proposed mitigation measures, the effect on minority or low-income populations/communities from public health effects for all action alternatives does not appear to be significant.

Impact EJ-8: Disproportionate Effect on Minority or Low-Income Populations/Communities from Climate Change Effects

No Action Alternative

Climate change and other natural processes and ongoing human activities would continue. How ongoing or changing conditions would affect environmental justice would depend on unknown individual, social, institutional, and political responses to change. Public water agencies would likely implement more or larger-capacity water and wastewater projects or policies than might be needed if one of the action alternatives was implemented, Water projects could have adverse or beneficial effects, which would likely be similar for general and minority and low-income populations.

Water quality changes within the Delta are expected to be driven primarily by climate change and sea level rise. Foreseeable effects due to climate change include a decrease in the amount of water in channels and associated infrastructure, sea level rise, saltwater intrusion, warmer water temperatures, and their associated effects on the natural environment. Where effects on human health or activities would occur in areas with a meaningfully greater proportion of minority and low-income populations, there would be a disproportionately high and adverse effect on environmental justice.

All Action Alternatives

Section 3.6, *Climate Change*, analyzes how climate change would affect the study area, how anticipated resource effects from the action alternatives would be affected by climate change, and how the action alternatives may improve the study area's resiliency and adaptability to climate change. Elements of climate change that are linked to resource effects include the increase in temperature and frequency of extreme heat events, flood events, droughts, and wildfire; and sea level rise, salinity intrusion, and the spread of pests and vector-borne diseases.

Climate change is a threat to the general population in terms of physical and mental health, air, water, food, and shelter, but socially and economically marginalized communities are differentially exposed and vulnerable because of where they live (e.g., rural or low-income areas), their health status, income, language barriers, and limited access to resources (Intergovernmental Panel on Climate Change 2012:7; Columbia Climate School 2020). Adaptation measures that benefit one population can have negative effects on others. For example, farm owners may adapt to drought conditions by increasing groundwater pumping and changing to tree crops that require less labor, but these actions can increase the vulnerability of farmworkers and rural communities (Greene 2018; Swain 2015). Swain (2015:10,001) documented how when surface water allocations were restricted during the drought years of 2012 to 2015, groundwater overdraft due to agricultural pumping in the Central Valley caused taps to run dry in homes in small, mostly low-income agricultural communities that relied on local wells. Greene (2018:285) reported the loss of nearly 43,000 agricultural sector jobs in the San Joaquin Valley during approximately the same period (2014, 2015, and 2016) due to land fallowing and conversion to more-profitable tree crops. The loss of reliable domestic water and income translates to effects on food security, water security, and health for minority and low-income communities.

To the extent that the action alternatives would provide greater reliability in water deliveries and water quality that would help farmers to keep crop land in production in the study area and allow farm employment to continue under changed conditions, the action alternatives would not have a disproportionately high and adverse effect on minority and low-income communities and could have a beneficial effect under conditions driven by climate change.

Based on the information presented above, the effect on minority or low-income populations/communities from climate change for all action alternatives does not appear to be significant and could be a beneficial effect.

3.8.2.3 Environmental Justice Effects of Mitigation Measures

Mitigation measures are designed to avoid, reduce, or minimize adverse effects of the action alternatives on the environment (Appendix C2, *Mitigation Measures*). Such reductions would generally affect the general population and minority and low-income populations equally.

3.9 Flood Protection

This section describes the affected environment for flood protection (i.e., flood risks, flood management, and flood control facilities) and analyzes effects that could occur in the study area from construction, operation, and maintenance of the action alternatives, as well as the No Action Alternative. Mitigation and minimization measures that would avoid, minimize, rectify, reduce, or compensate potentially adverse effects are included as part of each action alternative. Additional information on the affected environment, methods, and the anticipated effects of the action alternatives can be found in the Delta Conveyance Project Draft EIR Chapter 7, *Flood Protection* (California Department of Water Resources 2022a).

3.9.1 Affected Environment

The study area for flood protection includes the Delta and the federal, state, regional, and local flood management facilities, including levee systems, bypasses, floodways, weirs, and other pertinent facilities. The action alternatives do not include any changes in flood control operation rules or flood control facilities. It is expected that the operation of facilities in the San Joaquin River Basin would not be affected by the project; thus, the San Joaquin River Basin is excluded from the study area.

3.9.1.1 Hydrologic Conditions

California's statewide annual precipitation is highly variable. While annual precipitation ranges between roughly 100 million and 300 million acre-feet, about 200 million acre-feet of rain and snow fall per year on average (California Department of Water Resources 2020a:53). This precipitation is generally greatest in the Sierra Nevada and north coast regions, with precipitation ranging from 36 to 160 inches per year in these areas (California Department of Water Resources 2020a:53). Conversely, some of the southern regions of the state receive less than 4 inches of precipitation per year. The geographic variation and the variability in precipitation that California receives make it challenging to manage the available runoff that can be captured in storage to meet water needs while also managing flood risk.

Annual precipitation data from California shows significant year-to-year variation. This inter-annual variability makes trend analysis difficult; an analysis of precipitation records since the 1890s shows no statistically significant trend in precipitation throughout California. Although the overall precipitation trend is generally flat over the past 120 years, the precipitation record indicates significant decadal variability giving rise to dry and wet periods. A decadal fluctuation signal has become apparent in Northern California, where winter precipitation varies with a period of 14 to 15 years (California Department of Water Resources 2020b:10). This decadal signal has increased in intensity over the twentieth century, resulting in more distinct dry and wet periods. For example, the average water year (i.e., October 1–September 30) precipitation between 1966 and 2015 was 51.8 inches (California Department of Water Resources 2020b:10). However, there are extremely dry years—such as 1976–1977 with only 19.0 inches—and extremely wet years—such as 2016–2017 with 94.7 inches—as a result of this decadal variability.

Certain large storm events can lead to high discharge events in upstream areas of the Delta tributaries (i.e., the Sacramento River, San Joaquin River, and eastside tributaries). This large increase in Delta inflows—which increases Delta water surface elevations (WSEs)—can coincide with substantial flooding in the Delta, as was the case in February 1986. In the 2 weeks prior, heavy rains saturated Northern California watersheds and contributed to high inflows into the north Delta from the Cosumnes River, Dry Creek, and the Morrison Stream Group. The inflows exceeded the conveyance capacity of north Delta channels, resulting in ponding upstream of Franklin Road. A series of levee failures ensued at Glanville Tract, McCormack-Williamson Tract, Dead Horse Island, Tyler Island, and New Hope Tract (Delta Conveyance Design and Construction Authority 2022a:Att 1-1).

3.9.1.2 Existing Flood Management Facilities

In 1953, structures, lands, programs, and modes of operation and maintenance were brought together in a flood protection system known as the State Plan of Flood Control (SPFC). California Water Code Section 9110(f) defines the SPFC as follows.[21]

> The state and federal flood control works, lands, programs, plans, policies, conditions, and mode of maintenance and operations of the Sacramento River Flood Control Project described in Section 8350, and of flood control projects in the Sacramento River and San Joaquin River watersheds authorized pursuant to Article 2 (commencing with Section 12648) of Chapter 2 of Part 6 of Division 6 for which the board or the department has provided the assurances of nonfederal cooperation to the United States, and those facilities identified in Section 8361.

The SPFC includes approximately 1,600 miles of levee, and approximately 150 reservoirs constructed on streams draining to the Central Valley. The 10 major multipurpose reservoirs play an important role in moderating Central Valley flood inflows (excluding those draining to the Tulare Lake Basin), including the following waterbodies (California Department of Water Resources 2012a:1-5): Shasta Lake on the Sacramento River, Lake Oroville on the Feather River, New Bullards Bar Reservoir on the Yuba River, Folsom Dam on the American River, Camanche Reservoir on the Mokelumne River, New Hogan Reservoir on the Calaveras Reservoir, New Melones Reservoir on the Stanislaus River, New Don Pedro Reservoir on the Tuolumne River, Lake McClure on the Merced River, and Millerton Lake on the San Joaquin River. California's Central Valley Flood Protection Board (CVFPB) serves as the state regulatory agency for the flood management system in the Central Valley, and the California Department of Water Resources (DWR or the applicant) shares certain responsibility for flood management system operation and maintenance.

The federal Sacramento River Flood Control Project (SRFCP), as a major part of the SPFC facilities, is one of the primary flood control features on the Sacramento River system (California Department of Water Resources 2010:2-2). CVFPB is the nonfederal sponsor of the SRFCP and responsible for operation and maintenance of these facilities. Through additional agreement between the applicant and CVFPB, the applicant is responsible for maintaining and operating some portions of the SRFCP on behalf of CVFPB including the Fremont Weir, Sacramento Weir, and flood-carrying capacity of the Yolo Bypass.

The SRFCP area spans from Red Bluff to the northern Delta and includes a complex system of levees, overflow weirs, drainage pumping plants, and flood bypass channels. The operation and maintenance of these facilities serves a critically important role in managing floods that affect the Delta. The channels of the flood management system convey floodwater for safe discharge based on their design capacities and profiles. The flood bypass channels (i.e., Butte Basin; Tisdale, Sutter, and Yolo bypasses) of the SRFCP have major capacities to divert major flood flows away from limited

[21] https://codes.findlaw.com/ca/water-code/wat-sect-9110.html

river channels to avoid damages. The Yolo Bypass is a feature of the SRFCP and is located immediately west of the metropolitan area of Sacramento, extending from the Fremont Weir (upstream of the Delta) to Liberty Island (within the Delta). During high water, the diversion of water to the Yolo Bypass relieves the pressure of high flows from the Sacramento River and alleviates flood risk in the region. This function results in a frequent inundation during the winter months; it is usually cleared for farming operation in the spring, but the period of inundation may be longer if necessary. As part of the *2017 Central Valley Flood Protection Plan (CVFPP) Update*, the applicant analyzed SPFC channel design capacities and profiles, which are documented in the *2017 Flood System Status Report* (California Department of Water Resources 2017a; California Department of Water Resources 2017b).

SPFC facilities, and notably SPFC levees, are under the jurisdiction of CVFPB; for those levees that are part of the SRFCP, they are also under the jurisdiction of USACE. Most SPFC maintenance responsibilities have been transferred to a range of local levee maintenance agencies and the applicant (California Department of Water Resources 2010:5-5–5-14; California Department of Water Resources 2017c:5-1).

The SPFC is a portion of the larger flood management system in the Central Valley. The performance of SPFC facilities relies on non-SPFC facilities, including reservoirs—such as Shasta and Folsom Lakes—that provide important regulation of flows to levels that downstream SPFC facilities can accommodate as designed. On the Sacramento River, Shasta Lake regulates inflows from the Sacramento, McCloud, and Pit Rivers as well as numerous other tributaries and creeks. While not part of the SPFC, Shasta Lake—as a multipurpose reservoir—serves an important role in managing California's water supply while also providing flood control storage to help manage flood risk along the Sacramento River (California Department of Water Resources 2010:2-14). Similarly, Folsom Lake, formed by construction of Folsom Dam and managed by the Bureau of Reclamation (Reclamation), is the largest reservoir in the American River Basin and the only reservoir in the basin with designated flood control functions.

Other public and private levees, locally operated drainage systems, and other state, federal, and local facilities work in conjunction with the broader SPFC facilities. Major non-SPFC facilities that affect the performance of SPFC facilities (or provide flood risk reduction benefits to areas protected by SPFC levees) include levees that are not part of the federal projects, modifications and alterations to SPFC levees that have not been state-authorized, debris management facilities (e.g., Yuba Goldfields), and most of the reservoirs in the Central Valley (California Department of Water Resources 2017a:1-33).

Overall, the riverine system and channels in the Central Valley have been heavily modified and have limited capacity due to early reclamation in the twentieth century (California Department of Water Resources 2010:5-2).

3.9.1.3 Flood Management Facilities in the Delta

Land uses in the Delta are primarily rural and are dominated by agriculture and open space, with several dispersed small communities, although larger population centers (i.e., Sacramento, West Sacramento, and Stockton) exist as well. Flood management facilities within the Delta primarily include levees, which often protect lands at or below sea level. Flood management in the Delta is mainly provided via reclamation districts and local flood control agencies. Flood management responsibilities in Delta areas outside areas protected by SPFC facilities are managed by a variety of local agencies, which are supported by the state's Delta Special Flood Projects Program and Delta Levees Maintenance Subventions Program (California Department of Water Resources 2012a:3-24). In addition to flood protection, Delta levees also benefit habitats and ecosystems, and offer significant recreational opportunities (Delta Stewardship Council 2020:21).

About 380 miles of the total 1,100 miles of levees in the Delta are SPFC levees (Delta Stewardship Council 2017:1). SPFC levees are subject to federal levee standards and, where applicable, to DWR's *Urban Levee Design Criteria,* which requires a 200-year level of flood protection (California Department of Water Resources 2012b:7-1–7-50); they are also under CVFPB jurisdiction. SPFC levees in the northern Delta are part of the SRFCP and partially protect urban centers (i.e., 200-year level of flood protection)—such as Sacramento and West Sacramento—and smaller, unincorporated Delta towns (i.e., 100-year level of flood protection)—such as Clarksburg, Hood, and Courtland (California Department of Water Resources 2017b:3-3). Figure 7-2 in Chapter 7, *Flood Protection*, of the Delta Conveyance Project Draft EIR distinguishes between the urban and nonurban levees in the northern Delta (California Department of Water Resources 2022a). In the southern Delta, the Lower San Joaquin River Flood Control Project is also part of SPFC facilities and includes levees that protect, or partially protect urban or urbanizing communities such as Stockton, Lathrop, and Manteca (U.S. Army Corps of Engineers 1999; California Department of Water Resources 2010:2-3). The SRFCP and Lower San Joaquin River Flood Control Project also protect certain islands within the Delta, such as Sherman Island, Jones Tract, Upper Roberts Island, Middle Roberts Island, and Lower Roberts Island.

Most of the levees in the Delta (i.e., 720 of 1,110 miles of levees) are local nonproject levees (Delta Stewardship Council 2017:7-1). California Water Code Section 12980(e) defines these local levees in the Delta as a "nonproject levee" in contrast to a "project levee"—which is defined in Water Code Section 12980(f), and referred to as SPFC levees in the Delta.

For consistency and clarity in this section, nonproject levees are referred to as non-SPFC levees. Non-SPFC levees are maintained by landowners or local reclamation districts, and are generally built to local hazard management plans and accepted by Federal Emergency Management Agency (FEMA), including geometric standards (U.S. Army Corps of Engineers 1988:2). FEMA standards could be less stringent than SPFC levee standards. However, costs for improvement and frequent maintenance of non-SPFC levees can be beyond the financial capacity of property owners and local reclamation districts. The estimated state-subsidized expenditures to maintain non-SPFC Delta levees, including local matching funds, averages about $11.6 million annually (Delta Stewardship Council 2020:25).

3.9.1.4 Levee Standards and Compliance

Levees are an important element of flood protection; however, levees are not constructed to withstand all hydrologic conditions. Levees are designed to accommodate specific design channel capacities or WSE profiles. Therefore, levee performance could have a strong correlation to channel performance (i.e., channel capacity). Over the last few decades, state and federal agencies have developed guidelines, standards, and permitting requirements for levees. These standards and guidelines generally establish minimum criteria for levee design and maintenance. Levee geometry standards and requirements in the Delta vary based on SPFC versus non-SPFC levees, and for urban versus nonurban levees. In addition, California state law also requires additional protection to urban areas to a 200-year level of flood protection, and the applicant has developed additional criteria for urban levees. Urban and nonurban levees are those that provide flood risk reduction benefits to a population greater, or less than 10,000, respectively (Government Code § 65007(l)).

3.9.1.5 Seismic Activity

The Delta's levees are threatened by the active seismic zones west of the Delta, including the San Andreas and Hayward Faults. Less active faults, such as the Southern Midland Fault, underlie the Delta. A strong earthquake could damage Delta levees because of the potential for deformation or cracking of levees or the liquefaction of levee embankments and foundations during strong ground shaking. Moderate earthquakes between 1979 and 1984 damaged nearby Delta levees, and many Delta islands' levees failed during floods within a year after the 1906 San Francisco earthquake (Delta Stewardship Council 2020:7). If a levee were to fail on an island with land below sea level or during high flows, or if a flood were to occur soon after an earthquake, the protected area could be inundated.

3.9.1.6 Land Subsidence

Delta island subsidence resulting from the biochemical oxidation of organic soils and wind disturbance could pose a significant threat to Delta levees. The areas that are most susceptible to subsidence are the central, western, and northern Delta, where thick organic peat layers predominate (Public Policy Institute of California 2008:9). As the landside ground elevation decreases because of subsidence, the resulting increase in elevation difference between the water surface and ground provides increased hydraulic loading on the levee and its foundation, and associated risks related to seepage, piping, and slope instability. Recently, projects have been implemented in the western Delta for subsidence reversal, carbon sequestration, or both (California Department of Water Resources 2022b).

3.9.1.7 Sunny-Day Hazards

Even without an earthquake or flood, sunny-day levee failures do occasionally occur in the Delta. Generally, these failures may be the result of a combination of preexisting internal levee and foundation weaknesses caused by internal erosion of the levee and foundation over time and human interventions such as dredging or excavation at the toe of the levee (Delta Stewardship Council 2020:8). Internal erosion is often a result of seepage through the levee, which creates water pressure within the levee structure and is characterized through the formation of sand boils. Structural instability may also occur when seepage forces cause sloughing of the levee landside slope, shortening seepage paths that increase the probability of levee failure.

Other hazards that affect the performance of Delta levees include burrowing animals, encroachments, and penetrations. Burrowing animals, especially species such as beavers, ground squirrels, and owls, can weaken the structural integrity of a levee and increase the likelihood of piping. Encroachments, such as structures or farming practices on or close to the levee, can adversely affect a levee if they are not constructed or maintained in accordance with the requirements of federal, state, and local agencies. Penetrations of the levee, such as culverts or pipelines, can weaken the structural integrity of levees and lead to levee instability if the waterside opening does not have an appropriate closure device that seals the opening and prevents excessive seepage. Because of unregulated historical construction, levees also contain many hidden hazards. Interaction among the factors listed above is also common and increases the probability of levee failure.

3.9.1.8 High Water Conditions

The same hazards present during sunny-day conditions are exacerbated during high water events (e.g., winter atmospheric river storms), which are expected to increase in number and frequency under climate change conditions (Delta Stewardship Council 2020:3-17). Moreover, water levels in the Delta are influenced by the tide level at the Golden Gate Bridge. When these storms coincide with extreme winter tides (i.e., king tides), storm surges and high wind waves can cause levee failure (Maendly 2018:12–13, 46). Increased seepage is also common during these events. As sea levels rise in the future, tides and water levels will increase hydraulic stress on the levees and increase flood risk in the Delta.

3.9.1.9 Potential Climate Change Effects

Climate change has major implications for the Delta, and especially for flood risk management. The California Ocean Protection Council's (OPC) most conservative, risk-averse climate change scenario (H++) estimates 10.2 feet of sea level rise at the San Francisco tide gage by the year 2100. By 2050, rising sea levels will more than double the probability of flooding if levees are not only well-maintained, but also improved (Delta Stewardship Council 2020:10). Drainage of Delta islands will also be more difficult, impairing agriculture on which the finances of many reclamation districts rely. This projected sea level rise could be expected to be exacerbated during high water events, which are discussed in Section 3.9.1.8, *High Water Conditions*.

3.9.2 Environmental Consequences

This section describes the assessment methods used to evaluate the direct, indirect, and cumulative flood protection-related effects within the study area for the action alternatives, as well as the No Action Alternative. These effects would be associated with construction, operation, and maintenance of the action alternatives, and implementation of the compensatory mitigation.

3.9.2.1 Methods for Analysis

This section describes the qualitative and quantitative methods used to evaluate flood protection-related effects of the action alternatives within the study area. These effects would be associated with construction, operation, and maintenance of the project, and implementation of the compensatory mitigation.

Process and Methods of Review for Flood Protection

The action alternatives do not include any changes in rules and regulations for flood control operations. Flood control operations and associated rules are under the jurisdiction of USACE. Therefore, the operations of action alternatives would have no effects on flood protection upstream of the Delta, and the resulting level of flood protection for adjacent lands under the action alternatives would remain unchanged from the No Action Alternative. Since the project would not affect the Sacramento River upstream of the Delta or the San Joaquin River Basin outside of the Delta, the study area associated with flood protection focuses on the specific areas in the Delta that may be affected by project facilities—including the intakes, launch/maintenance/reception shafts, and Southern Forebay (although the Southern Forebay is included in Alternatives 1, 2b, 3, and 4b only).

Effects on flood protection were assessed by identifying flood risks within the study area to evaluate whether flood protection would be affected temporarily by construction or by operations of permanent project facilities.

Many major components of project construction and facilities are underground. The assessment for potential flood protection effects from construction and operations of permanent facilities were for aboveground facilities only. Specifically, the assessment for flood protection effects associated with the action alternatives examined: (1) changes that may increase flooding or flood risk in the Delta, and (2) changes to the potential rate or amount of runoff that may impede or redirect localized flood flows. However, these two areas of review require different settings to accommodate the different regulatory frameworks associated with applicable flood management practices. The following subsections summarize these two areas of effects assessments, including the reasons for selecting the associated existing conditions and No Action Alternative and the resulting effects on flood management.

Process and Method of Review for Potential Increase in Delta Flood Risks

There are many contributing factors to Delta risks of flooding that will continue to play a role. All action alternatives are for water supply purposes and include no changes in flood management infrastructure in the Sacramento River Basin and the Delta, including the reservoirs of the SRFCP and Central Valley Project (CVP), and associated flood operation rules and management. Therefore, changes from action alternatives that may increase flooding or flood risk in the Delta are related to the construction and operation of the intakes on the Sacramento River, which is often the primary source of flood flow from upstream watersheds.

The intakes located along the Sacramento River where SPFC levees are present may affect the drainage of the Sacramento River flow during flooding conditions. Therefore, consistency with regulatory requirements for SPFC levees and CVFPB's jurisdiction would be followed, including the consistency with the CVFPP. The CVFPP, prepared by DWR in accordance with the Central Valley Flood Protection Act of 2008 and adopted by CVFPB, is California's strategic blueprint to improve flood risk management in the Central Valley, and guides the state's participation in managing flood risk in areas protected by the SPFC. The CVFPP is updated every 5 years and thus, for this Draft EIS, tools and methods consistent with those used for the *2022 CVFPP Update* were used for evaluating the potential effects on the SPFC facilities and their resulting flood protection (California Department of Water Resources 2022b).

The *2022 CVFPP Update* has a 50-year planning horizon that begins in 2022 for analysis purposes and for developing assessment strategy (California Department of Water Resources 2022b). For consistency with the governing regulatory framework, the analysis for potential flood control effects on the area protected by the SPFC should be conducted using a similar planning horizon. In other words, the portion of the effects analyses that evaluate areas protected by the SPFC uses the years 2022 and 2072 as reference years for existing conditions and the No Action Alternative, respectively. Additional detail on the data and analytical tools used to assess the effects of the action alternatives on flood control is provided within the effects assessments below.

In addition to the increase in WSEs, effects on the localized velocity pattern changes near the intakes and the resulting erosion and scouring could also affect the SPFC levee stability. The final design of the action alternatives would include detailed evaluation and measures to minimize these effects.

Process and Method of Review for Impeding or Redirecting Localized Flood Flow

Many other facilities of the action alternatives are in the flood hazard zone and thus, it is necessary to evaluate the potential effects from these facilities on impeding or redirecting localized flood flow.

The action alternatives include design criteria to protect the facilities during flooding. As described in Chapter 2, *Project Description and Alternatives*, and detailed in the *Delta Conveyance Final Draft Engineering Project Reports* (EPRs) (Delta Conveyance Design and Construction Authority 2022b:16, 18, 39, 47, 54, 66; 2022c:29, 42, 45-46), permanent project facilities would be designed for long-term operations, and to be protected from a 200-year flood event (i.e., 0.5% annual exceedance probability) with climate change–induced hydrology, sea level rise for 2100 conditions, freeboard criteria, and wind fetch wave run-up. These design criteria are not related to effects on adjacent areas; however, the incorporated protection would prevent potential inundation of water conveyance structure and avoid redirected effects.

The overall approach to flood management associated with facility construction and permanent operations includes a combination of nonstructural and structural flood risk management measures to reduce the risk of flooding during construction and operations, including at tunnel shafts. In this context, nonstructural measures could involve staging of temporary facilities or equipment, but such facilities or equipment would not significantly affect the construction footprint or on-site activities. Nonstructural measures would involve fully integrating the project construction team with existing Delta flood preparation, response, and recovery systems using methods that range from safety training to safety kits for sheltering in place, especially in the case of a levee failure (Delta Conveyance Design and Construction Authority 2022a:8-10). This would occur in coordination with reclamation districts, levee maintaining agencies, and state and federal agencies with direct responsibilities, authorities, or emergency support roles over Delta levees, including USACE, FEMA, Reclamation, Office of Emergency Services (CalOES), DWR, and CVFPB. During construction, measures to minimize effects on existing levees would be implemented, including avoiding or minimizing the use of existing levees as construction haul routes for the project and setbacks of project activities from existing levees that are to be determined during the design phase based on site-specific investigation and analyses.

Most construction sites contain local irrigation and drainage facilities installed by existing or previous private landowners or reclamation districts. These systems may serve parcels that would be acquired for the project and adjacent parcels. Many of these existing facilities are buried and therefore not visible on aerial photographs. Consequently, for project feature locations without site access, no further analyses can be conducted at this time. During the design phase, when the project can acquire access to specific parcels, irrigation and drainage facilities would be mapped for each site. If the facilities used by adjacent properties to move water from the existing diversion are located on a parcel to be used for a project feature, pipelines or canals would be installed to maintain service to the adjacent properties.

The intakes and associated facilities would be located in the 100-year floodplain within DWR Maintenance Area 9, Reclamation District 744, and Reclamation District 813. The temporary and permanent infrastructure would affect the flow pattern and drainage of local floodwater, which would drain to Stone Lakes Canal during flooding conditions. The action alternatives would redesign the local drainage canals that are affected and would potentially upgrade the existing pumps to maintain adequate drainage in the areas protected by levees. Therefore, no further analyses are required for effects assessment.

Structural measures for flood management and facility protection may rely on existing levees that would be improved to meet Public Law (PL) 84-99 standards unless the surrounding levees already meet PL 84-99 standards. Given the long duration of work at the Bouldin Island (central alignment) and Lower Roberts Island (eastern and Bethany Reservoir alignments) tunnel launch sites, improvements of the island perimeter levee to meet PL 84-99 geometric standards, as well as addressing any known geotechnical weaknesses, are warranted to limit long-term flood risk. The extent and types of recommended levee repairs would be refined prior to construction and in coordination with the local reclamation districts. This approach would present an improvement to existing conditions. Therefore, no additional evaluation is required. The Twin Cities Complex is one exception to this approach. A ring levee configured in compliance with PL 84-99 standards would be used for the Twin Cities Complex since it is not fully protected by perimeter levees. Therefore, a site-specific evaluation of potential effects from the proposed facilities on flood flows in the 100-year floodplain is required using a methodology consistent with that for FEMA Flood Insurance Rate Maps.

The Southern Forebay facilities would be designed in accordance with the DWR Division of Safety of Dams (DSOD) requirements for jurisdictional dams based on the anticipated maximum height and storage volume. The levees on Byron Tract around the Southern Forebay are maintained by Reclamation District 800 and have met PL 84-99 standards. Therefore, there will be no need for improvements to the surrounding levees or a ring levee. However, as part of the design requirements for DSOD-jurisdiction dams, an overflow emergency spillway would be used in the unlikely condition that the forebay water level continued to rise above the design maximum elevation. The emergency spillway would discharge flow from the Southern Forebay into Italian Slough and then Old River during rare emergency conditions when the control of inflow from the Sacramento River to the Southern Forebay is compromised. The evaluation of effects on flood protection focuses on the flow path of the emergency release per DSOD requirements and potential effects on adjacent levees and associated protected areas.

Consistent with the evaluation of potential effects on other resources, most of the qualitative and quantitative analyses discussed in this section assess the significance of project effects in relation to No Action Alternative. The No Action Alternative includes reasonably foreseeable changes in existing conditions (e.g., sea level rise, climate change) and changes that could be expected to occur in the year 2040 if the project were not approved. The No Action Alternative is also compared to existing conditions, which includes existing facilities and ongoing programs that existed as of January 15, 2020 (i.e., the publication date of the Notice of Preparation).

Unique to this chapter, existing conditions and the No Action Alternative require an additional planning horizon that is different from the conditions (i.e., 2020 and 2040) previously discussed. This is done to better align with applicable flood management frameworks, in particular, the *2022 CVFPP Update*, which is the long-term plan for the area protected by the SPFC (California Department of Water Resources 2022b). The *2022 CVFPP Update* has a 50-year planning horizon that begins in 2022 for analysis purposes and for developing assessment strategy. Therefore, the analysis for potential flood control effects on the area protected by the SPFC should be conducted using a similar planning horizon. To maintain consistency with the planning horizon used in the *2022 CVFPP Update*, effects analyses that evaluate areas protected by the SPFC use the years 2022 and 2072 as reference years for existing conditions and future conditions, respectively.

For potential flood protection effects on areas that do not receive protection from the SPFC (i.e., Impact FP-2), the year 2020 was used for existing conditions while the year 2040 was used for future conditions—consistent with the evaluation of other resource sections in this Draft EIS. For potential flood protection effects on areas that do receive protection from the SPFC (i.e., Impact FP-1), the year 2022 was used for existing conditions while the year 2072 was used for future conditions—consistent with available flood tools and other planning efforts associated with the *2022 CVFPP Update* (California Department of Water Resources 2022b). Table 3.9-1 includes a comparison of the reference years used for the existing and future conditions associated with each effects analysis in this chapter.

Where appropriate, different permitting requirements for construction and operations of action alternatives were utilized to ensure compliance with flood protection regulations, which in some cases required customized analyses.

Table 3.9-1. Comparison of Reference Years Used for Flood Protection Impact Analyses

Impact	Existing Conditions	Future Conditions	Notes
Impact FP-1: Cause a Substantial Increase in Water Surface Elevations of the Sacramento River between the American River Confluence and Sutter Slough	2022	2072	Consistent with the planning horizon used in the *2022 CVFPP Update*
Impact FP-2: Alter the Existing Drainage Pattern of the Site or Area, including through the Alteration of the Course of a Stream or River, or Substantially Increase the Rate or Amount of Surface Runoff in a Manner That Would Result in Flooding On- or Off-Site or Impede or Redirect Flood Flows	2020	2040	Consistent with all other resource effects assessments in the EIS

Note: For potential flood protection effects on areas that receive protection from the SPFC in the study area (i.e., Impact FP-1), reference years were selected to maintain consistency with the planning horizon used in the *2022 CVFPP Update*. For potential flood protection effects on areas that do not receive protection from the SPFC in the study area (i.e., Impact FP-2), reference years were selected to maintain consistency with all other resource assessments in the Draft EIS.

Assessing Potential Flood Protection Effects from Construction

Construction of the action alternatives could affect: (1) WSEs of the Sacramento River between the confluence of the American River and Sutter Slough (near the proposed north Delta intakes), and (2) the depth and areal extent of the 100-year flood event at the Twin Cities Complex site.

The Southern Forebay is located on Byron Tract, an area that is already protected by levees that substantially meet the PL 84-99 criteria. Therefore, no further analysis on construction effects on flood protection at Byron Tract was conducted

North Delta Intakes on Sacramento River (Impact FP-1)

To evaluate the potential effects from construction of the proposed north Delta intakes on the drainage of Sacramento River flows during flood conditions, a Sacramento River hydraulic river model was prepared and used to evaluate river reaches in the Sacramento River between the American River confluence and Sutter Slough, where WSEs could potentially be affected by construction of the proposed north Delta intakes as part of the action alternatives. The upstream boundary (i.e., the confluence of the Sacramento River and American River) was selected due to its relevance as a major control point for flood management; moreover, there was no indication of additional upstream effects on WSEs beyond this upstream boundary. The downstream boundary (i.e., Sutter Slough) was selected because Sutter Slough is sufficiently downstream from the proposed north Delta intakes, and there are no significant inflows or flow splits between the American River confluence and Sutter Slough. The use of this reach for effects assessment was supported by modeled results.

The areas adjacent to this reach of the Sacramento River are protected by SPFC levees and thus are under USACE's, DWR's, and CVFPB's jurisdictions. Therefore, the best available information, tools, and evaluation methods used for project effects assessment are consistent with those for the *2022 CVFPP Update* (California Department of Water Resources 2022b). The Sacramento River hydraulic river model used for project effects analysis was extracted from the full Sacramento River system model developed by the applicant for use in the preparation of the *2022 CVFPP Update*. This 1-D model used for the *2022 CVFPP Update* was enhanced to a full 2-D steady-state Sacramento River system Hydrologic Engineering Center River Analysis System (HEC-RAS) model using new bathymetry data and light detection and ranging topography collected by the applicant in 2018 and 2019 (Delta Conveyance Design and Construction Authority 2022d:3, 8–9). CVFPB provided the flood hydrology from the *2022 CVFPP Update* for use in this assessment. These profiles are similar to the flood profiles used in the *2017 CVFPP Update*, based on 1997 flood hydrology with a scaling factor, but include more conservative estimates for climate-change-induced hydrology and sea level rise.

The effects assessment used model assumptions and data that are consistent with the *2022 CVFPP Update*. This includes the use of existing conditions and future conditions considered in the *2022 CVFPP Update*. The planning horizon for the CVFPP is 50 years; therefore, for the *2022 CVFPP Update*, existing conditions are set in 2022 and future conditions in 2072. Although different from the existing (i.e., 2020) and future conditions (i.e., 2040) used for the other analysis in this section (i.e., Impact FP-2) and the other resource sections in the Draft EIS, the use of CVFPP existing conditions in 2022 and future conditions in 2072 are considered important to stay consistent with governing regulatory frameworks, and the use of best available tools and information for environmental review purposes. Because project construction would be complete by 2072, construction effects were evaluated for existing (i.e., 2022) but not future conditions (i.e., 2072); however, it is assumed that construction effects would be similar under both existing and future conditions. When evaluating the potential effects on WSEs of the Sacramento River from construction, the action alternatives (under 2022 conditions) were compared to existing conditions. The No Action Alternative analysis for this effects assesses WSE effects in the Sacramento River under 2072 conditions relative to existing conditions (i.e., 2022).

As previously mentioned, the modeled reach of the Sacramento River includes urban levees extending south from the American River confluence to around the town of Freeport that are for protecting Sacramento urban areas; these areas are subject to Urban Level of Flood Protection (i.e., 200-year level of flood protection). Within the modeled reach, the remaining levees downstream of the town of Freeport are considered rural or nonurban levees that are not subject to the Urban Level of Flood Protection. Therefore, for completeness of the construction assessment for each action alternative, it is necessary to evaluate the effects on WSEs of the Sacramento River for 100- and 200-year flood events under existing conditions (i.e., 2022). Figure 7-2 in Chapter 7, *Flood Protection*, of the Delta Conveyance Project Draft EIR includes a map of the urban and nonurban levees along the Sacramento River between the American River confluence and Sutter Slough (California Department of Water Resources 2022a).

For evaluating effects from construction of the action alternatives, the construction footprint—including cofferdams—was evaluated in the Sacramento River hydraulic river model. All WSE differences, except the No Action Alternative analysis, were calculated based on the model differences between the flood event run with and without project facilities in place. The maximum WSE differences in the reach of the Sacramento River from the American River confluence to Sutter Slough for both the 100-year and 200-year flood events were used for comparative purposes. Alternatives 1, 3, and DWR's Preferred Alternative were specifically modeled using the Sacramento River hydraulic river model to evaluate the effects from construction of the intakes on WSEs of the Sacramento River. Alternatives 2b and 4b, with their smaller capacities (3,000 cfs) and smaller footprints, were not modeled because the resulting WSE increases would be similar to or less than the corresponding alternative of the same alignment but larger capacity. After an action alternative is selected, and in consideration of any changes made to the intake configuration during design, the modeling would be reconducted to support project permitting and final design. More detailed hydraulic evaluations concerning hydraulic loading, scour, and erosion forces at the interface between the intake structures and the river terrain as a result of increased WSEs would be done as part of the final project design for construction phase and for operation phase with final installed facilities. During these evaluations, the specific size and extent of slope protection would be verified and revised, if needed. A more detailed description of the modeling tool and analysis are included in the Sacramento River Flood Flow Hydraulic Modeling Technical Memorandum in Attachment A of the C-E EPR (Delta Conveyance Design and Construction Authority 2022d).

The assessment for potential flood protection effects from construction was also evaluated using flood flows consistent with those used to develop the 1957 USACE Sacramento River Project Levee design profiles. These design profiles were the basis of the levee design when the SRFCP was constructed and represent the anticipated level of performance in terms of channel flow carrying capacity and the conditions for operations and maintenance for flood control facilities, including levees and channels that the State of California provided assurance for. CVFPB is the nonfederal sponsor for the SRFCP. Therefore, this assessment is important to USACE and CVFPB for permitting purposes related to 33 United States Code (USC) Section 408 (Section 408), which ensures project construction and operation would not impede the continued functions of the levees and channels as they were originally designed (U.S. Army Corps of Engineers 2018:B-1).

It is important to use the same design flow conditions (1957 Design Flow) used in the original SRFCP design to allow adequate comparison of resulting WSE against the 1957 design profile. The design flow capacity through Sacramento River reach near the north Delta intakes is 110,000 cfs. This design flow and WSE profile was adapted from the SRFCP levee and channel profiles dated March 1957 (U.S. Army Corps of Engineers 1957). This design flood hydrology does not represent any specific level of current or future flood protection, and, similarly, the 1957 design profile does not correspond to WSEs for flood events of any specific return period based on the current flood hydrology.

Additional analyses for velocity near intakes and potential risks of erosion and scouring would be performed for the final design to meet permit requirements.

Twin Cities Complex (Impact FP-2)

The Twin Cities Complex site would be located on the Glanville Tract in the Mokelumne River watershed just north of the confluence of the Cosumnes River. Due to the unregulated Cosumnes River, limited Mokelumne River channel conveyance, and downstream tidal conditions, the area around the Twin Cities Complex site has a history of flooding. The potential effects on flood extents and depths in the area surrounding the Twin Cities Complex site that could result from the construction footprint were evaluated using the north Delta hydraulic model.

The north Delta hydraulic model was first created for Sacramento County and was later applied by the applicant in the McCormack-Williamson Tract Project (Delta Conveyance Design and Construction Authority 2022a:Att 3-3). This coupled 1-D/2-D HEC-RAS model incorporates topographic and bathymetric data collected by the applicant between 2007 and 2016 and was applied to evaluate the effects of the construction footprint around the Twin Cities Complex site on the 1% annual exceedance probability for flood (Delta Conveyance Design and Construction Authority 2022a:Att 3-2).

The north Delta hydraulic model was used for this evaluation because the model was calibrated to historical flood event gage data and high-water marks for floods at this location while applied to project evaluation for the McCormack-Williamson Tract Project, which is part of the DWR's North Delta Flood Control and Ecosystem Restoration Project for floodplain restoration and flood peak reduction. When the McCormack-Williamson Tract Project is completed, the potential flood depth near the Twin Cities Complex site is expected to be lower than the existing conditions. However, the completion date for the McCormack-Williamson Tract Project is not known at this time, so analysis was conducted assuming there was no such project, which results in a conservative evaluation.

The potential effects from construction of the action alternatives at the Twin Cities Complex were evaluated by examining the effects of the construction footprint that includes a ring levee surrounding all facilities during construction. The ring levee height was designed based on a FEMA 100-year flood depth outside of Glanville Tract within the adjacent floodway, so several feet of freeboard are available for the current analysis. Construction effects were evaluated for existing conditions (i.e., 2020 conditions) but not future conditions (i.e., 2040 conditions). A more detailed description of the flood effects analysis for the Twin Cities Complex site can be found in the Flood Risk Management Technical Memorandum in Attachment H of the C-E EPR and Levee Vulnerability Assessment and Flood Risk Management Supplement—Bethany Reservoir Alternative Technical Memorandum in the Bethany EPR (Delta Conveyance Design and Construction Authority 2022a, 2022e).

Indicators for Potential Effects

The potential effects from project construction were evaluated based on a comparison between existing conditions and the action alternatives and the:

- Changes in the resulting WSEs of the Sacramento River between the confluence of the American River and Sutter Slough (Impact FP-1). The increase in WSEs in the Sacramento River was used as an indicator for potential effects on flood protection for the adjacent urban and nonurban areas. For purposes of this analysis, WSE modeling results that show less than a 0.1-foot increase in WSE would not be considered a substantial increase.
- Changes in the extent of flooding at the proposed north Delta intakes, Southern Complex, tunnel shaft sites, or other project feature (Impact FP-2). The increase in flood depth or area was used as an indicator for potential effects on Delta flood protection.
- Changes in the flood depth and areal extent of the 100-year flood event surrounding the Twin Cities Complex site (Impact FP-2). The increase in flood depth or area was used as an indicator for potential effects on Delta flood protection.

Assessing Potential Flood Protection Effects during Operations Phase

Based on the above process and methods of review, operation of the action alternatives could affect: (1) WSEs of the Sacramento River between the confluence of the American River and Sutter Slough (near the proposed north Delta intakes); (2) the depth and areal extent of the 100-year flood event at the Twin Cities Complex site; and (3) a channel (i.e., Italian Slough) and adjacent areas located downstream of the Southern Forebay Emergency Spillway. The first effect is related to the placement of north Delta intakes along the Sacramento River with SPFC levees and, therefore, the data, tools, and analyses would be consistent with the *2022 CVFPP Update*. The other two are related to impeding or redirecting localized flood flow by permanent project facilities and, thus, FEMA National Flood Insurance Program methodology is followed. The following provides location-specific analyses.

North Delta Intakes on Sacramento River (Impact FP-1)

The tools and methods for evaluating potential effects on WSEs of the Sacramento River between the American River confluence and Sutter Slough during operation of the action alternatives are generally the same as those for evaluating potential effects from construction of the proposed north Delta intakes. Therefore, the reasons and choices of tools, data, and methods are not repeated herein. One difference is that the operations analysis evaluates permanent intake infrastructure—including the intake training walls, cylindrical tee screen structure, and log boom. WSE differences are due to the permanent footprint of the intake facilities and are not directly related to diversions at the proposed north Delta intakes; modeling was completed without diversions occurring to provide a more conservative estimate of potential effects. Unlike the evaluation of potential effects from construction of the proposed north Delta intakes, the effects during operations were evaluated for future conditions (i.e., 2072 conditions) with climate change, including corresponding hydrologic change and sea level rise. When evaluating the potential effects on WSEs of the Sacramento River from operations, the action alternatives (under 2072 conditions) were compared to the No Action Alternative (i.e., 2072 conditions).

While no current guidance exists for use of specific climate scenarios under NEPA, per OPC, the H++ scenario, or extreme risk aversion scenario, is recommended and relevant for high-stakes, long-term decisions and for projects with a lifespan beyond 2050 that have a low risk tolerance. The 2072 conditions for the *2022 CVFPP Update* include climate change conditions, reflected in hydrology and sea level rise, that are consistent with those used for the Draft EIS's 2040 conditions for the No Action Alternative—although further in the future and with more pronounced effects. For example, the H++ sea level rise projection in 2040 is 1.8 feet, while the sea level rise projection in 2072 used by *2022 CVFPP Update* is 3.7 feet. This is considered more conservative for project effects assessment. A more detailed description of the climate change and sea level rise projections for this Draft EIS can be found in the *2022 CVFPP Update* (California Department of Water Resources 2022b).

The assessment for potential flood protection effects during operations was also evaluated using flood flows consistent with those used to develop the 1957 USACE Sacramento River Project Levee design profiles. As previously mentioned, this analysis is expected to be used by USACE and CVFPB for permitting purposes.

Twin Cities Complex (Impact FP-2)

The tools and methods for evaluating potential effects on local flood flows in the 100-year floodplain during operations of the action alternatives at the Twin Cities Complex site are the same as those described for evaluating potential effects from construction of the permanent facilities at the Twin Cities Complex site for the central, eastern, and Bethany Reservoir alignments. Therefore, the reasons and choices of tools, data, and methods are not repeated herein. The permanent stockpile for the central alignment is smaller than that of the eastern alignment and thus would have less of an effect in increasing flood depth adjacent to the facility during flooding. A more detailed description of the flood effect analysis and hydraulic model scenarios for the Twin Cities Complex site can be found in the Flood Risk Management technical memoranda of the EPRs (Delta Conveyance Design and Construction Authority 2022a, 2022e).

Southern Forebay (Impact FP-2)

The Southern Forebay is located on Byron Tract—an area that is already protected by levees that mostly meet the PL 84-99 criteria. Consequently, the Southern Forebay would not include any facilities within the 100-year flood hazard area and would instead be located in an area that is considered a reduced risk. During the design phase, local irrigation and drainage facilities near the proposed Southern Forebay would be evaluated in detail for potential localized effects from the forebay construction and operation, and associated mitigation needs, if any. If the facilities used by adjacent properties to move water from the existing diversion are located on a parcel to be used for a project feature, pipelines or canals would be installed to maintain service to the adjacent properties.

As previously mentioned, the Southern Forebay would be designed to meet the requirements of DSOD for jurisdictional dams, including an emergency spillway. The hydraulic design of the Southern Forebay Emergency Spillway would be based on controlling events, including rare emergency operation of the system (e.g., if the pumps were on and the downstream gates closed unexpectedly such as could occur with a power outage) or uncontrolled flood flow through the conveyance system (e.g., system intake gates open accompanied by power outage during high river stage leading to uncontrolled gravity flow into the Southern Forebay). These control events are based on facility design and the resulting flow conditions would not change from existing conditions to future.

Uncontrolled gravity flow through the system with the intake gates open would potentially result in a longer event but at lesser flow due to frictional head losses through the system. A qualitative analysis was conducted for the resulting flow path for assessing the potential effects on flood protection. To assess the hydraulic effect of operating the Southern Forebay Emergency Spillway on the existing levee system of Italian Slough and Old River, a 1-D model was developed of the channel and levees using HEC-RAS. The probability of the emergency spillway being operated is very low due to project operations and is assumed to be independent of hydrologic conditions. Nevertheless, two hydrologic conditions were analyzed to estimate a potential range of WSE effects: a 100-year flood event and a mean higher high water event if the emergency spillway was used. The downstream WSE on Old River was assumed to be 10 feet for the 100-year event and 5 feet for the mean higher high water event. A range of operational scenarios were modeled to assess potential effects on the existing levee system during a Southern Forebay spill event. Spillway releases were assumed to be equal to the project pumping capacities of 3,000, 4,500, and 6,000 over a 12-hour period. See the Southern Forebay Emergency Spillway Siting Analysis Technical Memorandum in

Attachment D of the C-E EPR for additional detail on the analysis (Delta Conveyance Design and Construction Authority 2022f).

Indicators for Potential Effects

The potential effects from project operations were evaluated based on a comparison between the No Action Alternative and the action alternatives and the:

- Changes in the resulting WSEs of the Sacramento River between the confluence of the American River and Sutter Slough (Impact FP-1). The increase in WSEs in the Sacramento River was used as an indicator for potential effects on flood protection for the adjacent urban and nonurban areas. For purposes of this analysis, WSE modeling results that show less than a 0.1-foot increase in WSE would not be considered a substantial increase.
- Changes in the depth and areal extent of the 100-year flood event surrounding the Twin Cities Complex site (Impact FP-2). The increase in flood depth or area was used as an indicator for potential effects on Delta flood protection.
- Increases in risk of flooding by emergency release through the Southern Forebay Emergency Spillway (Impact FP-2). The indicator is based on evaluation if the emergency releases could affect levees and associated protected area.

No Action Alternative

Under the No Action Alternative, surface water operations would largely continue to function in a manner similar to existing conditions. The applicant would continue to operate the State Water Project (SWP) to divert, store, and convey SWP water consistent with applicable laws and contractual obligations. Similarly, current operations of the CVP would be maintained. The No Action Alternative considers projects, plans, and programs that would be reasonably expected to occur in the foreseeable future if the project were not approved and the purpose and need were not met.

Predictable Water Supply-Related Actions by Public Water Agencies

Public water agencies participating in the Delta Conveyance Project have been grouped into four geographic regions: northern coastal, northern inland, southern coastal, and southern inland. These regions are further defined in Appendix 3C, *Defining Existing Conditions, No Project Alternative, and Cumulative Impact Conditions*, of the Delta Conveyance Project Draft EIR (California Department of Water Resources 2022a). The water agencies within each geographic region would likely pursue a similar suite of water supply projects under the No Action Alternative. Activities associated with the various water supply projects could temporarily alter localized drainage patterns and stream courses, resulting in changes to surface water runoff and elevations, all of which could potentially exceed the capacities of stormwater management facilities. Construction effects are expected to be primarily associated with construction of distribution pipelines; however, construction of these facilities would not be expected to result in substantial changes to drainage patterns or increases in surface water runoff because disturbed areas would generally be returned to pre-project conditions. In addition, distribution pipelines would mostly be below ground and would not affect drainage patterns.

It is expected that water supply facilities would be located in upland areas to the greatest extent possible and would not be situated within flood inundation zones so as not to alter existing drainage patterns. Operational activities typically include inspection, monitoring, testing, maintenance, and facility operations. These activities are not expected to affect the ability of river, stream, or drainage channels to safely pass high flow events; expose people or structures to a significant risk of loss, injury, or death involving flooding; or result in substantial changes in the rate or amount of runoff or impede or redirect flood flows. Operation and maintenance activities for the water supply projects are not expected to require substantial or sustained discharge of water to existing waterbodies. Operation of desalination plants includes discharge of brine and distribution of product water. Discharge of brine is typically accomplished through isolated discharge pipes to the ocean or into injection wells and would not increase flows in rivers, streams, or drainage channels.

Table 3.9-2 provides examples of how flood risk could be affected by water supply–reliability projects in the four geographic regions.

Table 3.9-2. Examples of Effects on Flood Risk from Construction and Operation of Projects in Lieu of the Proposed Project in the No Action Alternative

Project Type	Potential Flood Risk Effects	Region(s) in Which Effects Would Likely Occur [a]
Desalination	Construction of distribution pipelines could result in temporary changes in localized drainage patterns that could change surface runoff and affect stormwater facilities	Northern coastal, southern coastal
Groundwater management and recovery	Construction of distribution pipelines could result in temporary changes in localized drainage patterns that could change surface runoff and affect stormwater facilities.	Northern coastal, northern inland, southern coastal, southern inland
Water recycling	Construction of distribution pipelines could result in temporary changes in localized drainage patterns that could change surface runoff and affect stormwater facilities.	Northern coastal, northern inland, southern coastal, southern inland
Water use efficiency measures	Minor changes in localized drainage patterns that could change surface runoff and affect stormwater facilities.	Northern coastal, northern inland, southern coastal, southern inland

[a] See Chapter 2, *Project Description and Alternatives*, Section 2.5, *No Action Alternative*, for a complete definition of the geographic regions.

Future Conditions of Flood Protection in the Delta

The high variability of precipitation makes it difficult to make future projections and is one of the least certain aspects of climate models, especially when applied at the regional level because climate models do not resolve many of the fine-scale and complex interactions that occur locally (Delta Stewardship Council 2021:3-13). Uncertainty regarding precipitation projections is greatest in the northern part of California, where most of the snowfall and rainfall in the state occurs. However, climate models do project precipitation to change under warming conditions, resulting in more frequent rainfall events and less frequent snowfall events (He et al. 2019:11). Warming air temperatures are expected to shift the timing and volume of snowmelt in the Sierra Nevada to earlier in the spring as well. Changing precipitation patterns and an earlier snowmelt would lead to shorter, more intense spring periods of river flow and freshwater discharge, consequently affecting inflows into the Delta.

Future surface water conditions are expected to change considerably when compared to existing conditions due to sea level rise and a shift in hydrologic patterns as a result of climate change. Within the study area, sea level rise conditions under the No Action Alternative could be expected to increase the duration of high-water conditions in Delta channels, decrease flood protection, and increase flood risk relative to existing conditions. The trend would be further amplified by changing hydrology and storm patterns under climate change.

Sea level rise and changes in hydrologic patterns in Delta watersheds could be expected to increase peak water levels and flooding in the Delta in the coming decades, exposing additional land to flooding in the future (Delta Stewardship Council 2021:5-6). In some parts of the Delta, the existing freeboard—while effective in reducing current flood risk—will decrease and potentially be exceeded in the future as peak water levels increase in response to climate change (assuming no future improvements in levee crest elevations).

3.9.2.2 Effects and Mitigation

Impact FP-1: Cause a Substantial Increase in Water Surface Elevations of the Sacramento River between the American River Confluence and Sutter Slough

No Action Alternative

The anticipated effects of the No Action Alternative on WSEs in the Sacramento River between the American River confluence and Sutter Slough were evaluated using a Sacramento River hydraulic model that incorporates climate change and sea level rise. These projected changes might have effects on flood protection independent of the proposed project. Under the No Action Alternative, WSEs for the 100-year flood event could increase by a maximum of 0.40 foot (river mile [RM] 45.6; see Figure 7-2 in Chapter 7, *Flood Protection*, of the Delta Conveyance Project Draft EIR for the corresponding location [California Department of Water Resources 2022a]) in the river reaches with urban levees and 0.60 foot (RM 37.0) in the river reaches with nonurban levees when compared to existing conditions (Table 3.9-2). Under the No Action Alternative, WSEs for the 200-year flood event could increase by a maximum of 0.70 feet (RM 45.6) in the urban leveed sections and 0.90 feet (RM 37.0) in the nonurban leveed sections when compared to existing conditions. Under the No Action Alternative, increases in WSEs simulated in the Sacramento River could result in increases in flood risk in the Delta. These potential increases in WSEs are attributed to flood flows (due to changes in hydrology) and more so by sea level rise as a result of climate change because the high-water stage in the Delta channels is mostly influenced by tide and storm surges. Figure 7-2 in Chapter 7 of the Delta Conveyance Project Draft EIR distinguishes between the urban and nonurban levees in the modeled study area (California Department of Water Resources 2022a).

Under the No Action Alternative, existing levee maintenance practices in the Delta are assumed to continue. These practices include continued improvements to overcome subsidence and sea level rise with potentially large costs and unquantified economic and social effects, as the usable areas within Delta islands would continue to reduce (assuming no future improvements in levee crest elevations). Implementation of projects to reverse the trend of subsidence will also continue where opportunities exist. The threat of seismic activities for destructive effects on Delta levees will also persist with possibly increasing chance of occurrence but without specific predictions of when and where.

All Action Alternatives

All action alternatives would have similar effect levels and are discussed together. This effects analysis discusses potential effects on flood protection that could result from the action alternatives when compared to existing conditions and the No Action Alternative. Because the area being evaluated for this impact (i.e., the Sacramento River between the American River confluence and Sutter Slough) receives protection from the SPFC, the planning horizons used in this analysis are consistent with those used in the *2022 CVFPP Update*. When examining construction effects, the action alternatives and existing conditions are evaluated under 2022 conditions; when examining operations effects, the action alternatives and No Action Alternative are evaluated under 2072 conditions. See Table 3.9-1 for a comparison of the planning horizons used for the existing and future conditions associated with each effects analysis in this section.

Project Construction

Intake construction would include on-bank facilities that could encroach into the existing river cross section in the Sacramento River at the northern end of the Delta and require work on the SPFC levee nearby as described in Chapter 2. During construction, a temporary levee designed to comply with California Code of Regulations Title 23 and Urban Levee Design Criteria would be built at the intake site adjacent to but landward of the existing SPFC levee. This temporary levee would provide an equivalent, or higher, level of flood protection to adjacent properties as the existing SPFC levee and allow the intake facilities to be constructed along the Sacramento River while maintaining continuous flood protection. SR 160 would be relocated on top of the temporary levee. As excavation continues on the intake site, a new permanent SPFC levee would be constructed around the perimeter of the sedimentation basin and intake outlet channel. The new SPFC levee would extend to the existing jurisdictional levee at the north and south ends of the intake structure and would be designed to protect the site and surrounding area to flood control standards that could accommodate a 200-year flood event with sea level rise. This level of protection exceeds the requirements of both USACE and CVFPB. Following construction of the intake structure, SR 160 would be relocated to approximately its original location east of the intake structure near the Sacramento River.

To minimize encroachment of the intake structure into the river flow cross section and minimize the associated effect on flood flow WSEs, the bathymetry and river bank configuration must accommodate construction of the intake structure and associated training walls without extending the intake structure screen face into the river more than about 100 feet (preferable) to 125 feet (maximum); this would limit the rise of maximum WSEs to within the original design profile with minimal effects in accordance with multiple-dimensional modeling results.

Project construction would require temporary in-river cofferdam structures at the proposed north Delta intakes. The cofferdams would enable construction of the intakes and provide a contractor-selected level of construction-phase flood protection within the confines of the cofferdams. The cofferdam would be placed in a configuration to reduce hydraulic effects on the Sacramento River. Temporary measures would be in place during particular construction sequences, such as the cofferdam or the temporary jurisdictional levee, and would be removed either fully or partially after the completion of applicable construction tasks. Partially removed temporary features would not be included as part of permanent SPFC facilities. While there may be minor increases in WSE at the proposed north Delta intakes during construction, any construction would be done to limit the rise in WSEs and therefore avoid a substantial increase.

The potential effects on WSE from the construction of the intake structures (where a cofferdam is used along the riverbank of the Sacramento River) were examined using a hydraulic model covering the Sacramento River between the American River confluence and Sutter Slough. Because project construction would be complete by 2072, effects associated with construction were not evaluated under future conditions. However, it is assumed that construction effects would be similar under both existing (i.e., 2022) and future (i.e., 2072) conditions and are, therefore, discussed below. The proposed north Delta intakes are located in a nonurban leveed section (100-year flood protection) of the Sacramento River, although project construction could affect the urban leveed sections (200-year flood protection) of the river upstream.

The anticipated effects of the action alternatives on WSEs in the Sacramento River between the American River confluence and Sutter Slough were also evaluated using a Sacramento River hydraulic model that incorporates climate change and sea level rise. During construction of Alternatives 1, 3, and DWR's Preferred Alternative, WSEs for the 1957 Design Flow would increase by a maximum of 0.08 foot (RM 45.6) in the river reaches with urban levees and 0.09 foot (RM 40.0) in the river reaches with nonurban levees when compared to the 1957 design profile (Table 3.9-2). During construction of Alternatives 1, 3, and DWR's Preferred Alternative, WSEs for the 100- and 200-year flood events would increase by a maximum of 0.08 foot (RM 45.6) in the urban leveed sections and 0.10 foot (RM 40.0) in the nonurban leveed sections when compared to existing conditions. Alternatives 2b and 4b (3,000 cfs) were not modeled because WSE effects would be similar to, or less than, Alternatives 1 and 3 (6,000 cfs). Figure 7-2 in Chapter 7, *Flood Protection*, of the Delta Conveyance Project Draft EIR distinguishes between the urban and nonurban levees in the modeled study area (California Department of Water Resources 2022a).

All increases in WSEs of the Sacramento River are relatively limited; however, the applicant considered that increases more than 0.1 feet are generally considered substantial as a practice or a rule of thumb for considering flood protection effects. Therefore, construction of the conveyance facilities under Alternatives 1, 2b, 3, 4b, and DWR's Preferred Alternative would not appear to substantially increase WSEs near the intakes.

Postconstruction Effects During Operation

Operation of the action alternatives would experience a smaller increase in WSEs than the temporary increase seen under the construction phase.

The nature of the proposed north Delta intake structures requires placement along the bank of the Sacramento River, with the structure projecting into flowing water. This effectively constricts a portion of the river's conveyance capacity along the respective length of each intake. This in turn may cause a rise in WSE upstream of the intakes. This rise in WSE is dependent on the combination of intakes used to achieve the project needs, the screen type chosen, and phase of construction for each intake. The major features of the intake structures that affect Sacramento River hydraulics are the intake training walls and the structural elements supporting the fish screens that encroach into the river. The structure's protective log boom, debris fender, and pile system could also affect river hydraulics. The debris fender and log boom—provided to protect the fish screen structures from damage by floating and near surface debris—may collect debris periodically, especially after or during storm runoff. Debris would be removed so that it does not impede flood capacity or backwater effect. During flood events, the fish screen structures could be removed from the intakes to further reduce any effect on flood protection.

The potential impact on WSE in the Sacramento River between the American River confluence and Sutter Slough from the operation of the intake structures was examined using the same hydraulic model for assessing effects during construction discussed above. As previously discussed, the potential effect on WSEs during operations of the action alternatives is not directly related to diversions at the proposed north Delta intakes. Instead, the following discussion related to "operational" effects evaluates the effects that are a result of the permanent facility footprint. The proposed north Delta intakes are located in a nonurban leveed section (100-year flood protection) of the Sacramento River, although project operations could affect the urban leveed sections (200-year flood protection) of the river upstream. Figure 7-2 in Chapter 7, *Flood Protection*, of the Delta Conveyance Project Draft EIR includes a map of the urban and nonurban levees along the Sacramento River between the American River confluence and Sutter Slough (California Department of Water Resources 2022a).

The anticipated effects of the action alternatives on WSEs in the Sacramento River between the American River confluence and Sutter Slough were also evaluated using a Sacramento River hydraulic model that incorporates climate change and sea level rise. These projected changes might have effects on flood protection independent of the action alternatives. During operation of Alternatives 1, 3, and DWR's Preferred Alternative, WSEs for the 1957 Design Flow would increase by a maximum of 0.03 foot (RM 45.6) in the river reaches with urban levees and 0.04 foot (RM 40.0) in the river reaches with nonurban levees when compared to the 1957 design profile (Table 3.9-3). Under Alternatives 1, 3, and DWR's Preferred Alternative, WSEs for the 100-year flood event would increase by a maximum of 0.03 foot (RM 45.6) in the river reaches with urban levees and 0.04 foot (RM 40.0) in the reaches with nonurban levees when compared to the No Action Alternative. Under Alternatives 1, 3, and DWR's Preferred Alternative, WSEs for the 200-year flood event would increase by a maximum of 0.04 foot (RM 45.6) in the reaches with urban levees and 0.05 foot (RM 40.0) in the river reaches with nonurban levees when compared to the No Action Alternative. Alternatives 2b and 4b (3,000 cfs) were not modeled because WSE effects would be similar to, or less than, Alternatives 1, 3, and DWR's Preferred Alternative (6,000-cfs capacity alternatives). Figure 7-2 in Chapter 7, *Flood Protection*, of the Delta Conveyance Project Draft EIR distinguishes between the urban and nonurban levees in the modeled study area (California Department of Water Resources 2022a).

Operation of the conveyance facilities under all action alternatives would not appear to substantially increase WSEs of the Sacramento River near the intakes.

Table 3.9-3 Water Surface Elevation Differences for the Action Alternatives at Select Locations in the Sacramento River between the American River Confluence and Sutter Slough

Action Alternatives and Flood Flow Scenario	Urban Leveed Section – Max WSE Difference Relative to the 1957 Design Profile (feet)	Urban Leveed Section – Max WSE Difference Relative to the No Action Alternative (feet)	Urban Leveed Section – Max WSE Difference Relative to Existing Conditions (feet)	River Mile of Greatest WSE Difference in Urban Leveed Section	Nonurban Leveed Section – Max WSE Difference Relative to the 1957 Design Profile (feet)	Nonurban Leveed Section – Max WSE Difference Relative to the No Action Alternative (feet)	Nonurban Leveed Section – Max WSE Difference Relative to Existing Conditions (feet)	River Mile of Greatest WSE Difference in Nonurban Leveed Section
No Action Alternative								
USACE 1957 Design Profile	0			N/A	0			N/A
100-year Flood Event	--	--	0.40	45.6	--	--	0.60	37.0
200-year Flood Event	--	--	0.70	45.6	--	--	0.90	37.0
Construction Phase								
Alternatives 1, 3, and DWR's Preferred Alternative								
USACE 1957 Design Profile	0.08		--	45.6	0.09		--	40.0
100-year Flood Event	--		0.08	45.6	--		0.10	40.0
200-year Flood Event	--		0.08	45.6	--		0.10	40.0
Operation Phase								
Alternatives 1, 3, and DWR's Preferred Alternative								
USACE 1957 Design Profile	0.03			45.6	0.04		--	40.0
100-year Flood Event	--	0.03	--	45.6	--	0.04	--	40.0
200-year Flood Event	--	0.04	--	45.6	--	0.05	--	40.0

Source: Delta Conveyance Design and Construction Authority 2022d

Note: Alternatives 2b and 4b (3,000-cfs capacity alternatives) were not modeled because WSE effects would be similar to, or less than, Alternatives 1, 3, and DWR's Preferred Alternative (6,000-cfs capacity alternatives).

USACE = U.S. Army Corps of Engineers; WSE = water surface elevation.

Although the CMP described in Appendix C3, *Compensatory Mitigation Plan for Special-Status Species and Aquatic Resources,* does not act as mitigation for effects on this resource from project construction or operations, implementation of the CMP could result in effects on flood protection.

Actions undertaken for compensatory mitigation would restore three freshwater ponds along I-5, wetland, open water, and upland natural communities on Bouldin Island, and tidal wetland and channel margin restoration sites within the North Delta Arc. Compensatory mitigation would convert existing agriculture land on Bouldin Island to wetlands, riparian habitat, ponds, and grassland. For the I-5 ponds, it is proposed that the existing grasslands, riparian habitat, wetlands, and ponds would be replaced by improved grassland, wetland, riparian, and open-water habitat. Tidal wetland and channel margin habitat would be restored within the North Delta Arc.

Channel margin enhancements associated with compensatory mitigation actions would likely occur along migration corridors that also provide a certain level of flood protection for adjacent properties. Channel margin restoration would improve channel geometry, similar to what is currently practiced by USACE and other flood management agencies when implementing levee improvements. Channel margin restoration associated with federal project levees would not be implemented on the levee, but rather on benches to the waterward side of such levees, and flood conveyance would be maintained as designed. Channel margin enhancements associated with federal project levees would require permission from USACE in accordance with USACE's authority under the Rivers and Harbors Act (RHA) (33 USC § 408) and levee vegetation policy. Any restoration activities associated with compensatory mitigation would be designed, constructed, and maintained to ensure no reduction in performance of the federal flood project.

The construction and operations of water-conveyance facilities would potentially affect tidal perennial aquatic habitat and alter hydrodynamics at Georgiana Slough for migrating Chinook salmon juveniles and would potentially reduce habitat extent and possibly habitat access for delta smelt spawning. Restoration of tidal wetlands is one approach to mitigate for these effects. Tidal wetland habitat mitigation would generally be achieved at suitable locations by reconnecting former wetland areas to adjacent tidal sloughs and rivers. Restoration would primarily occur through breaching or setback of levees, thereby restoring tidal fluctuation to land parcels currently isolated behind those levees. Where practicable and appropriate, portions of restoration sites would be raised to elevations that would support tidal marsh vegetation following levee breaching.

Depending on the location of tidal wetland restoration, it may be necessary to construct an entirely new flood control levee along portions of the project perimeter to protect adjacent properties. This new flood control levee could affect WSEs in the adjacent waterbody, although the final design would ensure that resulting WSE increase would not be more than 0.1 foot relative to the No Action Alternative. Any restoration activities associated with tidal wetlands would be designed, constructed, and maintained to ensure no reduction in channel performance.

Based on the information presented above, and considering the proposed mitigation measures, the potential for all action alternatives to cause a substantial increase in water surface elevations of the Sacramento River between the American River confluence and Sutter Slough does not appear to be significant.

Impact FP-2: Alter the Existing Drainage Pattern of the Site or Area, including through the Alteration of the Course of a Stream or River, or Substantially Increase the Rate or Amount of Surface Runoff in a Manner That Would Result in Flooding On- or Off-Site or Impede or Redirect Flood Flows

No Action Alternative

The anticipated effects of the No Action Alternative on drainage patterns resulting from construction of approved projects were assessed by reviewing the range of programs and projects in the study area that might have effects on flood protection independent of the proposed project. Construction of projects under consideration in the study area could involve excavation, grading, stockpiling, soil compaction, and dewatering that could result in alterations to runoff, drainage patterns, erosion, stream courses, and surface water elevations during construction of facilities. These activities could result in temporary and long-term changes to drainage patterns, paths, and facilities that would, in turn, cause changes in drainage flow rates, directions, and velocities. Changes in drainage depths would vary depending on the specific conditions at each of the work sites. Because drainage paths could be blocked by construction activities, the temporary ponding of drainage water could occur and result in decreases in drainage flow rates downstream of the new facilities. Moreover, increased runoff due to erosion could occur during construction if the runoff volume exceeds the capacities of local drainages.

Each project has undergone or would likely undergo an environmental compliance process (NEPA and/or CEQA) and, thus, these projects would comply with applicable programs, laws, and regulations related to flood protection.

The anticipated effects of the No Action Alternative on flood protection resulting from construction of approved projects were assessed by reviewing the range of programs and projects in the study area that might have effects on flood protection independent of the proposed project. It is assumed that each project has undergone or would undergo an environmental compliance process (NEPA and/or CEQA) and that that these projects would comply with applicable programs, laws, and regulations related to flood protection. Therefore, the No Action Alternative would not impede or redirect flood flows by placing structures within a special flood hazard area (i.e., areas that are subject to inundation by the 100-year flood). If a project did place structures within a 100-year special flood hazard area, the appropriate mitigation measures would be employed.

All Action Alternatives

All action alternatives would have similar effect levels and are discussed together.

Project Construction

Construction of the earthen embankments, pumping plants, levees, tunnels, tunnel access shafts, forebay, and access roads would require excavation, grading, or stockpiling at project facility sites or at temporary work sites. In addition, site grading needed to construct any of the proposed facilities has the potential to block, reroute, or temporarily detain and impound surface water in existing drainages and velocities.

All project features would be constructed to not increase peak runoff flows into adjacent storm drains, drainage ditches, or rivers and sloughs. At the proposed north Delta intakes, tunnel shafts, Southern Complex, and Bethany Complex, all water from dewatering (i.e., groundwater removal) activities and stormwater runoff would be collected, treated, and stored on-site to reduce the need for off-site water sources (Chapter 2, *Project Description and Alternatives*, and Section 3.11, *Groundwater*). On-site reuse and storage would be maximized to reduce the peak runoff rate from project construction sites. If additional stored water is not needed, the treated runoff flows would be released in a manner that would not increase flow rates in local drainage channels or rivers on site. Dispersion facilities would be used to reduce the potential for channel erosion due to the discharge of dewatering or stormwater runoff flows. The discharge rates of water collected during construction would be relatively small compared to the capacities of most of the Delta channels where discharges would occur. Permits for the discharges would be obtained from the Regional Water Quality Control Board or the State Water Board.

Shallow, localized flooding has historically occurred at the sites of the proposed north Delta intakes due to natural depressions. This flooding could be exacerbated during storm and high-water events and may be due to stormwater runoff, increased groundwater levels, or through-seepage in levee and railroad embankments.

For all intake locations, drainage and irrigation would be rerouted to accommodate the project footprint. Similar to the dewatering activities described above, project facilities would be designed to capture runoff on-site to minimize off-site effects during construction. The action alternatives include drainage and pump enhancements to ensure intake facilities would not be subject to localized flooding during operation. During construction, the local drainage at intake facility sites would be managed to minimize local flooding through installing temporary pumps if necessary to allow continued construction activities. These temporary changes in drainage would be minimized, and in some cases avoided, by construction of new or modified drainage facilities, as described in Chapter 2, *Project Description and Alternatives*. Drainage studies, as part of the final design, would be prepared for each construction location to assess the need for, and to finalize, other drainage-related design measures, such as a new on-site drainage system or new cross drainage facilities. The action alternatives would include installation of temporary drainage bypass facilities, long-term cross drainage, and replacement of existing drainage facilities that would be disrupted by construction of new facilities. These new facilities would be constructed prior to disconnecting or crossing existing drainage facilities. Locations of stockpiles and other temporary construction features were selected and refined to minimize flow impedance under flood flow conditions.

The action alternatives would include permanent facilities within the 100-year flood hazard area; these structures would be designed to withstand a 200-year flood event with sea level rise and climate change hydrology for 2100 (Delta Conveyance Design and Construction Authority 2022b:66). The levee systems surrounding each Delta island along the central and eastern alignments where various shafts and facilities are located provide the first line of defense against flooding. The levee reliability was evaluated in terms of their compliance with PL 84-99 criteria.

The Southern Complex and Bethany Complex would include large sites and a large number of personnel and equipment; however, these sites either have adequate levee heights (Southern Complex) or are not located in the potential flood area (Bethany Complex). The two Southern Complex tunnel launch shaft sites near the northern embankment of the Southern Forebay (Southern Forebay Inlet Structure launch shaft and working shaft) are already protected by levees that substantially meet the PL 84-99 criteria, primarily on the east side of the Southern Complex. The western side of the Southern Complex would be located on higher ground. In the area protected by levees, the time to flood in the event of a catastrophic failure has been conservatively estimated as being very short (Delta Conveyance Design and Construction Authority 2022b:68). However, the chance of levee failure is relatively low, and a sudden, catastrophic structural failure is unlikely at the Southern Complex because portions of the levee system are on mineral soil foundations as compared to being on organic soils on Bouldin and Lower Roberts Islands. Because it is an area of reduced risk, further levee improvements on Byron Tract would not be warranted as part of the comprehensive flood risk management strategy for the tunnel construction corridor.

Launch shafts sites at the Twin Cities Complex site, Bouldin Island, and Lower Roberts Island would be much larger and involve more personnel and equipment than at maintenance and reception shaft construction sites. Accordingly, the applicant would improve existing levees (Bouldin Island or Lower Roberts Island) or build a ring levee (at the Twin Cities Complex site) to protect workers, facilities, and equipment at those locations. These tunnel launch shaft sites would be active work sites for a 7- to 9-year construction period. During construction, all tunnel shaft pads would be constructed to an elevation at, or slightly above, the adjacent levee height, thus providing a high ground refuge above the local 100-year flood elevation. All launch, maintenance, and reception shaft sites would enact nonstructural flood risk management measures.

Based on the flood risk evaluation, tunnel shaft sites on Bouldin Island (central alignment) and Lower Roberts Island (eastern and Bethany Reservoir alignments) would be located in a higher risk category due to the combined effects of levee geometric deficiencies and potential inundation time and depth of flooding. Therefore, levee modifications on the inland side of the island levees would be constructed prior to construction of the tunnel shafts. Use of the existing levees with improvement would result in no effects on existing drainage flows around the islands or within the island. The total size of the construction site and postconstruction site for the Bouldin Island levee modifications would be approximately 251 acres, with an additional 90 acres for temporary levee modification access roads. The total size of the construction site and postconstruction site for the Lower Roberts Island levee modifications would be approximately 30 acres, plus an additional 37 acres for temporary levee modification access roads. To account for ongoing work by levee maintaining agencies, the extent of levee repairs would be reevaluated during the design phase and coordinated with the local levee maintaining agency. Levee modifications at Bouldin Island or Lower Roberts Island would remain in place after project construction, providing a higher level of flood protection to surrounding areas than currently exists.

Given the long duration of work at these launch sites, island perimeter levee improvements to meet PL 84-99 geometric standards, as well as addressing any known geotechnical weaknesses, are warranted to limit long-term flood risk. The extent and types of recommended levee repairs would be refined prior to construction and in coordination with the local reclamation districts. The levee improvements would be initiated in the early phases of project construction and may overlap to some extent with the initiation of shaft pad construction at the shaft sites. However, if critical weaknesses were identified in these levee systems, remediation would be completed before shaft sites are constructed. Ongoing and continuous levee maintenance and monitoring would be critical to reducing flood risk at the shaft sites during project construction and would be closely coordinated with the reclamation districts. It is anticipated that levee maintaining agencies would continue making levee improvements to maintain geometric standards after repairs are completed and because sea level rise can be expected to increase in the future.

The exception to this flood management approach is the ring levee for the Twin Cities Complex site, which would require a separate evaluation. The Twin Cities Complex would be located on the eastern portion of Glanville Tract in an upland area vulnerable to overland flow flooding from the Sacramento, Cosumnes, and Mokelumne Rivers as well as Morrison Creek. Historically, Glanville

Tract has been subject to flooding along the local levees and surrounding roadways of I-5, SR 99, Twin Cities Road, and Lambert Road. Glanville Tract is not fully protected by perimeter levees as the railroad embankment on the eastern side of Glanville Tract was not designed to perform as a flood control structure, but rather is relied upon by the reclamation district to protect Glanville Tract from backwater flooding upstream of the confluence of the Cosumnes and Mokelumne Rivers. Therefore, a ring levee would be used to protect the Twin Cities Complex in the event of a levee failure on Glanville Tract. It would be configured to minimize impedance of flood flows from nearby streams, including the Cosumnes River, and minimize the inundation effects on the surrounding land during a potential overland flooding event within Glanville Tract. The ring levee and modifications to existing drainage features would convey floodwater around the ring levee to the west side of I-5 and eventually toward Snodgrass Slough. After project construction, the ring levee at Twin Cities Complex would be deconstructed except for a portion adjacent to the reusable tunnel material (RTM) storage area.

The flood effects analysis for the Twin Cities Complex site found that the ring levee would increase the 100-year flood depth directly adjacent to the ring levee by a maximum of approximately 0.3 foot for the central and eastern alignments and 0.4 foot for the Bethany Reservoir alignment, when compared to existing conditions with approximate flood depth of 3 feet. The resulting 100-year floodplain would increase by approximately 10 acres for the central and eastern alignments and 15 acres for the Bethany Reservoir alignment. However, the flood effect is confined to an open space area north of the Twin Cities Complex site for grazing purposes that are subject to flooding under the existing conditions. The inundation would last about 2.5 days (Delta Conveyance Design and Construction Authority 2022a:Att 3-16, 2022e:Att 4). The flood depth of the narrow space between the ring levee and existing railroad embankment would increase by 3 feet with potential overtopping of the existing railroad embankment, compared to existing conditions; however, the flow volume is fairly low and the flood depth increase is mainly due to the limited space between Franklin Boulevard and the railroad embankment, and the effects are localized to this area. Dierssen Road would be overtopped by approximately 3.5 feet under existing conditions and become unusable; the conditions remain the same under action alternatives. Modeling results show that the ring levee would not change flood depth west of I-5, south of the Twin Cities Complex site, or north of Lambert Road.

After the McCormack-Williamson Tract Project is completed, the hydraulic profile would be reduced approximately 1 to 1.5 feet within the adjacent floodway, which reduces the likelihood of flooding within Glanville Tract. As a result, the overtopping of the existing railroad embankment would not occur.

The launch site associated with Byron Tract near the South Delta Pumping Plant and Southern Forebay Inlet Structure would include two shafts—the Southern Forebay Inlet Structure launch shaft and an intermediate working shaft approximately 1 mile to the north. This site would be protected by levees that substantially meet the PL 84-99 criteria, and have levees primarily only on the east side, with high ground on the west side. Although the time to flood in the event of a catastrophic failure has been conservatively estimated as being short, the chance of failure would be relatively low, and a sudden, catastrophic structural failure would be unlikely because portions of the levee system are on mineral soil foundations and are on markedly higher ground elevations compared to Bouldin Island and Lower Roberts Island. For these reasons further levee improvements on Byron Tract would not be warranted as part of the comprehensive flood risk management strategy for the tunnel construction.

The DSOD is the state agency with jurisdiction over the design, construction, and safe operation of the planned Southern Forebay for Alternatives 1, 2b, 3, and 4b. The Southern Forebay would be designed in accordance with the DSOD requirements for jurisdictional dams based on the anticipated maximum embankment height and storage volume. The embankments and spillway crest elevations would be established based on interior freeboard considerations mandated by DSOD and exterior sea level rise and flood condition data provided by the applicant. The embankment, outlet works, emergency spillway, and their appurtenances would be designed to protect the forebay from the 200-year flood event with sea level rise and climate change hydrology for year 2100 as defined by the applicant, including wave run-up and appropriate freeboard in the Southern Forebay to reduce risk of overtopping of the embankment from external flooding. Riprap would be placed along the inside embankment slopes and native grasses would be placed along the outside embankment slopes for erosion protection. Within the Southern Forebay, internal WSEs could be higher than external WSEs; therefore, the embankments would be of adequate height to contain maximum overflow water elevation, wave run-up, and freeboard on the interior side of the embankment (except at the emergency spillway location).

Postconstruction Effects During Operation

Shallow, localized flooding has historically occurred at the sites of the proposed north Delta intakes due to natural depressions. This flooding could be exacerbated during storm and high-water events and may be due to stormwater runoff, increased groundwater levels, or through-seepage in levee and railroad embankments.

For all intake locations, drainage and irrigation would be rerouted to accommodate the project footprint. The action alternatives include drainage and pump enhancements to ensure intake facilities would not be subject to flooding during operation.

The flood effect analysis for the Twin Cities Complex site found that the RTM stockpile storage areas would increase the 100-year flood depth by approximately 0.1 and 0.15 foot for the eastern and Bethany Reservoir alignments, respectively, when compared to existing conditions with a flood depth of approximately 3 feet; however, the flood effect is confined to an open space area north of the Twin Cities Complex site that is subject to flooding under existing conditions with no effect on residential development and/or critical facilities (Delta Conveyance Design and Construction Authority 2022a:Att 3-16; Delta Conveyance Design and Construction Authority 2022e).

The stockpile storage areas would increase the 100-year floodplain by approximately 4 acres for both the eastern and Bethany Reservoir alignments in the open space to north of the Twin Cities Complex. However, this increase in the 100-year floodplain would affect grazing land that is mostly inundated under existing flood conditions without the project facilities. The permanent RTM stockpile for the central alignment is smaller than that of the eastern alignment and thus would have less of an effect in increasing flood depth adjacent to the facility during flooding. Modeling results show that the stockpile storage areas would not change flood depth west of I-5 or south of the Twin Cities Complex site. With the eventual completion of the McCormack-Williamson Tract Project, the hydraulic profile would be reduced approximately 1 to 1.5 feet within the adjacent floodway, which reduces the likelihood of flooding within Glanville Tract.

Permanent RTM stockpiles expected at some tunnel launch shaft sites other than the Twin Cities Complex would extend above the surrounding grades and would be planted with native grasses primarily for erosion control or to create a natural habitat area. Recommended treatments for permanent RTM stockpiles would include spreading topsoil, cross disking, and planting native grasses. As previously mentioned, the surrounding levees of these launch shaft sites would be improved to meet PL 84-99 standards and no additional analysis is required.

The Southern Forebay includes an overflow emergency spillway that would be used under the unlikely condition that the forebay water level continued to rise above the design maximum elevation. The emergency spillway would discharge flow from the Southern Forebay into Italian Slough, which flows into Old River. To accommodate this, a portion of the existing Italian Slough levee would be removed. New levees would be constructed to channelize and contain the spillway discharge flows between the outboard toe of the spillway and the existing levee along Italian Slough. The discharge channel and levees would be expected to settle and require maintenance over time. The design of the emergency spillway would accommodate the controlling event where 6,000 cfs inflow continues and the outlet structure was closed (Delta Conveyance Design and Construction Authority 2022f:1). In addition, the capacity of draining the Southern Forebay with the combined capacity of the emergency spillway and the outlet structure meets the DSOD requirements for emergency drawdown for minimizing the risk of catastrophic failure of the Southern Forebay (Delta Conveyance Design and Construction Authority 2022g:10). The discharge into Italian Slough would initially be contained within the slough's existing levees but would, over a short distance, converge with Old River. The connection to Old River and the broader Delta waterways would allow spillway flows to be absorbed during discharge.

The potential hydraulic effect of the Southern Forebay Emergency Spillway on the existing levee system of Italian Slough and Old River was evaluated using a 1-D hydraulic model. The change in WSEs was compared between the different operational scenarios (i.e., spillway releases of 3,000, 4,500, and 6,000 cfs) and the baseline (i.e., no spill event). The 6,000 cfs scenario exhibited the largest increases in WSEs when compared to the baseline for both the 100-year flood event and the mean higher high water event (Delta Conveyance Design and Construction Authority 2022f:Att 2-5). For the 100-year flood event, the 6,0000 cfs scenario increased WSEs by 0.31 foot when compared to the baseline, with the affected area extending 2.47 miles upstream and 1.15 miles downstream of the spillway location. For the mean higher high water event, the 6,000 cfs scenario increased WSEs by 0.46 foot when compared to the baseline, with the affected area extending 2.47 miles upstream and 1.61 miles downstream of the spillway location. Although the spillway was assumed to flow for 12 hours, peak WSEs were achieved in 2 hours or less for the modeled scenarios. In the modeled scenarios, the peak WSE was located upstream of the spillway location due to backwater effects from the additional flow entering Italian Slough from the spillway. None of the scenarios analyzed resulted in overtopping levees of the main Italian Slough channel or Old River due to the releases from the Southern Forebay Emergency Spillway.

Although the CMP described in Appendix C3, *Compensatory Mitigation Plan for Special-Status Species and Aquatic Resources,* does not act as mitigation for effects on this resource from project construction or operations, its implementation could result in effects on flood protection.

Actions undertaken for compensatory mitigation would restore three freshwater ponds along I-5, wetland, open water, and upland natural communities on Bouldin Island, and tidal wetland and channel margin restoration sites in the North Delta Arc. Compensatory mitigation would convert existing agriculture land on Bouldin Island to wetlands, riparian habitat, ponds, and grassland. For the I-5 ponds, it is proposed that the existing grasslands, riparian habitat, wetlands, and ponds would be replaced by improved grassland, wetland, riparian, and open-water habitat. Tidal wetland and channel margin habitat would be restored within the North Delta Arc.

Channel margin enhancements associated with compensatory mitigation actions would likely occur along migration corridors that also provide a certain level of flood protection for adjacent properties. Channel margin restoration would improve channel geometry, similar to what is currently practiced by USACE and other flood management agencies when implementing levee improvements. Channel margin restoration associated with federal project levees would not be implemented on the levee but rather on benches to the waterward side of such levees, and flood conveyance would be maintained as designed. Channel margin enhancements associated with federal project levees may require permission from USACE in accordance with USACE's authority under the RHA (33 USC § 408) and levee vegetation policy. Any restoration activities associated with compensatory mitigation would be designed, constructed, and maintained to ensure no reduction in performance of the federal flood project.

The construction and operations of water-conveyance facilities would potentially affect tidal perennial aquatic habitat and alter hydrodynamics at Georgiana Slough for migrating Chinook salmon juveniles and would potentially reduce habitat extent and possibly habitat access for delta smelt spawning. Restoration of tidal wetlands is one approach to mitigate these effects. Tidal wetland habitat mitigation would generally be achieved at suitable locations by reconnecting former wetland areas to adjacent tidal sloughs and rivers. Restoration would primarily occur through breaching or setback of levees, thereby restoring tidal fluctuation to land parcels currently isolated behind those levees. Where practicable and appropriate, portions of restoration sites would be raised to elevations that will support tidal marsh vegetation following levee breaching.

Depending on the location of tidal wetland restoration, it may be necessary to construct an entirely new flood control levee along portions of the project perimeter to protect adjacent properties. This new flood control levee could affect WSEs in the adjacent waterbody, although the final design would have a less-than-substantial increase on WSEs relative to existing conditions. Any restoration activities associated with tidal wetlands would be designed, constructed, and maintained to ensure no reduction in channel performance.

Some of the compensatory mitigation efforts would require developing temporary facilities, such as staging areas, access haul roads, work areas, and borrow sites. These facilities could involve clearing and grubbing, excavation, and other grading activities that entail soil disturbance. Unless measures are implemented to control erosion, these construction activities could result in accelerated water runoff rates. The potential effect on receiving waters, as a result of accelerated erosion, would be greatest on the waterside of sloping project features (e.g., new and modified existing levees).

At the Bouldin Island mitigation site, landside improvements would include the construction of a new setback levee behind and connected to the existing levee. The actual extent of earthmoving required for levee construction would vary significantly by site depending on the degree of land subsidence and the level of flood protection needed. The surface soils underlying the Bouldin Island site are organic and, therefore, subject to subsidence. The compensatory mitigation is not expected to involve construction of habitable structures or significant foundations, but some of the mitigation efforts would entail construction of up to 5 miles of new setback levees on Bouldin Island, which may be founded on soils subject to subsidence. Subsidence of the levee foundation soil of the levee itself over time could cause levee failure and unintentional flooding. However, the applicant would construct these levees according to Delta standards, such as PL 84-99, and maintain them to keep pace with subsidence of the underlying foundation soils, such as by periodically adding soil material to the levee.

As with the action alternatives, construction related to the CMP would be required to gain coverage under the State Water Board Stormwater Construction General Permit, compliance with which would ensure that there would be no excessive accelerated erosion or runoff caused by mitigation actions. Construction of setback levees, foundations for water control structures, and similar features would be required to be designed and constructed in accordance with resource agency and professional engineering specifications to avoid the effects of subsidence.

Based on the information presented above, the potential for all action alternatives to alter existing drainage patterns, alter the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding or impede or redirect flood flows does not appear to be significant.

3.9.2.3 Cumulative Analysis

It is anticipated that some changes related to flood flows would take place—even assuming that future projects would be designed to avoid such effects to the extent feasible. For this analysis, the plans, policies, and programs considered are listed in Table 3.9-4.

Table 3.9-4. Plans, Policies, and Programs Included in the Cumulative Analysis

Program/Project	Agency	Status	Description of Program/Project	Effects on Flood Protection
Delta Dredged Sediment Long-Term Management Strategy/Pinole Shoal Management Study	USACE	Ongoing	Maintenance and improvement of channel function, levee rehabilitation, and ecosystem restoration.	Could alter the existing drainage pattern of sediment reuse sites and directly affect flood protection.
California Water Plan Update 2018	DWR	Updated in 2018, ongoing	Provides a framework for water managers, legislators, and the public to consider options and make decisions regarding California's water future.	Could modify surface water flow patterns and indirectly affect flood protection.
Bay-Delta Water Quality Control Plan Update (Delta Outflows, Sacramento River and Delta Tributary Inflows, Cold Water Habitat and Interior Delta Flows)	State Water Board	Planning phase	Would establish flow objectives for the Sacramento River and its tributaries, Delta eastside tributaries (including the Calaveras, Cosumnes, and Mokelumne Rivers), Delta outflows, and interior Delta flows.	Could modify surface water flow patterns, increase instream flows, increase minimum Delta outflows, and indirectly affect flood protection.
Delta Flood Protection Fund	DWR	Ongoing	Provides funding to levee maintaining agencies for their use to maintain and improve critical levees in the Delta.	Could modify surface water flow patterns or alter the existing drainage pattern and indirectly affect flood protection.

Program/Project	Agency	Status	Description of Program/Project	Effects on Flood Protection
North Delta Flood Control and Ecosystem Restoration Project	DWR	Ongoing	Will improve flood management and provide ecosystem benefits in the North Delta area through actions such as construction of setback levees and configuration of flood bypass areas to create quality habitat for species of concern.	Will reduce flooding and provide contiguous aquatic and floodplain habitat along the downstream portion of the Cosumnes River Preserve.
McCormack-Williamson Tract Flood Control and Ecosystem Restoration Project	DWR	Ongoing	Will implement flood control improvements principally on and around McCormack-Williamson Tract in a manner that benefits aquatic and terrestrial habitats, species, and ecological processes.	Will reduce flooding and improve flood control and management.
Sacramento River Bank Protection Project	USACE	Planning phase	A long-term flood risk management project designed to enhance public safety and help protect property along the Sacramento River and its tributaries.	Could modify surface water flow patterns or alter the existing drainage pattern and indirectly affect flood protection.
Lookout Slough Tidal Habitat Restoration and Flood Improvement Project	DWR	Planning phase	Designed to be a multi-benefit project to restore approximately 3,100 acres of tidal marsh, increase flood storage and conveyance in the Yolo Bypass, increase levee resilience, and decrease flood risk.	While the project would breach and degrade an SPFC levee (i.e., Shag Slough), which would lead to hydraulic changes during flood events, it would reduce local flood risk and improve local flood control. Therefore, the project would not substantially alter the drainage pattern of the area; this effect would be less than significant.
Incidental Take Permit for Long-Term Operation of the State Water Project in the Sacramento–San Joaquin Delta 2020	CDFW	Ongoing	CDFW issued an ITP to DWR for long-term operations of the SWP.	Potential effects on flood management could be from required conservation actions and activities in the floodways (e.g., Yolo Bypass), flood control channels, or floodplain would, if necessary, be mitigated.
2019 National Marine Fisheries Service Biological Opinion on the Long-term Operations of the Central Valley Project and State Water Project	NMFS	Ongoing	On October 21, 2019, NMFS issued a final BiOp finding that continued operations of the CVP/SWP is not likely jeopardize several listed species, including Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley steelhead, Southern Distinct Population Segment of North American green	Potential effects on flood management could be from required conservation actions and activities in the floodways (e.g., Yolo Bypass), flood control channels, or floodplain would, if necessary, be mitigated.

Program/Project	Agency	Status	Description of Program/Project	Effects on Flood Protection
			sturgeon, and Southern Resident killer whales.	
2019 U.S. Fish and Wildlife Service Biological Opinion on the Long-Term Operations of the Central Valley Project and State Water Project (Delta Smelt)	Reclamation, USFWS, and DWR	Ongoing	On October 21, 2019, USFWS delivered its BiOp to Reclamation on the effects of continued operation of the federal components of CVP and SWP on delta smelt and its designated critical habitat.	Potential effects on flood management could be from required conservation actions and activities in the floodways (e.g., Yolo Bypass), flood control channels, or floodplain would, if necessary, be mitigated.
Central Valley Flood Protection Plan	DWR	Ongoing	The plan lays out strategies to: prioritize the state's investment in flood management over the next 3 decades, promote multi-benefit projects, and integrate and improve ecosystem functions associated with flood risk reduction projects. The plan is updated every 5 years and is currently undergoing a 2022 update.	Implementation of the plan has improved flood risk management in the Central Valley. Implementation of the recommended plan has reduced the estimated expected annual damage and potential life loss.

BiOp = Biological Opinion; CDFW = California Department of Fish and Wildlife; CVP = Central Valley Project; DWR = California Department of Water Resources; EIS = environmental impact statement; ITP = Incidental Take Permit; NMFS = National Marine Fisheries Service; SWP = State Water Project; USACE = U.S. Army Corps of Engineers; USFWS = U.S. Fish and Wildlife Service.

Construction of the action alternatives could result in alterations to channel conveyance capacity, drainage patterns, the rate or amount of surface runoff, or the placement of structures within a special flood hazard area. However, temporary and permanent levees constructed would provide an equivalent (or higher) level of flood protection for the areas where construction is occurring. Construction of the action alternatives would have a temporary cumulative effect, as construction would cause a temporary increase in WSEs as described under Impact FP-1 due to project structures and materials placed within the river. After construction is complete, the temporary structures would be removed and WSEs would return to levels experienced preconstruction. All project structures placed within a 100-year special flood hazard area would be designed to not impede or redirect flood flows. Most of the effects associated with these impact mechanisms are restricted to the specific sites, and therefore, would not act in combination with other projects.

Implementation of the projects considered for the cumulative effects analysis could affect flood control and management in the study area if the projects all undergo construction at the same time and if those projects with specific objectives to improve flood control and management are not completed. This is not anticipated to occur and it is assumed the changes due to construction of the action alternatives would remain localized and not contribute to an overall cumulative effect that would be detrimental to the flood control and management of the study area.

3.10 Geology, Soils, and Paleontological Resources

This section describes the affected environment for geology, seismicity, soils, and paleontological resources and analyzes the effects that could occur in the study area from construction, operation, and maintenance of the action alternatives, as well as the No Action Alternative. Mitigation and minimization measures that would avoid, minimize, rectify, reduce, or compensate potentially adverse effects are included as part of each action alternative. Additional information on the affected environment, methods, and anticipated effects of the action alternatives on geology, seismicity, soils, and paleontological resources can be found in Delta Conveyance Project Draft EIR Chapter 10, *Geology and Seismicity*, Chapter 11, *Soils*, and Chapter 28, *Paleontological Resources* (California Department of Water Resources 2022).

3.10.1 Affected Environment

This section describes geology, seismicity, soils, and paleontological resources in the study area (i.e., the area in which effects may occur) that could be affected by construction, operations, and maintenance of the action alternatives. The study area for geology, seismicity, soils, and paleontological resources includes all areas that could involve excavation, construction, or other ground-disturbing activities to build the conveyance facilities and appurtenant features, such as tunnels, intakes, forebays, tunnel access shafts, levees, and new and improved roads, including ground-improvement activities to improve soil stability. The study area for these resources includes a 0.5-mile buffer beyond the construction footprint, except for power transmission lines, metering areas, and park-and-ride sites, which include a 0.125-mile buffer extending beyond the construction footprint. This expanded study area allows for an assessment of the broader geologic context, such as the relative position of rock layers between geologic units.

3.10.1.1 Geology and Seismicity

Geology and seismicity in this section refer to the existing geologic and seismologic conditions and the associated potential geologic, seismic, and geotechnical hazards in the study area. The surficial geologic units of the study area include organic soils, alluvium, eolian deposits (i.e., dune sand), sedimentary bedrock, and hydraulic-dredge spoils. Peat soils within the study area occur to a maximum depth of approximately 15 feet below the ground surface, and organic mineral soils and sediments (e.g., organic silt) occur to a maximum depth of approximately 30 feet below the ground surface. Both the peat and organic mineral soils are above what would be the main tunnel invert elevation (i.e., roughly -139 to 163 feet North American Vertical Datum of 1988 [NAVD88], depending on the action alternative and location along the alignment).

The study area is located near several major active fault systems, including the San Andreas, Hayward-Rodgers Creek, Calaveras, Concord-Green Valley, and Greenville Faults, and all are capable of generating earthquakes with magnitude 6.0 or greater. The seismic sources underlying the Delta are mostly blind thrusts that are not expected to rupture to the ground surface during an earthquake but can produce ground deformation and large and damaging ground shaking. Blind faults potentially capable of causing ground deformation and possibly surface rupture, such as the potentially active West Tracy Fault, are present in the western part of the Clifton Court Forebay and in the vicinity of the proposed Southern Complex facilities (Delta Conveyance Design and

Construction Authority 2021). Because the study area topography has little topographic relief, the potential for mass failure of natural slopes, including landslides and debris flows in nearly all the study area is considered low. The effects of a tsunami and seiche in the study area are expected to be minimal. Detailed descriptions of the existing geologic and seismic conditions in the study area are presented in Delta Conveyance Project Draft EIR Chapter 10, *Geology and Seismicity* (California Department of Water Resources 2022).

3.10.1.2 Soils

The terms *soil* and *soils* refer to the upper approximately 5 feet of earthen material in the study area as mapped and classified by NRCS and to any unconsolidated earthen material, irrespective of the depth at which it occurs. The physical and chemical characteristics of soil affect the way a soil behaves under specific land uses. These characteristics are especially important for engineering considerations. Relevant soil physical and chemical properties include the degree of expansiveness (i.e., shrink-swell potential), soil compressibility (i.e., the resistance against a decrease in volume when soil is subjected to a mechanical load), and erodibility by water and wind.

Clay soils with the high shrink-swell potential occur in large portions of the northern and southwestern parts of the Delta. Soils comprising inorganic silts and very fine sands, organic clays, and peat that are subject to soil compression are also present in the study area. Erosion hazard potential is considered slight because of the level to nearly level slopes present throughout the study area. In more sloping areas, specifically in the vicinity of the Bethany Reservoir, the erosion hazard is generally moderate. Much of the study area in the central Delta is underlain by organic soils that have a high susceptibility to wind erosion. These organic soils, in some areas ranging from 5 to 15 feet thick, are also subject to subsidence caused by the decomposition of organic carbon. Subsidence rates in the Delta during the first half of the twentieth century were as high as 3 to 4 inches per year. Long-term average rates of subsidence are currently estimated at 1 to 3 inches per year (Ingebritsen et al. 2000:1). Detailed descriptions of soil associations in the study area and their physical and chemical characteristics are presented in Delta Conveyance Project Draft EIR, Chapter 11, *Soils* (California Department of Water Resources 2022).

3.10.1.3 Paleontological Resources

Paleontological resources, commonly called fossils, are the remains, traces, imprints, or life history artifacts (e.g., nests) of prehistoric plants and animals found in ancient sediments. Recovered specimens in the study area vicinity range from the shells of marine invertebrates to the bones and teeth of extinct Pleistocene megafauna, such as mammoths and giant ground sloths that are less than 200,000 years old. The primary geologic units in the study area with high sensitivity for paleontological resources include the Modesto Formation, Riverbank Formation, Turlock Lake Formation, Older Eolian Deposits, Tehama Formation, San Pablo Group, Markley Sandstone, Moreno Formation, and Panoche Formation. Additional information on the geologic units in the study area with high paleontological sensitivity is presented in Delta Conveyance Project Draft EIR Chapter 28, *Paleontological Resources* (California Department of Water Resources 2022).

3.10.2 Environmental Consequences

This section describes the assessment methods used to analyze potential environmental effects and identifies the direct, indirect, and cumulative effects on geology, seismicity, soils, and paleontological resources that would result from construction, operation, and maintenance of the action alternatives, as well as the No Action Alternative.

3.10.2.1 Methods for Analysis

This section describes the assessment methods used to analyze potential environmental effects on geology, seismicity, soils, and paleontological resources. Additional information on the methods of analysis for geology, seismicity, soils, and paleontological resources can be found in Delta Conveyance Project Draft EIR Chapter 10, *Geology and Seismicity*, Chapter 11, *Soils*, and Chapter 28, *Paleontological Resources* (California Department of Water Resources 2022).

Geology and Seismicity

Information about existing geologic and seismologic conditions and the associated potential geologic, seismic, and geotechnical hazards in the study area was obtained from published and unpublished sources. Regional and site information was compiled from DCA project-specific reports and maps and reports published by various agencies, researchers, and consultants, including DWR, USACE, USGS, and California Geological Survey (CGS, formerly California Division of Mines and Geology). Potential effects were identified if construction resulted in unstable soil in tunnel bores, excavations, cut slopes, fill slopes, or areas of native soil material that are naturally subject to instability (e.g., landslide, debris flow). Effects were also identified if seismic conditions and soil and groundwater conditions present within the conveyance facility footprints could be subject to seismic ground shaking and liquefaction, fault displacement or fault rupture, or construction-induced liquefaction, such as that generated from impact pile-driving and heavy construction vehicle vibrations.

Soils

Information about soils present in the study area was obtained from the NRCS online Soil Survey Geographic (SSURGO) database, supplemented by printed soil survey reports for the five counties in the study area. Other sources used include DCA project-specific reports, DWR and USGS data and publications, academic technical reports and publications, and county general plans. The effects analysis for soil-related effects from construction activities focuses on 1) how and where soil disturbance (e.g., grading, excavating, tunneling, borrow material excavating, and stockpiling) could lead to soil loss from accelerated water and wind erosion; 2) the potential loss of topsoil as a resource caused by excavation or permanent overcovering; and 3) the potential degradation of the condition (i.e., soil health) and productivity of topsoil from construction activities, such as soil compaction.

Paleontological Resources

The effects of construction and operations activities on paleontological resources were evaluated by determining the geologic units that would be disturbed by construction of water-conveyance facilities, both at the surface and at depth, and evaluating the paleontological sensitivity of those units. Paleontological sensitivity determinations were based first on review of records in the paleontological database at the University of California Museum of Paleontology (UCMP). Effects on paleontological resources were analyzed qualitatively on a large-scale level, based on professional judgment and the Society of Vertebrate Paleontology (SVP) guidelines for protecting paleontological resources (Society of Vertebrate Paleontology 2010:1–11).

No Action Alternative

The No Action Alternative includes the ongoing projects and programs in the Delta that will require ground disturbance to either construct new facilities or implement restoration and habitat enhancement goals. In addition, planning documents that govern portions of the Delta include buildout footprints that allow development of undisturbed land that is likely to contain paleontological resources.

The No Action Alternative takes into account projects, plans, and programs that would be reasonably expected to occur in the foreseeable future if none of the action alternatives were approved and the proposed action's purpose and need were not met. Many of these projects, such as construction of desalination plants or water recycling facilities, would involve construction of facilities which would require ground-disturbing and other construction activities by individual public water agencies to ensure local water supply reliability for its constituents. Construction of water supply–reliability projects would result in ground-disturbing activities and other construction activities and operations that that may be constrained or affected by geologic, seismic and soil conditions and hazards or that could destroy unique paleontological resources. Table 3.10-1 summarizes the effects on geology and soils provides, and Table 3.10-2 provides examples of geologic units sensitive to paleontological resources that could be affected by the projects.

Table 3.10-1. Summary of Effects on Geology and Soils from Construction and Operation of Projects in Lieu of the Project

Project Type	Region [a]	Potential Construction Effects	Potential Operational Effects
Increased/ accelerated desalination	Northern coastal, southern coastal	Failure of cut slopes and excavations (pipeline trenches). Accelerated water and wind erosion and loss of topsoil.	Potential for earthquake fault rupture, seismic ground shaking and liquefaction, thereby presenting risk to life and property. Potential for facility damage due to expansive or corrosive soil.
Groundwater recovery (brackish water desal)	Northern inland, southern coastal, southern inland	Failure of cut slopes and excavations (pipeline trenches). Accelerated water and wind erosion and loss of topsoil.	Potential for earthquake fault rupture, seismic ground shaking and liquefaction, thereby presenting risk to life and property. Potential for facility damage due to expansive or corrosive soil.
Groundwater management	Northern coastal, southern coastal	Failure of cut slopes and excavations (pipeline trenches). Accelerated water and wind erosion and loss of topsoil.	Potential for earthquake fault rupture, seismic ground shaking and liquefaction, subsidence caused by groundwater overdraft, increased liquefaction hazard as a result of elevated ground water levels in aquifers, reservoir-triggered seismicity and resultant seiche waves, thereby presenting risk to life and property. Potential for facility damage due to expansive or corrosive soil.
Water recycling	Northern coastal, northern inland,	Failure of excavations (pipeline trenches). Accelerated water and	Potential for earthquake fault rupture and seismic ground shaking, thereby presenting risk to life and property.

Project Type	Region [a]	Potential Construction Effects	Potential Operational Effects
	southern coastal, southern inland	wind erosion and loss of topsoil.	Potential for facility damage due to expansive or corrosive soil.
Water Use efficiency measures	Northern coastal, southern coastal, southern inland	No effect.	No effect.

[a] See Chapter 2, *Project Description and Alternatives*, Section 2.5, *No Action Alternative*, for a complete definition of the geographic regions.

Table 3.10-2. Examples of Sensitive Geologic Units That Could Be Affected and Known Fossils

Region [a]	Examples of Geologic Units with Potential to Contain Sensitive Paleontological Resources That Could Be Affected	Examples of Fossils Known to Occur in These Units
Northern coastal	Orinda and Briones Formations and Irvington Gravels	Horses, cat, camel, rhinoceros, elephant, *Desmostylus* (marine mammal somewhat like a sea cow), birds, bony and cartilaginous fishes, *Tetrameryx* (relative of the pronghorn), and tortoise
Northern inland	Briones, Santa Clara, Modesto, and Riverbank Formations	Horses, elephant, camel, tortoise, bison, horse, bony fish, ground sloths, bison, mammoth, rodents, coyote, badger, and fox
Southern coastal	Monterey, Santa Margarita, Caliente, and Sespe Formations	*Desmostylus,* toothed whales, bony and cartilaginous fishes, bird, oreodonts, horses (many species), rodents, camel, other artiodactyls, and canid
Southern inland	Bopesta, Ricardo, Tulare, San Joaquin, and Barstow Formations	Horses (many species), oredont, camel, deer, other artiodactlys, barbourofelis (felid), mustelid, canids, rabbit, bird, mastodon, beaver, and peccary

[a] See Chapter 2, *Project Description and Alternatives*, Section 2.5, *No Action Alternative*, for a complete definition of the geographic regions.

Effects of the Alternatives on Geology and Seismicity

Impact GEO-1: Loss of Property, Personal Injury, or Death from Structural Failure Resulting from Rupture of a Known Earthquake Fault or Based on Other Substantial Evidence of a Known Fault

No Action Alternative

Surface fault rupture or ground deformation caused by subsurface fault displacement could cause damage to, or collapse or failure of, the constructed facilities and could result in personal injury or death from structural failure, both during construction and operations. In extreme cases, facility damage could cause an uncontrolled release of water from reservoirs, pipelines, and canals, resulting in loss of property, personal injury, or death.

All Action Alternatives

Construction activities would not increase the potential for loss of property, personal injury, or death from structural failure resulting from a rupture of a known earthquake fault under any of the action alternatives. However, rupture of the West Tracy Fault (if future field investigations determine it to be a hazard) during construction of certain Southern Complex or Bethany Complex water-conveyance facilities could cause injury or death of workers at the construction sites because of collapse of facilities. Other than the West Tracy Fault, there are no known active faults capable of surface rupture in the study area. Future field investigations would include trench explorations and geophysical surveys along the possible surface trace of the West Tracy Fault to determine if that fault is capable of surface rupture. Additionally, possible ground deformation (e.g., uplift) from fault movement along the fault could occur without surface rupture in the vicinity of the Southern Complex and the Bethany Complex.

Prior to construction, the applicant would conduct the future field investigations. The results of the investigations would be used to inform the detailed design of the water-conveyance facilities. The detailed design would conform with applicable design standards and building codes as described in Appendix G, *Potentially Relevant Laws, Regulations, and Programs.* All facilities and active construction sites would be designed and managed to meet the California Division of Occupational Safety and Health (Cal/OSHA) and safety-and-collapse-prevention requirements of the relevant state codes and standards for the anticipated seismic loads, such as by implementing shoring, bracing, lighting, excavation depth restrictions, required slope angles, and other measures, to protect worker safety.

Based on the information presented above, the potential for loss of property, personal injury, or death from structural failure resulting from a rupture of a known earthquake fault under all of the action alternatives does not appear to be significant.

Impact GEO-2: Loss of Property, Personal Injury, or Death from Strong Earthquake-Induced Ground Shaking

No Action Alternative

Seismically induced ground shaking from local or regional seismic sources that may occur, and the resultant ground motions at some construction sites and facilities, could cause damage, collapse, or other failure of water-conveyance facilities while under construction and during operations. The damage to the facilities could cause an uncontrolled release of water and in extreme cases, cause an uncontrolled release of water from reservoirs, pipelines, and canals, resulting in loss of property, personal injury, or death.

All Action Alternatives

Construction activities would not increase the potential for earthquake-induced ground shaking to occur in the study area. However, earthquakes could be generated from local and regional seismic sources during construction of the water-conveyance facilities. Ground shaking could cause injury or death of workers at the construction sites because of collapse of facilities, especially those conveyance facilities located closer to regional and local active faults, such as the facilities that make up the Southern Complex or Bethany Complex and the southern tunnel segments and tunnel shafts.

Prior to construction, the applicant would conduct the future field investigations, which include geotechnical studies, to inform the detailed design of the conveyance facilities. The design would be consistent with applicable design standards and building codes as described in Appendix G, *Potentially Relevant Laws, Regulations, and Programs*; all facilities and active construction sites would be designed and managed to meet Cal/OSHA and safety-and-collapse-prevention requirements of the relevant state codes and standards for the anticipated seismic loads, such as by implementing shoring, bracing, lighting, excavation depth restrictions, required slope angles, and other measures, to protect worker safety. Conformance with these health and safety requirements and the application of accepted, proven construction engineering practices would reduce any potential risk that construction and operation of the conveyance facilities increase the likelihood of loss of property, personal injury, or death of individuals from earthquake-induced ground shaking.

Based on the information presented above, the potential for loss of property, personal injury, or death from strong earthquake-induced ground shaking under all of the action alternatives does not appear to be significant.

Impact GEO-3: Loss of Property, Personal Injury, or Death from Earthquake-Induced Ground Failure, including Liquefaction and Related Ground Effects

No Action Alternative

Seismically induced ground shaking could cause liquefaction and related ground effects at certain facilities, both during construction and operations. The consequences of liquefaction could be manifested by soil compaction or settlement, loss of soil-bearing capacity, lateral spreading, and increased lateral soil pressure within the zones of liquefaction. Failure of facilities could result in injury or loss of life and uncontrolled releases of water and flooding, resulting in loss of property, personal injury, or death.

All Action Alternatives

Construction activities[22] would not increase the potential for loss of property, personal injury, or death from structural failure resulting from earthquake-induced ground failure, including liquefaction, under any of the action alternatives. However, an earthquake of sufficient magnitude along local or regional faults could result in ground failure, including liquefaction, during construction and could cause injury or death of workers because of collapse of the conveyance facilities. Site-specific investigations conducted for the action alternatives indicate that the soils underlying the north Delta intake sites, Southern Forebay Inlet Structure, South Delta Pumping Plant, Southern Forebay Outlet Structure, Union Island tunnel maintenance shaft site, and tunnel shaft sites along the central and eastern alignments are subject to liquefaction.

Prior to construction, the applicant would conduct future field investigations, which include geotechnical studies, to inform the detailed design of the water-conveyance facilities. The design would conform with applicable design standards and building codes as described in Appendix G, *Potentially Relevant Laws, Regulations, and Programs*; all facilities and active construction sites would be designed and managed to meet Cal/OSHA and safety-and-collapse-prevention

[22] Construction activity-induced ground shaking (as opposed to earthquake-induced ground motions), such as from pile driving and heavy vehicle use, and the associated hazard of ground effects is discussed separately in *Impact GEO-5: Loss of Property, Personal Injury, or Death from Structural Failure Resulting from Proposed Action-Related Ground Motions*.

requirements of the relevant state codes and standards for the anticipated seismic loads, such as by implementing shoring, bracing, lighting, excavation depth restrictions, required slope angles, and other measures, to protect worker safety. Conformance with these health and safety requirements and the application of accepted, proven construction engineering practices would reduce any potential risk that construction and operation of the water-conveyance facilities increase the likelihood of loss of property, personal injury, or death of individuals from earthquake-induced ground failure, including liquefaction and related ground effects.

Based on the information presented above, the potential for loss of property, personal injury, or death from earthquake-induced ground failure, including liquefaction and related ground effects under all of the action alternatives does not appear to be significant.

Impact GEO-4: Loss of Property, Personal Injury, or Death from Slope Instability or Other Ground Failure

No Action Alternative

Excavation of canals and trenches for pipelines and cut slopes could cause slope failure, potentially causing injury of workers at the construction sites. Dewatering of excavations could stimulate soil settlement and could cause the slopes or sidewalls of the excavations to fail, endangering workers in the excavations themselves and workers at ground level near the edge of the excavation.

All Action Alternatives

Ground settlement above the tunnel could result in loss of property or personal injury during construction. In extreme circumstances, large settlement above the tunnel, caused by voids, sinkholes, or both above the tunnel during boring, could translate to the ground surface, potentially causing loss of property or personal injury above the tunnel construction area. Collapse of the tunnel during boring could also translate to the ground surface and result in a greater depth of ground surface settlement than large settlement. Although the potential effect of large settlement and systematic settlement is expected to be minor, during detailed design, a site-specific subsurface geotechnical review would be conducted along the tunnel alignment to verify or refine the findings of the preliminary geotechnical investigations. The tunneling equipment and drilling methods would be reevaluated and refined based on the results of the investigations, and field procedures for sudden changes in ground conditions would be implemented to minimize or avoid settlement over the tunnel.

Excavation of borrow material could result in failure of cut slopes, and application of temporary spoils and RTM at storage sites could lead to excessive settlement in the spoils, potentially causing injury of workers at the construction sites. Soil excavations in areas with shallow or perched groundwater levels, such as at the intakes, sedimentation basins, tunnel shafts, Bethany Reservoir Discharge Structure, and the Southern Forebay emergency spillway, would require dewatering. Dewatering could stimulate soil settlement in the excavations and could cause the slopes or sidewalls of the excavations to fail, endangering workers in the excavations themselves and workers at ground level near the edge of the excavation.

Because the action alternatives would conform with applicable design standards and building codes as described in Appendix G, *Potentially Relevant Laws, Regulations, and Programs*, federal design manuals and professional society and geotechnical literature would be used to predict the maximum amount of settlement that could occur for site-specific conditions, to identify the maximum allowable settlement for individual critical assets, and to develop recommendations for tunneling to avoid excessive settlement, all to minimize the likelihood of loss of property or personal injury from ground settlement above the tunneling operation during and after construction.

Cut-and-fill slopes, embankments, and levees would conform to applicable construction, design, and building codes, guidelines, and standards, such as the California Building Code (CBC) and USACE's Engineer Manual (EM) 1110-2-2400, *Engineering and Design—Structural Design and Evaluation of Outlet Works* (U.S. Army Corps of Engineers 2003). The applicant would ensure that the geotechnical design recommendations are included in the construction and design of water-conveyance facilities and construction specifications to minimize the potential effects from failure of excavations and settlement, including those from dewatering. The applicant would also ensure that the design specifications are properly executed during construction.

Based on the information presented above, the potential for loss of property, personal injury, or death from slope instability or other ground failure under all of the action alternatives does not appear to be significant.

Impact GEO-5: Loss of Property, Personal Injury, or Death from Structural Failure Resulting from Proposed Action-Related Ground Motions

No Action Alternative

Impact pile-driving could cause vibrations that may initiate liquefaction and associated ground movements in places where soil and groundwater conditions are present to allow liquefaction to occur. The consequences of liquefaction could be manifested in terms of compaction or settlement, loss of bearing capacity, lateral spreading (i.e., horizontal soil movement), increased lateral soil pressure, and buoyancy within the zones of liquefaction. These consequences could cause personal injury or death and could damage nearby structures and levees.

All Action Alternatives

Impact pile-driving at the intakes could initiate localized liquefaction, which could threaten the safety of workers at the site and cause failure of nearby structures during construction. In the absence of corrective measures, potential levee effects that could occur during construction may include rutting, settlement, and slope movement. During detailed design, the facility-specific potential for liquefaction would be investigated by a geotechnical engineer. The potential effects of construction vibrations on nearby structures, levees, and utilities would be evaluated using specific piling information (e.g., pile type, length, spacing, pile-driving hammer to be used). In areas determined to have a potential for liquefaction, the California-registered civil engineer or California-certified engineering geologist would develop design strategies and construction methods to ensure that pile-driving and heavy equipment and truck traffic operations do not damage facilities under construction and surrounding structures and do not threaten the safety of workers at the site. The civil engineer or engineering geologist would recommend any design measures to conform to applicable design codes, guidelines, and standards as described in Appendix C1, *Environmental Commitments and Best Management Practices*. Conformance with applicable codes and standards would reduce the potential risk for increased likelihood of loss of property or personal injury from structural failure resulting from construction-related ground motions.

Based on the information presented above, the potential for loss of property, personal injury, or death from structural failure resulting from proposed action-related ground motions under all of the action alternatives does not appear to be significant.

Impact GEO-6: Loss of Property, Personal Injury, or Death from Seiche or Tsunami

No Action Alternative

At facilities near coastlines and along bay shores, a tsunami would inundate the facility, resulting in loss of property, personal injury, or death both during construction and operations. Certain facilities consisting of a body of water may be subject to a seismically induced seiche. Large and deep water bodies may generate reservoir-triggered seismicity, which may produce a seiche wave, potentially causing loss of property, personal injury, or death during operations.

All Action Alternatives

The tsunami-inundation hazard area nearest to the study area is on the north shore of the Sacramento River, extending approximately to 1 mile upstream (i.e., east) of the Benicia Bridge (California Governor's Office of Emergency Services 2021). The low height of a tsunami wave in the vicinity of the Benicia Bridge, combined with the attenuating effect of the Suisun Bay and the northwestern part of the Delta, indicates that the potential hazard of loss of property or personal injury because of a tsunami on the water-conveyance facilities is low.

There is a low potential for an earthquake-generated seiche to occur in the Southern Forebay during operations. If a seiche occurred in the Southern Forebay and the embankment was not properly designed, multiple seiche waves could overtop the embankment, erode it, and cause localized flooding. The applicant would ensure that the geotechnical design recommendations are included in the design of water-conveyance facilities and construction specifications to minimize the potential effects from any seismic events and consequent seiche waves.

Based on the information presented above, the potential for loss of property, personal injury, or death from seiche or tsunami under any of the action alternatives does not appear to be significant.

Effects of the Alternatives on Soils

Impact SOILS-1: Accelerated Soil Erosion Caused by Vegetation Removal and Other Disturbances as a Result of Constructing the Proposed Water-Conveyance Facilities

No Action Alternative

Construction of some of the facilities would involve grading and vegetation removal and result in accelerated water and wind erosion and subsequent effects on receiving waters.

Alternatives 1, 2b, 3, and 4b

Construction of water-conveyance facilities would involve vegetation removal and surface disturbance of approximately 4,560 acres (Alternative 1), 4,033 acres (Alternative 2b), 4,149 acres (Alternative 3), and 3,588 acres (Alternative 4b). The extent of such activities would be greatest at the Southern Forebay and its work area. Some of the work would be conducted in agricultural areas that would be fallow at the time. These activities could result in soil compaction, degraded soil structure, reduced soil infiltration capacity, and increased runoff rates, all of which could accelerate erosion. Excavation, grading, and other soil disturbance conducted in gently sloping to level areas would result in little or no accelerated soil erosion, particularly in areas where existing or proposed levees would prevent sediment from entering receiving waters. In contrast, graded and otherwise disturbed tops and side slopes of existing and proposed levees and other embankments could experience accelerated soil erosion if not properly treated.

The applicant would implement Environmental Commitment EC-4b: *Develop and Implement Stormwater Pollution Prevention Plans* under Alternatives 1, 2b, 3, and 4b to prevent accelerated soil erosion from occurring. All Stormwater Pollution Prevention Plans (SWPPPs), are likely to contain the following best management practices.

- Preservation of existing vegetation
- Perimeter control
- Fiber roll and/or silt fence sediment barriers
- Watering to control dust entrainment
- Tracking control and "housekeeping" measures for equipment refueling and maintenance
- Solid waste management

Most construction sites would require temporary and permanent seeding and mulching. Sites that involve disturbance or construction of steep slopes (e.g., setback levees at intakes) may require installation of erosion-control blankets or rock slope protection. Temporary turbidity curtains and cofferdams may be prescribed for in-water work. Excavations that would require dewatering (such as for underground utilities and footings) would require proper storage of the water, such as land application or filtration. Soil and material stockpiles (such as for borrow material) would require perimeter protection and covering or watering to control wind erosion.

Most of the areas that would involve extensive soil disturbance are also underlain by soils with a medium to high susceptibility to wind erosion. Many of these areas are already routinely disturbed by agricultural activities such as disking and harrowing and the amount of soil disturbance from the action alternatives would be relatively small compared to ongoing agricultural operations. The most likely source of wind-caused erosion would occur during excavation of soil from borrow areas and transport of RTM to storage areas. Approximately 7.5 to 14.8 million cubic yards of wet excavated (i.e., bulked) RTM would be transported, unloaded, and placed as permanent stockpiles, depending on the action alternative. This material would be especially susceptible to wind erosion while it is being handled and without proper management could be transported great distances. Soil moisture and compaction of RTM and Environmental Commitment EC-11: *Fugitive Dust Control* would be used to reduce wind erosion.

Based on the information presented above, including the environmental commitment, the potential for accelerated soil erosion caused by vegetation removal and other disturbances during construction of Alternatives 1, 2b, 3, and 4b does not appear to be significant.

DWR's Preferred Alternative

Construction of water-conveyance facilities could cause accelerated soil erosion and effects of the erosion similar to those described above for Alternatives 1, 2b, 3, and 4b. The extent of ground disturbance under DWR's Preferred Alternative (approximately 3.090 acres) would be less than other action alternatives because it would not include the Southern Complex. However, the water erosion hazard of the soils in the sloping area east of the Bethany Reservoir would be higher (generally "moderate") than the erosion hazard of the soils found within the construction footprints of the other action alternatives.

The applicant would implement Environmental Commitment EC-4b: *Develop and Implement Stormwater Pollution Prevention Plans* under DWR's Preferred Alternative to prevent accelerated soil erosion from occurring. All Stormwater Pollution Prevention Plans (SWPPPs), irrespective of the action alternative's site and characteristics, are likely to contain the following best management practices.

- Preservation of existing vegetation
- Perimeter control
- Fiber roll and/or silt fence sediment barriers
- Watering to control dust entrainment
- Tracking control and "housekeeping" measures for equipment refueling and maintenance
- Solid waste management

Most construction sites would require temporary and permanent seeding and mulching. Sites that involve disturbance or construction of steep slopes (e.g., setback levees at intakes) may require installation of erosion-control blankets or rock slope protection. Temporary turbidity curtains and cofferdams may be prescribed for in-water work. Excavations that would require dewatering (such as for underground utilities and footings) would require proper storage of the water, such as land application or filtration. Soil and material stockpiles (such as for borrow material) would require perimeter protection and covering or watering to control wind erosion.

Most of the areas that would involve extensive soil disturbance are also underlain by soils with a medium to high susceptibility to wind erosion. Many of these areas are already routinely disturbed by agricultural activities such as disking and harrowing and the amount of soil disturbance from the action alternatives would be relatively small compared to ongoing agricultural operations. The most likely source of wind-caused erosion would occur during excavation of soil from borrow areas and transport of RTM to storage areas. Approximately 14.4 million cubic yards of wet excavated (i.e., bulked) RTM would be transported, unloaded, and placed as permanent stockpiles, depending under DWR's Preferred Alternative. This material would be especially susceptible to wind erosion while it is being handled and without proper management could be transported great distances. Soil moisture and compaction of RTM and Environmental Commitment EC-11: *Fugitive Dust Control* would be used to reduce wind erosion.

Based on the information presented above, including the environmental commitments, the potential for accelerated soil erosion caused by vegetation removal and other disturbances during construction of DWR's Preferred Alternative does not appear to be significant.

Impact SOILS-2: Loss of Topsoil from Excavation and Overcovering as a Result of Constructing the Proposed Water-Conveyance Facilities

No Action Alternative

Large areas of topsoil could be lost as a result of excavation and overcovering under the No Action Alternative.

Alternatives 1, 2b, 3, and 4b

Construction of the conveyance facilities would involve various forms of soil excavation and overcovering, such as topsoil salvage and stockpiling; borrow areas; excavations for building pads, levees, trenches, and embankments; road construction; and temporary and permanent RTM storage. Extensive areas of native topsoil effectively would be lost as a resource because of these activities. The extent of permanent topsoil loss from excavation and overcovering would be 2,797 acres for Alternative 1, 2,465 acres for Alternative 2b, 2,324 acres for Alternative 3, and 1,963 acres for Alternative 4b. Degradation of soil health could occur at construction sites at which the topsoil would not be excavated or overcovered, such as at construction staging and laydown areas where the soil could be compacted. Operations and maintenance of the action alternatives would not entail large areas of excavation, filling, grading, or other soil disturbances and would not be expected to result in notable loss of topsoil.

Various measures would be undertaken to minimize the extent of topsoil loss and to promote revegetation of cut-and-fill areas under Alternatives 1, 2b, 3, and 4b. Peat and mineral topsoil would be excavated and stockpiled locally. Excavated peat soil would be stockpiled and covered with mineral topsoil to limit oxidation of the peat. As described in Chapter 2, *Project Description and Alternatives*, Section 2.6.1.9, *Land Reclamation*, reclamation efforts would help restore soil health, to the extent practical, in areas that have been compacted from construction equipment activities, that have consolidated beneath material stockpiles, and that have properties less suitable for agriculture or habitat restoration due to construction activities. After demobilization of equipment, materials, and temporary facilities, sites would be graded and leveled to generally meet adjacent lands. Initial soil treatments would depend on the actual disturbance, but for soils that have undergone more than minimal effect, the work would be expected to include ripping the soil and incorporating amendments (e.g., gypsum) to reduce compaction and to promote soil health.

Compliance with the State Water Board Stormwater Construction General Permit, as described in Environmental Commitment EC-4b: *Develop and Implement Stormwater Pollution Prevention Plans*, requires that the extent of vegetation removal and soil disturbance be minimized to the maximum extent practical in design and during construction of the action alternatives. Implementing this environmental commitment would reduce effect of loss of topsoil and degradation of soil health to a degree. This environmental commitment will also complement and is related to activities recommended under Mitigation Measure AES-1c: *Implement Best Management Practices to Implement Project Landscaping Plan*, in Section 3.1, *Aesthetics*.

Based on the information presented above, the potential for loss of topsoil from excavation and overcovering during construction of Alternatives 1, 2b, 3, and 4b does not appear to be significant.

DWR's Preferred Alternative

Construction of the conveyance facilities under DWR's Preferred Alternative would entail a loss of topsoil as a result of excavation and overcovering that would be less (i.e., 1,320 acres) than Alternatives 1, 2b, 3, and 4b.

Various measures would be undertaken to minimize the extent of topsoil loss and to promote revegetation of cut-and-fill areas under DWR's Preferred Alternative. Peat and mineral topsoil would be excavated and stockpiled locally. Excavated peat soil would be stockpiled and covered with mineral topsoil to limit oxidation of the peat. As described in Chapter 2, *Project Description and Alternatives*, Section 2.6.1.9, *Land Reclamation*, reclamation efforts would help restore soil health, to the extent practical, in areas that have been compacted from construction equipment activities, that have consolidated beneath material stockpiles, and that have properties less suitable for agriculture or habitat restoration due to construction activities. After demobilization of equipment, materials, and temporary facilities, sites would be graded and leveled to generally meet adjacent lands. Initial soil treatments would depend on the actual disturbance, but for soils that have undergone more than minimal effect, the work would be expected to include ripping the soil and incorporating amendments (e.g., gypsum) to reduce compaction and to promote soil health.

Compliance with the State Water Board Stormwater Construction General Permit, as described in Environmental Commitment EC-4b: *Develop and Implement Stormwater Pollution Prevention Plans*, requires that the extent of vegetation removal and soil disturbance be minimized to the maximum extent practical in design and during construction of the action alternatives. Implementing this environmental commitment would reduce effect of loss of topsoil and degradation of soil health to a degree. This environmental commitment will also complement and is related to activities recommended under Mitigation Measure AES-1c: *Implement Best Management Practices to Implement Project Landscaping Plan*, in Section 3.1, *Aesthetics*.

Based on the information presented above, including mitigation measures and environmental commitments, the potential for loss of topsoil from excavation and overcovering during construction of DWR's Preferred Alternative does not appear to be significant.

Impact SOILS-3: Property Loss, Personal Injury, or Death from Instability, Failure, and Damage as a Result of Constructing the Proposed Water-Conveyance Facilities on or in Soils Subject to Subsidence

No Action Alternative

Some of the proposed water-conveyance facilities could be constructed on soils that are subject to subsidence, which could cause facility damage. Overdraft of groundwater in aquifers could cause subsidence, damaging overlying existing structures and infrastructure.

All Action Alternatives

For all action alternatives, some of the proposed facilities would be constructed in areas where the surface soils and substrates are subject to subsidence. Organic soils in the study area are particularly subject to subsidence. Facilities that would be constructed on such soils include certain launch, maintenance, and reception shafts; shaft pads and other appurtenant structures; rail spurs and rail-served materials depots; temporary and permanent levees; parts of the Southern Complex (particularly the Southern Forebay); some topsoil and RTM storage areas; some bridges; and some transmission lines and access roads. Without adequate engineering, facilities constructed on these soils could be subject to appreciable subsidence.

Based on site-specific geotechnical investigations, ground improvement measures may be designed for soils that are subject to subsidence, depending on the nature of the facility. Embankment foundation improvements would be implemented where needed (i.e., cutoff walls for seepage, or ground improvement for embankment stability). The ground improvement measures for a given facility may include various combinations of removal of peat soils, installation of vertical wick drains and pre-loading of soils to promote ground settlement prior to construction, installation of seepage cutoff walls, and in situ soil treatments for improving foundation strength such as the deep mechanical mixing approach.

Conforming to state and federal design standards would protect the integrity of the proposed facilities against any subsidence that takes place. Such design codes and standards include the CBC and resource agency and professional engineering specifications, such as the American Society of Civil Engineers (ASCE) Standard 7-10, *Minimum Design Loads for Buildings and Other Structures* (American Society of Civil Engineers 2016). In addition, the action alternatives would conform with applicable design standards and building codes as described in Appendix G, *Potentially Relevant Laws, Regulations, and Programs,* which would safeguard the stability of cut-and-fill slopes and embankments as the water-conveyance features are operated.

Based on the information presented above, the potential for the action alternatives to result in property loss, personal injury, or death from instability, failure, and damage during construction on or in soils subject to subsidence does not appear to be significant.

Impact SOILS-4: Risk to Life and Property as a Result of Constructing the Proposed Water-Conveyance Facilities in Areas of Expansive or Corrosive Soils

No Action Alternative

Soils with a high shrink-swell potential (i.e., expansive soils) could damage facilities or cause the facilities to fail. Soils that are moderately or highly corrosive to concrete or to uncoated steel may cause the concrete or steel to degrade, thereby threatening the integrity of a facility.

All Action Alternatives

Some of the proposed facilities would be constructed in areas that are underlain by near-surface soils that are expansive, corrosive to concrete, or compressible. Nearly all of the facilities would be constructed in areas that are underlain by soils that are corrosive to uncoated steel. However, all facility design and construction would be executed in conformance with the CBC, which specifies measures to mitigate effects of expansive soils, corrosive soils, and soils subject to compression and subsidence. The CBC requires measures such as soil replacement, lime treatment, and post-tensioned foundations to offset expansive soils. The CBC also requires such measures as using protective linings and coatings, dielectric (i.e., use of an electrical insulator polarized by an applied electric field) isolation of dissimilar materials, and active cathodic protection systems to prevent corrosion of concrete and steel. Potential adverse effects of compressible soils and soils subject to subsidence could be addressed by overexcavation and replacement with engineered fill or by installation of structural supports (e.g., pilings) to a depth below the organic soil where the geologic strata have adequate load-bearing strength, as required by the CBC and by USACE design standards. By conforming to the CBC and other applicable design standards, potential effects associated with expansive and corrosive soils and soils subject to compression and subsidence would be avoided.

Based on the information presented above, the potential for the action alternatives to result in risk to life and property during construction in areas of expansive or corrosive soils does not appear to be significant.

Impact SOILS-5: Have Soils Incapable of Adequately Supporting the Use of Septic Tanks or Alternative Wastewater Disposal Systems Where Sewers Are Not Available for the Disposal of Wastewater

No Action Alternative

Construction of on-site wastewater disposal systems is not expected to be required at the facilities anticipated to be constructed under the No Action Alternative.

All Action Alternatives

All action alternatives would involve construction and use of septic tanks or alternative wastewater disposal systems (generally referred to as on-site wastewater disposal systems). During construction, there would be between four and seven septic tanks or alternative wastewater disposal systems, depending on the number of intakes. During operations, there would be two permanent septic tanks or alternative wastewater disposal systems. Most of the study area is underlain by soils that have a use limitation rating of very limited for use for septic tank absorption fields. A review of the specific locations of the proposed septic tank/alternative wastewater disposal system locations reveals that these sites have a use limitation rating of very limited for septic tank/alternative wastewater disposal systems. Such limitations are due to slow water movement through the soils, a shallow depth to a saturated zone, or both. If a conventional disposal system were to be constructed on soils with a rating of very limited for septic tank absorption fields, use of the system could contaminate surface water and groundwater and create objectionable odors during operations and maintenance. The water contamination could raise the risk of disease transmission and human exposure to pathogens. County planning and building departments typically require on-site soil percolation tests and other analyses to determine site suitability and type of system appropriate to the site. Along with compliance with county requirements, implementation of Mitigation Measure SOILS-5: *Conduct Site-Specific Soil Analysis and Construct Alternative Wastewater Disposal System as Required* would adequately support the use of septic tanks or alternative wastewater disposal systems.

Based on the information presented above, including the proposed mitigation measure, the potential for the action alternatives to encounter soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems does not appear to be significant.

Effects of the Alternatives on Paleontological Resources

Impact PALEO-1: Result in Destruction of a Unique Paleontological Resource

No Action Alternative

Ground-disturbing activities related to construction, such as site clearing, grading, excavating, backfill, trenching, and jack and bore tunneling, could cause the destruction of unique paleontological resources (i.e., with high or undetermined sensitivity). All project types across all regions would involve relatively typical construction techniques (i.e., no large-scale tunnels) and would be required to conform with the requirements of state and local regulations protecting paleontological resources, and mitigation measures would be developed to protect these resources, such as requiring paleontological monitoring in areas known to have geologic units sensitive for paleontological resources and requiring stop work measures in the event unexpected fossils are encountered. In addition, these activities would occur in a wide variety of geologic units, and effects would not be focused on a single geologic unit sensitive for paleontological resources.

Alternatives 1 and 2b

Construction of water-conveyance facilities could cause the destruction of sensitive paleontological resources from excavation for intakes, tunnel shafts, tunnels, other water facility components, roads, and on-site borrow. Construction of the intakes and associated sediment basins would entail deep and extensive excavation in the northern portion of the study area that would disturb portions of the Modesto, Riverbank, and Turlock Lake Formations. Excavation for the intakes would occur in the same geologic units. Excavation for 10 shafts would disturb portions of the Modesto, Riverbank, and Turlock Lake Formations.

Ground improvements would be required at some shafts where liquefiable soils are present. Liquefiable soils are generally poorly consolidated sandy Holocene soils and therefore have a low sensitivity for paleontological resources. However, as described in the Liquefaction and Ground Improvement Analysis (Final Draft) Technical Memorandum (Delta Conveyance Design and Construction Authority 2022:6–16), the depth of ground improvements may extend into the Modesto and Riverbank Formations. Although with further geotechnical refinement it may be determined that ground improvement may be limited to the Holocene units, this analysis assumes the Modesto and Riverbank Formations, which are sensitive for paleontological resources, would be affected by ground improvement. During ground improvement, in-situ techniques would be used to mix amendments, such as cement, into the ground underlying the intakes, most tunnel shafts, Southern Forebay embankments, and South Delta Pumping Plant.

The main tunnel under Alternatives 1 and 2b would extend for 39 miles or 37 miles, respectively, to the new pumping plant in the south Delta, primarily through the Modesto and Riverbank Formations. The greatest amount of excavation would occur under Alternative 1. Alternative 2b would involve the least excavation. TBMs would be used to excavate the tunnels and would bore primarily through the Modesto and Riverbank Formations, which are both sensitive for paleontological resources. Operation or maintenance activities for any of the action alternatives would have no effect on paleontological resources.

Implementation of Mitigation Measures PALEO-1a: *Prepare and Implement a Monitoring and Mitigation Plan for Paleontological Resources* and PALEO-1b: *Educate Construction Personnel in Recognizing Fossil Material* would reduce the effects for surface-related ground disturbance, such as grading and surface excavation. Implementing these mitigation measures would ensure that a qualified professional paleontologist would develop a monitoring and mitigation plan and determine which activities would occur in units sensitive for paleontological resources; educate construction personnel in recognizing paleontological resources; and have qualified monitors in place to monitor for paleontological resources and stop construction should paleontological resources be discovered.

Based on the information presented above, even with implementation of the proposed mitigation measures, impacts on unique paleontological resources from construction of Alternatives 1 and 2b may be significant.

Alternatives 3 and 4b

Construction of water-conveyance facilities could cause the destruction of sensitive paleontological resources from excavation for intakes, tunnel shafts, tunnels, other water facility components, roads, and on-site borrow. Construction of tunnel shafts would be the same as described for Alternatives 1 and 2b except that 11 shaft sites would be excavated for the launch, maintenance, and retrieval/reception of the TBMs, and these shafts would occur in the eastern alignment. Somewhat more excavation would occur for Alternative 3 and 4b compared to Alternatives 1 and 2b.

The main tunnel under Alternatives 3 and 4b would extend for 42 miles or 40 miles, respectively, to the new South Delta Pumping Plant (depending on how many intakes are included), would use the same construction method, and would occur for the most part in the same geologic units (i.e., the Modesto and Riverbank Formations) as Alternatives 1 and 2b. However, because of the longer tunnel length, more excavation would be required. The effects of this tunneling would be similar to Alternatives 1 and 2b but the quantity of material excavated would generally be greater. Alternative 3 excavation would be similar to but somewhat greater than Alternative 1 and Alternative 4b excavation would be similar to but somewhat greater than Alternative 2b. Major construction in the Southern Complex under Alternatives 3 and 4b would be the same as Alternatives 1 and 2b. There would be no effect on paleontological resources from operation or maintenance of any of the action alternatives.

Implementation of Mitigation Measures PALEO-1a: *Prepare and Implement a Monitoring and Mitigation Plan for Paleontological Resources* and PALEO-1b: *Educate Construction Personnel in Recognizing Fossil Material* would reduce the effects for surface-related ground disturbance, such as grading and surface excavation. Implementing these mitigation measures would ensure that a qualified professional paleontologist would develop a monitoring and mitigation plan and determine which activities would occur in units sensitive for paleontological resources; educate construction personnel in recognizing paleontological resources; and have qualified monitors in place to monitor for paleontological resources and stop construction should paleontological resources be discovered.

Based on the information presented above, even with implementation of the proposed mitigation measures, impacts to unique paleontological resources from construction of Alternatives 3 and 4b may be significant.

DWR's Preferred Alternative

As with the other action alternatives, construction of water-conveyance facilities under DWR's Preferred Alternative could cause the destruction of sensitive paleontological resources from excavation for intakes, tunnel shafts, tunnels, aqueduct, other water facility components, roads, and the on-site borrow. Effects related to intakes and tunnel shafts would be the same as Alternative 3 because the design of DWR's Preferred Alternative is the same between the intakes and Lower Roberts Island. There would be a slight difference in the location of the shaft on Upper Jones Tract, but the same geologic units would be affected, and the shafts in the southern portion of the alignment, below the Upper Jones Tract, would be in the same geologic units as Alternative 3. Effects related to tunneling would also be similar to Alternative 3 because the same geologic units would be disturbed, though DWR's Preferred Alternative would involve somewhat less excavation because the 1.7-mile-long dual tunnel would not be built.

Rather than construction of the Southern Complex, DWR's Preferred Alternative would construct an underground pumping plant and surge basin at a different location south of the Clifton Court Forebay and immediately east of the Jones pumping plant. This construction would involve the same geologic units as Alternatives 1 through 4b. Construction of a pipeline aqueduct from the pumping plant to the discharge structure at Bethany Reservoir would involve trenching, two short tunnel reaches, and excavation for the discharge structure. These activities would affect the Holocene or Upper Pleistocene alluvium of creeks from the Corral Hollow Drainage to Brushy Creek, Quaternary fan deposits, and Pleistocene Modesto Formation, but also the Panoche Formation, Miocene fanglomerate, and San Pablo Group. There would be no effect on paleontological resources from operation or maintenance of any of the action alternatives.

Implementation of Mitigation Measures PALEO-1a: *Prepare and Implement a Monitoring and Mitigation Plan for Paleontological Resources* and PALEO-1b: *Educate Construction Personnel in Recognizing Fossil Material* would reduce the effects for surface-related ground disturbance, such as grading and surface excavation. Implementing these mitigation measures would ensure that a qualified professional paleontologist would develop a monitoring and mitigation plan and determine which activities would occur in units sensitive for paleontological resources; educate construction personnel in recognizing paleontological resources; and have qualified monitors in place to monitor for paleontological resources and stop construction should paleontological resources be discovered.

Based on the information presented above, even with implementation of the proposed mitigation measures, impacts to unique paleontological resources from construction of DWR's Preferred Alternative may be significant.

3.10.2.2 Cumulative Analysis

This section describes the cumulative effects from the simultaneous construction of the Delta Conveyance Project and other projects in the vicinity that could result in effects on geology and seismicity, soils, paleontological resources. Table 3.10-3 lists examples of these projects, programs, and planning documents. The projects identified in Table 3.10-3 may be constrained or affected by geologic, seismic, and soil conditions and hazards.

Table 3.10-3. Plans, Policies, and Programs Included in the Cumulative Analysis

Program/Project	Agency	Status	Description of Program/ Project	Effects on Geology, Soils, and Paleontological Resources
Delta Dredged Sediment Long-Term Management Strategy	USACE	Ongoing	Maintaining and improving channel function, levee rehabilitation, and ecosystem restoration; a cooperative planning effort to coordinate, plan, and implement beneficial reuse of sediments in the Delta.	No direct effect on increased risks at Delta Conveyance Project construction locations from fault rupture, seismic ground shaking, liquefaction, slope instability, seiche, or tsunami. Accelerated water and wind erosion. Loss of topsoil. Reduced vulnerability to levee failure. Sediments disturbed by dredging would likely be too young to contain fossils.

Program/Project	Agency	Status	Description of Program/ Project	Effects on Geology, Soils, and Paleontological Resources
West Sacramento Levee Improvements Program	WSAFCA and USACE	Planning phase	Improvements to levees protecting West Sacramento to meet local and federal flood protection criteria.	Construction of levees could disturb the Riverbank Formation, which underlies Holocene basin deposits.
Dutch Slough Tidal Marsh Restoration Project	DWR	Ongoing	Wetland and upland habitat restoration in area used for agriculture.	No direct effect on increased risks at Delta Conveyance Project construction locations from fault rupture, seismic ground shaking, liquefaction, slope instability, seiche, or tsunami. May increase water and wind erosion rates. Loss of topsoil. Excavation would be required to create channels and habitat. No effects were found related to paleontological resources.
CALFED Levee System Integrity Program	DWR, CDFW, USACE	Planning phase	Reuse of dredge material. Levee maintenance and levee improvement	No direct effect on increased risks at Delta Conveyance Project construction locations from fault rupture, seismic ground shaking, liquefaction, slope instability, seiche, or tsunami. May increase water and wind erosion rates. Loss of topsoil. Depending on locations of improvements, construction could result in effects on paleontological resources.
Mayberry Farms Subsidence Reversal and Carbon Sequestration Project	DWR	Completed (ongoing maintenance)	Wetland restoration and enhancement to reverse subsidence	No direct effect on increased risks at Delta Conveyance Project construction locations from fault rupture, seismic ground shaking, liquefaction, slope instability, seiche, or tsunami. Beneficial effect by reducing subsidence in region. Sediments disturbed by excavation likely too young to contain fossils.
Twitchell Island - San Joaquin River Setback Levee	DWR	Planning phase	Levee stabilization and habitat restoration	No direct effect on increased risks at Delta Conveyance Project construction locations from fault rupture, seismic ground shaking, liquefaction, slope instability, seiche, or tsunami.

Program/Project	Agency	Status	Description of Program/ Project	Effects on Geology, Soils, and Paleontological Resources
Central Valley Joint Venture Program	Central Valley Joint Venture	Ongoing	Restoration of 19,170 acres of seasonal wetland, enhancement of 2,118 acres of seasonal wetland annually, restoration of 1,208 acres of semi-permanent wetland	No direct effect on increased risks at Delta Conveyance Project construction locations from fault rupture, seismic ground shaking, liquefaction, slope instability, seiche, or tsunami. May increase water and wind erosion rates. Loss of topsoil. Geologic units sensitive for paleontological resources are present in the project area and could be affected by excavation for restoration.
Lower Putah Creek Realignment	CDFW	Planning phase	Restoration of 300–700 acres of tidal freshwater wetlands and creation of 5 miles of a new fish channel	No direct effect on increased risks at Delta Conveyance Project construction locations from fault rupture, seismic ground shaking, liquefaction, slope instability, seiche, or tsunami. May increase water and wind erosion rates. Loss of topsoil. Sediments disturbed by excavation would likely be too young to contain fossils. Mitigation measures are available should paleontological resources be encountered.
San Joaquin County General Plan Update	San Joaquin County	Ongoing	In December 2016, San Joaquin County began the process to update the 2008 general plan. The general plan update will provide the blueprint for growth in the county unincorporated areas through 2035.	Buildout related to the general plan could disturb units sensitive for paleontological resources, such as the Modesto, Riverbank, Laguna, and Tehama Formations. Could cause accelerated water and wind erosion loss of topsoil.

CDFW = California Department of Fish and Wildlife; DWR = California Department of Water Resources; USACE = U.S. Army Corps of Engineers; WSAFCA = West Sacramento Area Flood Control Agency.

Geology and Seismicity

Ongoing and future projects and programs in the study area could be constrained or affected by geologic and seismic hazards in the same time frame as the action alternatives. Other than rise in sea level, which could increase groundwater levels such that there could be a modest increase in liquefaction hazard, the geologic and seismic environment is not expected to change as a result of past, present, and reasonably foreseeable future projects.

Soils

Ongoing and future projects and programs in the study area would require ground-disturbing construction that could result in effects on soil erosion rates, loss of topsoil, and degradation of soil health, depending on the type of construction needed for repairs or adjustments to potential irrigation water, and drainage needed for water quality and flood management (Section 3.9, *Flood Protection,* Table 3.9-4).

All of the action alternatives would involve vegetation clearing, grubbing, excavation, placement of fill and stockpile soil for both water-conveyance construction and compensatory mitigation. Potential increases in water and wind erosion rates from the action alternatives would be addressed with implementation of Environmental Commitment EC-4b: *Develop and Implement Stormwater Pollution Prevention Plans* and, therefore, would not markedly combine with effects on soils from other past, present, and probable future projects and programs in the study area. There would be no cumulative effects associated with the other soil effect mechanisms (i.e., direct topsoil loss from excavation or overcovering; degradation of soil health; soil corrosivity; soil expansion; subsidence and compressible soils; and soils unsuited to on-site wastewater disposal) because the effects of those mechanisms would be restricted to the physical location and would not act in combination with other projects.

Paleontological Resources

Ongoing and future projects and programs in the study area would require ground-disturbing activities to either construct new facilities or implement restoration and habitat enhancement goals. All of the action alternatives would involve similar ground-disturbing activities, such as surface excavation, ground improvements, and tunneling. Although surface excavation effects on paleontological resources would be addressed with implementation of Mitigation Measures PALEO-1a and PALEO-1b, tunnel boring and ground improvements could have an unavoidable effect on sensitive paleontological resources.

3.11 Groundwater

This section describes the affected environment for groundwater and analyzes effects that could occur in the study area from construction, operation, and maintenance of the action alternatives, as well as the No Action Alternative. Mitigation and minimization measures that would avoid, minimize, rectify, reduce, or compensate potentially adverse effects are included as part of each action alternative. Additional information on the affected environment, methods, and the anticipated effects of the action alternatives can be found in the Delta Conveyance Project Draft EIR Chapter 8, *Groundwater* (California Department of Water Resources 2022).

3.11.1 Affected Environment

The study area for groundwater primarily consists of the Sacramento–San Joaquin Delta (Delta) region, which overlies groundwater subbasins from both the Sacramento Valley and San Joaquin Valley groundwater basins. Groundwater basins in the study area include the southern subbasins of the Sacramento Valley groundwater basin, including the Yolo, Solano, and North American Subbasins, and the northern subbasins of the San Joaquin Valley groundwater basin, including the South American, Tracy, East Contra Costa, Cosumnes, and Eastern San Joaquin Subbasins. Rivers draining the Coast Ranges, the Cascade Ranges, and the Sierra Nevada convey water into the Central Valley, interconnect with the underlying groundwater basins, and eventually flow into San Francisco Bay.

Throughout the study area, hydrogeology and hydrology strongly influence groundwater flow and aquifer recharge with natural conditions affected by local land and water use. Spring runoff generated by melting snow in the Sierra Nevada increases flows in the Sacramento and San Joaquin Rivers and tributaries and causes groundwater levels near the rivers to rise. Because the Delta is a large floodplain and the shallow groundwater is hydraulically connected to surface water, changes in river stages affect groundwater levels and vice versa. This hydraulic connection is also evident when the tide is high and surface water flows from the ocean into the Delta, thereby increasing groundwater levels nearby.

Groundwater levels in the central Delta are very shallow, and land subsidence on several islands has resulted in groundwater levels close to the ground surface. Maintaining groundwater levels below crop rooting zones is critical for successful agriculture, especially for islands that lie below sea level, and many farmers rely on an intricate network of drainage ditches and pumps to maintain groundwater levels of about 3 to 6 feet below ground surface. The accumulated agricultural drainage is pumped through or over the levees and discharged into adjoining streams and canals (U.S. Geological Survey 2000). Without this drainage system, the islands would become flooded.

The study area overlies groundwater basins assigned medium and high priority under the provisions of the Sustainable Groundwater Management Act (SGMA), enacted in 2014. The eastern portion of the study area overlies a portion of the high-priority and critically overdrafted Eastern San Joaquin Subbasin. High- and medium-priority groundwater basins are required to form groundwater sustainability agencies (GSAs) and develop and implement groundwater sustainability plans (GSPs) to achieve sustainability within 20 years.

Private individual groundwater wells provide for most of the residential potable water sources for several Delta communities, such as Clarksburg, Courtland, Freeport, Hood, Isleton, Rio Vista, Ryde, and Walnut Grove. The largely agricultural San Joaquin Valley depends on groundwater to support agricultural and municipal demands. Some water flowing through the Delta is exported by the SWP/CVP to areas outside the Delta, and the availability of these water supplies influences the groundwater use and conditions of those Delta areas.

Groundwater quality in the study area includes areas with high salinity content attributed to poor-quality groundwater intrusion from the Delta caused by the decline of groundwater levels and worsened by sea level rise. Between 2009 and 2018, the most commonly detected chemicals above a maximum contaminant level (MCL) or secondary MCL (SMCL) in the Eastern San Joaquin Subbasin were manganese (16%), arsenic (16%), and iron (15%) (California Department of Water Resources 2022). These percentages are for when detections above MCLs or SMCLs occur.

In the Tracy Subbasin, areas of poor water quality exist throughout the subbasin. Elevated chloride concentrations are found along the western side of the subbasin near the City of Tracy and along the San Joaquin River. Between 2009 and 2018, the most commonly detected chemicals above an MCL or SMCL in the South American Subbasin were arsenic (20%), manganese (18%), and iron (18%) (California Department of Water Resources 2022). These percentages are for when detections above MCLs or SMCLs occur. Most samples do not indicate chemicals above their maximum levels.

3.11.2 Environmental Consequences

This section describes the assessment methods used to analyze potential environmental effects and identifies the direct, indirect, and cumulative effects on groundwater associated with the action alternatives, as well as the No Action Alternative.

3.11.2.1 Methods for Analysis

The groundwater analysis addresses changes in groundwater conditions in the vicinity of the proposed facilities within the Delta due to construction and maintenance activities. Effects related to construction and maintenance of the action alternatives were evaluated qualitatively due to the lack of an available analytical tool at the spatial scale required for the site-specific quantitative analysis; the qualitative evaluation is based on existing groundwater conditions and hydrogeology, and anticipated changes in groundwater elevations, storage, and quality from the construction methods and protocols described in the two EPRs (C-E EPR and Bethany EPR) (Delta Conveyance Design and Construction Authority 2022a, 2022b). On the other hand, the effects of operations on groundwater conditions were evaluated quantitatively using the Delta Groundwater (DeltaGW) model, a numerical integrated groundwater surface water model described in the Delta Conveyance Project Draft EIR Appendix 8A, *Delta Groundwater Model: Development and Calibration* (California Department of Water Resources 2022). The analysis of effects of operations on groundwater can be found in the Delta Conveyance Project Draft EIR Chapter 8, *Groundwater* (California Department of Water Resources 2022).

The groundwater analysis relied on geospatial information identifying temporary ground-disturbing activities necessary for construction. Longer-term effects resulting from the physical footprints of water-conveyance facilities and conservation areas, as well as operational effects on groundwater resources, are also described. Areas south of the Delta that receive Delta water would not be affected during construction activities in the Delta because the changes in groundwater levels due to construction dewatering occur locally around the site of dewatering and are not propagated into other groundwater basins. During construction activities, the Delta exports are assumed to remain identical to what they would be without construction activities associated with the new conveyance facility.

No Action Alternative

The No Action Alternative accounts for projects, plans, and programs that would be reasonably expected to occur in the foreseeable future and projects that may occur if none of the action alternatives were approved and the purpose and need were not met. Many of these in lieu projects, such as construction of desalination plants or water recycling facilities, would involve construction and operation of facilities by individual public water agencies to ensure local water supply reliability.

Water agencies participating in the project are grouped into four regions—northern coastal, northern inland, southern coastal, and southern inland. Each region would likely pursue a specific suite of water supply projects in a No Action Alternative scenario in lieu of the action alternatives. Activities associated with the various water supply projects could result in groundwater effects. The specific types and amounts of construction and operational activities would differ depending on the water supply project. Table 3.11-1 summarizes potential project types and the magnitude of implementation that would be required to meet the proposed action's purpose and need.

Table 3.11-1. Examples of Effects on Groundwater from Construction and Operation of Projects in Lieu of the Project

Project Type	Region [a]	Potential Magnitude of Water Supply Objectives Met
Increased/ accelerated desalination	Northern coastal, southern coastal	Increased or accelerated desalination could meet all supply objectives for the northern coastal region and part of the southern coastal region
Groundwater recovery (brackish water desal)	Northern inland, southern coastal, southern inland	Implementation of groundwater recovery projects could meet part of the supply objectives for the northern inland region and small portions for the southern coastal and southern inland regions
Groundwater management	Northern coastal, northern inland, southern coastal, southern inland	Utilization of groundwater management projects and strategies could meet part of the supply objectives for the northern coastal and inland regions and a small portion for the southern coastal and inland regions
Water recycling	Northern coastal, northern inland, southern coastal, southern inland	Increased water recycling could meet part of the supply objectives for the northern coastal and northern inland regions, and a small portion for the southern coastal and southern inland regions
Water Use efficiency measures	Northern coastal, southern coastal, southern inland	Implementation of enhanced water use efficiency measures could meet a small portion of the proposed action's purpose and needs for the northern coastal, southern coastal, and southern inland regions

[a] See Chapter 2, *Project Description and Alternatives*, Section 2.5, *No Action Alternative*, for a complete definition of the geographic regions.

3.11.2.2 Effects and Mitigation

Impact GW-1: Changes in Stream Gains or Losses in Various Interconnected Stream Reaches

No Action Alternative

Achievement of the sustainability goals contained in the GSPs for basins south of the Delta would be more difficult to achieve under the No Action Alternative without the reliable delivery of surface water south of the Delta. Specifically, the inability to reliably convey surface waters south of the Delta would result in a greater reliance on local water resources. This, in turn, would result in an increased reliance on groundwater to meet demands not otherwise met by surface water supplies, reduced surface water supplies available for land application resulting in a reduction of groundwater recharge, or the reduced ability to exchange supplies from areas north of the Delta to those south of the Delta. Together, these limitations may result in land fallowing or effects on interconnected surface waters if the GSAs are unable to implement projects that use local resources (such as stormwater) to sufficiently achieve groundwater basin sustainability or meet local demands, and/or secure additional supplies to offset these effects.

The specific number and types of construction and operational activities would differ depending on the water supply project. This analysis assumes that construction best management practices would be implemented during construction activities. Implementation of GSPs, along with applicable federal, state, and local regulations and ordinances would reduce the potential for adverse changes to the corresponding underlying groundwater basins.

All Action Alternatives

Effects on interconnected surface water bodies may occur during construction when shallow groundwater levels are lowered such that they markedly reduce or reverse the hydraulic gradient between interconnected water bodies and the underlying aquifer, resulting in increased flows from the surface water bodies to the aquifers or a decrease in flows from the aquifers to the surface water bodies. Dewatering during construction or maintenance of the action alternatives could affect groundwater elevations at and around the areas of construction due to the anticipated pumping rates required to dewater the excavation and the extended period of time required for construction. The use of slurry walls around subsurface infrastructure construction and dewatering would reduce the lowering of groundwater elevations in the shallower portions of the aquifer and therefore reduce the effects on stream gains and/or losses from nearby interconnected surface water courses. Additionally, areas adjacent to construction dewatering locations would be monitored for potential effects on groundwater levels and associated operational effects on wells in the vicinity, as described in the EPRs (Delta Conveyance Design and Construction Authority 2022a, 2022b), and in Mitigation Measure GW-1: *Maintain Groundwater Supplies in Affected Areas.* Monitoring data would be used to adaptively manage dewatering operations to mitigate possible effects; for example, dewatered water could be recharged outside the slurry walls to reduce the decline in groundwater levels. The spacing, depth, and location of recharge wells and monitoring piezometers, as well as thresholds for target external groundwater levels, would be determined after further site-specific investigation, testing, and analysis during future design phases. Mitigation Measure GW-1 could recharge the extracted groundwater back into the upper aquifer zones outside the slurry wall and would further limit notable changes to groundwater elevations in shallower aquifer zones accessed by interconnected stream reaches. Resultant changes in gains and/or losses in various interconnected streams are expected to be short-term, minimal, and localized in nature.

Creation of the wetlands and other habitats on Bouldin Island, at the in I-5 ponds (Ponds 6, 7, and 8), and in the North Delta Arc as a part of the implementation of compensatory mitigation would result in increased groundwater levels at areas in the vicinity of the new habitats. This, in turn, would affect the local hydraulic gradients resulting in the movement of groundwater from mounds (elevated groundwater levels) under the new ponds and habitats into adjacent stream courses when surface water levels are low. As such, compensatory mitigation would benefit interconnected surface waterbodies in the Delta.

Based on the information presented above, including proposed mitigation measures, the effects from construction of the action alternatives on interconnected surface water bodies does not appear to be significant.

Impact GW-2: Changes in Groundwater Elevations

No Action Alternative

Effects resulting from the No Action Alternative for would be the same as described for Impact GW-1.

All Action Alternatives

The marked lowering of groundwater levels at and adjacent to the alignments of the action alternatives may occur as a result of dewatering for construction and maintenance, primarily due to the anticipated pumping rates required to dewater the excavations and the extended period of time required for construction. According to the EPRs, there would be no dewatering at the intakes or at shafts locations because the intakes would be constructed using a coffer dam with sealed bottom and walls around it, and the shafts would be constructed “wet” with sealed bottoms. The construction of the sedimentation basin would require dewatering, but the use of slurry walls around the basin would reduce the lowering of groundwater elevations in and adjacent to the facility (Delta Conveyance Design and Construction Authority 2022a, 2022b).

During construction, dewatering at the Southern Complex would occur at the Southern Forebay Emergency Spillway, Southern Forebay Outlet Structure, and the Outlet and Control Structures located to the west of Byron Highway (for Alternatives 1, 2b, 3, and4b). Dewatering at the Southern Forebay Emergency Spillway would occur for several months adjacent to Italian Slough. Sheet pile walls would be used to limit effects on groundwater levels from dewatering at the Southern Forebay Emergency Spillway and Southern Forebay Outlet. Dewatering at the Outlet and Control Structures located west of Byron Highway and the Delta-Mendota Canal Control Structure would be managed using well points for controlled dewatering, while dewatering at the Bethany and Southern Complex pumping plants would be actively managed until structure walls are keyed into underlying clay layers. At all dewatering locations in the Southern Complex, a network of piezometers would be installed to monitor for effects during construction and allow adaptive management of dewatering practices to maintain local groundwater conditions. A series of groundwater recharge and extraction wells could also be installed around the external perimeter of the dewatering location to allow discharge of captured water back into the subsurface on the external side of the construction in the event that some local external effects due to dewatering are observed, or for additional groundwater extraction to mitigate for mounded water outside the construction.

The spacing, depth, and location of recharge wells and monitoring piezometers, as well as thresholds for target external groundwater levels, would be determined after further site-specific investigation, testing, and analysis during future design phases. Resultant potential groundwater level effects are expected to be short-term and localized in nature, but local conditions can vary so effects may have the potential to occur. Mitigation Measure GW-1: *Maintain Groundwater Supplies in Affected Areas* would mitigate effects on groundwater elevations from project construction.

Creation of the wetlands and other habitats on Bouldin Island, at the I-5 ponds (Ponds 6, 7, and 8), in the North Delta Arc would result in increased groundwater levels at areas in the vicinity of the new habitats, thereby lessening potential drops in groundwater elevations during project construction and operations. As such, compensatory mitigation would have a positive impact on groundwater elevations.

Based on the information presented above, including proposed mitigation measures, the effects from construction of the action alternatives on groundwater elevations do not appear to be significant.

Impact GW-3: Reduction in Groundwater Levels Affecting Supply Wells

No Action Alternative

Effects resulting from the No Action Alternative would be the same as described for Impact GW-1.

All Action Alternatives

Marked effects on supply wells may occur during construction when groundwater levels are lowered such that they dewater the supply wells, lower groundwater levels below pump intakes, or otherwise interfere with the transmission of groundwater to the supply well or extraction of groundwater from the supply well. Dewatering during construction could affect groundwater elevations at and around infrastructure of the action alternatives due to the anticipated pumping rates required to dewater the excavation and the extended period of time required for construction. The use of slurry walls or sheet piles around proposed infrastructure requiring dewatering for construction would reduce the lowering of groundwater elevations in the underlying aquifer but could still affect nearby shallower supply wells. As described in the EPRs (Delta Conveyance Design and Construction Authority 2022a, 2022b), and Mitigation Measure GW-1: *Maintain Groundwater Supplies in Affected Areas*, monitoring would occur in areas adjacent to construction dewatering locations for potential effects on groundwater levels and associated operational effects on wells in the area of effect. The spacing, depth, and location of recharge wells and monitoring piezometers, as well as thresholds for target external groundwater levels, would be determined after further site-specific investigation, testing, and analysis during future design phases. Monitoring data would be used to adaptively manage dewatering operations to mitigate possible effects; for example, dewatered water could be recharged outside the slurry walls to reduce the decline in groundwater levels around the facilities. Mitigation Measure GW-1: *Maintain Groundwater Supplies in Affected Areas* would recharge the extracted groundwater back into the upper aquifer zones outside the slurry wall and would further limit notable changes to groundwater elevations in shallower aquifer zones accessed by domestic wells.

Use of surface water for creation of the wetlands and other habitats on Bouldin Island, at the I-5 ponds (Ponds 6, 7, and 8), and in the North Delta Arc would result in increased groundwater levels at areas in the vicinity of the new habitats. This, in turn, would minimize impacts on nearby supply wells stemming from decreases in groundwater elevations resulting from project construction and operations. Thus, compensatory mitigation would have a positive impact on groundwater elevations.

Based on the information presented above, including proposed mitigation measures, the effects from construction of the action alternatives on groundwater levels and supply wells do not appear to be significant.

Impact GW-4: Changes to Long-Term Change in Groundwater Storage

No Action Alternative

Effects resulting from the No Action Alternative would be the same as described for Impact GW-1.

All Action Alternatives

Reductions to the volume of groundwater in storage may occur as a result of dewatering operations during construction or maintenance. The use of slurry walls or sheet piles around infrastructure requiring dewatering would reduce the volume of water required for dewatering by limiting lateral aquifer flows into the excavations. However, reductions in the volume of groundwater in storage as a result of construction where dewatering would occur for several years are anticipated to be localized and short-term in nature. Groundwater dewatering at the tunnel shaft locations would occur for only a few weeks and be limited to the volume of water inside the shaft after the shaft was constructed and sealed at the bottom from the adjacent groundwater. Groundwater dewatering at the Southern Forebay Emergency Spillway would occur for a few months adjacent to Italian Slough. Additionally, dewatering would occur at the Southern Forebay Outlet Structure, the California Aqueduct Control Structure, and the South Delta Outlet and Control Structure (for Alternatives 1, 2b, 3, and 4b). As described in the EPRs (Delta Conveyance Design and Construction Authority 2022a, 2022b), and Mitigation Measure GW-1: *Maintain Groundwater Supplies in Affected Areas*, monitoring would occur in areas adjacent to construction dewatering locations for potential effects on groundwater levels and associated operational effects on wells in the area of effect. The spacing, depth, and location of recharge wells and monitoring piezometers, as well as thresholds for target external groundwater levels, would be determined after further site-specific investigation, testing, and analysis during future design phases. Monitoring data would be used to adaptively manage dewatering operations to mitigate possible effects; for example, dewatered water could be recharged outside the slurry walls to reduce the decline in groundwater levels around the facilities. Mitigation Measure GW-1: *Maintain Groundwater Supplies in Affected Areas*, would reduce these effects through the recharge of groundwater outside the slurry walls as needed.

Creation of the wetlands and other habitats on Bouldin Island, at the I-5 ponds (Ponds 6, 7, and 8), and in the North Delta Arc would result in increased recharge to the underlying groundwater basins. This, in turn, would increase the volume of groundwater in storage during project construction and operations. As such, compensatory mitigation would have a positive impact on groundwater storage.

Based on the information presented above, including the proposed mitigation measures, the potential for the action alternatives to result in a long-term change in groundwater storage does not appear to be significant.

Impact GW-5: Increases in Groundwater Elevations near Project Intake Facilities Affecting Agricultural Drainage

No Action Alternative

Effects resulting from the No Action Alternative would be the same as described for Impact GW-1.

All Action Alternatives

Construction of the action alternatives, including the conveyance tunnels and shafts and slurry walls, would introduce subsurface barriers to groundwater flows. Depending on local hydrogeologic conditions, these barriers may result in the increase in shallow groundwater elevations, potentially affecting agricultural drainage systems. As described in the EPRs (Delta Conveyance Design and Construction Authority 2022a, 2022b), and Mitigation Measure GW-1: *Maintain Groundwater Supplies in Affected Areas*, groundwater level monitoring in and around the slurry walls during construction would be conducted to identify possible adverse effects and construction practices modified to minimize effects on agricultural drainage as needed (Delta Conveyance Design and Construction Authority 2022a, 2022b).

Modeling conducted to simulate operations show that changes in agricultural drainage relative to the existing conditions baseline used in the Delta Conveyance Project Draft EIR (California Department of Water Resources 2022) may slightly increase agricultural drainage over the simulated period. For further description of the effects of operations see Delta Conveyance Project Draft EIR, Chapter 8, *Groundwater* (California Department of Water Resources 2022). Implementation of Mitigation Measure GW-5: *Increases in Groundwater Elevations Near Project Intake Facilities Affecting Agricultural Drainage* would further reduce risks of effects on agricultural drainage.

Implementation of compensatory mitigation resulting in the creation of the wetlands and other habitats on Bouldin Island, the I-5 ponds (Ponds 6, 7, and 8), and in the North Delta Arc would likely result in increased groundwater levels at areas in the vicinity of the new habitats. These increased groundwater levels, along with increases in groundwater elevations in the study area as a result of project operations, may affect agricultural drainage in the vicinity of wetlands and other habitats sites. Active management of the new wetlands and habitats (i.e., adjusting amounts of applied water) may be able to address localized changes to groundwater levels, further minimizing impacts on agricultural drainage. Given that most of the proposed habitats to be constructed and managed under the Compensatory Mitigation Plan are either habitats or seasonal or emergent wetlands, the addition of approximately 10 acres of new depressions (lakes or ponds) in a total area of over 6,000 acres represents an increase of approximately 0.17%.

Based on the information presented above, including the proposed mitigation measures, the potential for the action alternatives to increase groundwater elevations near project intake facilities affecting agricultural drainage does not appear to be significant.

Impact GW-6: Damage to Major Conveyance Facilities Resulting from Land Subsidence

No Action Alternative

Effects resulting from the No Action Alternative would be the same as described for Impact GW-1.

All Action Alternatives

The primary mechanism for land subsidence as a result of groundwater extraction is the removal of groundwater in or below geologic strata dependent on interstitial hydrologic pressures to support the aquifer framework. This typically occurs in fine-grained units, such as those containing clays and silts, and the removal of water from those zones results in the compression of the unit when the groundwater supporting the aquifer framework is extracted. In the study area, this effect is predominantly seen in the San Joaquin Valley, with land subsidence occurring as a result of groundwater extractions occurring below the Corcoran Clay layer. Dewatering for construction would occur in the upper portion of the groundwater basin to a maximum depth of approximately 165 feet, which is shallower than the depth to the Corcoran Clay in the southern portion of the alignment. Additionally, reductions in groundwater elevations as a result of operations as simulated by the DeltaGW Model show that groundwater elevation declines of greater than 5 feet occur less than 1% of the time, or 1 year of the 94-year simulation period from 1922 to 2015. Groundwater extractions from this depth are not sub-Corcoran and therefore would not induce land subsidence and related effects on facilities resulting from aquifer compaction below the Corcoran Clay. As a result, potential for land subsidence due to the action alternatives would be minimal.

Based on the information presented above, the potential for all action alternatives to damage major conveyance facilities resulting from land subsidence does not appear to be significant.

Impact GW-7: Degradation of Groundwater Quality

No Action Alternative

Effects resulting from the No Action Alternative would be the same as described for Impact GW-1.

All Action Alternatives

Groundwater quality effects could result from (1) construction practices, (2) the migration of existing groundwater contaminant plumes toward supply wells due to changes in groundwater flow paths occurring during construction and/or operations, and/or (3) the inducement of the migration of poorer-quality (i.e., higher saline) water into the areas of higher-quality groundwater. The use of best management practices during construction would minimize potential effects on groundwater quality.

Operations of the action alternatives simulated by the DeltaGW Model show minimal changes to groundwater levels, and as previously described, the use of slurry walls would minimize changes to shallow groundwater levels. For further description of the effects of operations see Delta Conveyance Project Draft EIR, Chapter 8, *Groundwater* (California Department of Water Resources 2022).

Based on the information presented above, the potential for the action alternatives to degrade groundwater quality does not appear to be significant.

3.11.2.3 Cumulative Effects

Simultaneous construction of the Delta Conveyance Project along with other projects in the vicinity of the study area could result in marked changes in groundwater gradients that result in the potential drying of neighboring supply wells and potential movement of existing groundwater contamination plumes or could have effects on groundwater, predominantly through the routine transport, use, or disposal of hazardous materials, or the release of hazardous materials into the environment. However, monitoring during construction, along with the recharge of groundwater extracted as part of dewatering operations, would minimize the effects of decline in groundwater levels; and the effects from minor spills or drips would be avoided by thoroughly cleaning up minor spills as soon as they occur. While foreseeable projects have the potential to cause similar effects, it is assumed these projects would also implement similar best management practices and follow all regulations regarding the transport, disposal, and handling of hazardous wastes during construction. Furthermore, as the action alternatives result in the remediation and cleanup of certain hazardous sites and locations within the study area, conditions would improve as a result.

Table 3.11-2 summarizes the plans, policies, and programs that are reasonably expected to occur in the study area in the foreseeable future.

Table 3.11-2. Plans, Policies, and Programs Included in the Cumulative Analysis

Program/Project	Agency	Status	Description of Program/Project	Effects on Groundwater Resources
North Delta Flood Control and Ecosystem Restoration Project	DWR	Final EIR completed in 2010.	Implements flood control and ecosystem restoration benefits in the north Delta.	Potential increase in groundwater levels and groundwater recharge; potential groundwater seepage to adjacent islands/tracts; potential groundwater contamination.
Dutch Slough Tidal Marsh Restoration Project	DWR	Final EIR completed in 2010. Supplemental EIR completed in 2014.	Includes breaching levees and restoring a tidal channel system on parcels between Dutch Slough and Contra Costa Canal.	Potential groundwater intrusion onto adjacent parcels.
Los Vaqueros Reservoir Expansion Project	CCWD, Reclamation, and DWR	Final EIS/EIR completed in 2010 with Final Supplement completed in 2020. Final feasibility report completed in 2020.	Increases the storage capacity of Los Vaqueros Reservoir and divert additional water from the Delta.	Construction of the first phase was completed in 2012 (raising the dam height by 34 feet). The second phase has been evaluated in an EIR/EIS that indicates no adverse effects or less-than-significant effects on groundwater resources.
Eastern San Joaquin Integrated Conjunctive Use Program	Northeastern San Joaquin County Groundwater Banking Authority	Final Programmatic EIR completed in 2011.	Improves the use and storage of groundwater by implementing conjunctive use projects such as water transfers and groundwater banking.	Affects groundwater level fluctuations due to groundwater banking operations; potential groundwater quality effects; mostly beneficial effects; the effects would be located outside of the action alternatives conveyance footprint area.
Grassland Bypass Project	Reclamation, San Luis & Delta-Mendota	Final EIS/EIR completed in 2009.	Reduces effects from agricultural drainage on wildlife refuges and wetlands. Will convey subsurface	Beneficial, neutral, or negligible effects on subsurface agricultural drainage and shallow

Program/Project	Agency	Status	Description of Program/Project	Effects on Groundwater Resources
	Water Authority		agricultural drainage to Mud Slough (tributary of San Joaquin River).	groundwater levels; beneficial effects on groundwater salinity
San Joaquin River Restoration Program	Reclamation, USFWS, NMFS, DWR, and CDFW	Final EIS/EIR completed in 2012.	A direct result of a September 2006 legal settlement by the U.S. Departments of the Interior and Commerce, the Natural Resources Defense Council, and the Friant Water Users Authority to restore spring- and fall-run Chinook salmon (*Oncorhynchus tshawytscha*) to the San Joaquin River below Friant Dam while supporting water management actions within the Friant Division. Public Law 111-11 authorized and directed federal agencies to implement the settlement. Interim flows began October 1, 2009, and full restoration flows are scheduled to begin no later than January 2014. Site-specific improvements are ongoing.	Temporary construction-related effects on groundwater quality; changes in groundwater levels and groundwater quality along San Joaquin River; changes in groundwater levels and groundwater quality in SWP/CVP service areas.
California EcoRestore	DWR, Delta Conservancy, various other state and local agencies, NGOs, and private sector partners	Initiated in 2015.	Accelerates and implements a suite of Delta restoration actions for up to 30,000 acres of fish and wildlife habitat by 2020. Construction of improvements is ongoing.	Potential for direct and indirect effects on groundwater conditions adjacent to tidal habitat restoration sites.
SGMA Implementation	DWR (in collaboration with State Water Board)	Signed into law September 2014.	Defines rules and regulations that DWR needs to implement to help local agencies manage groundwater resources sustainably. GSPs for critically overdrafted groundwater basis were submitted to DWR by January 31, 2020.	SGMA requires the formation of locally controlled GSAs, which must develop GSPs in groundwater basins or subbasins that DWR designates as medium or high priority. This will have a beneficial effect on groundwater resources, as most areas will manage groundwater extractions to not exacerbate further groundwater level declines.
San Francisco Bay Area Integrated Regional Water Management Plan	Bay Area Water Quality and Supply Reliability Program	Final Released September 2013.	An evolving plan that is used to prioritize projects and provide information for projects to be funded by state and federal agencies, such as the Proposition 50 and Proposition 1 projects.	Program identifies local water supply projects to increase water supply reliability in the Bay Area, including for SWP and CVP water users. One of the identified goals is for better conjunctive use and groundwater management. This would have a

Program/Project	Agency	Status	Description of Program/Project	Effects on Groundwater Resources
				beneficial effect on groundwater resources.
Sacramento River Water Reliability Study	Placer County Water Agency	Notice of Preparation in 2003. Project is on hold during recent recession. Reclamation was preparing a joint NEPA document; however, the NEPA process was halted in 2009. The study has been suspended.	Placer County Water Agency, Sacramento Suburban Water District, and the cities of Roseville and Sacramento are investigating the viability of a joint water supply diversion from the Sacramento River, consistent with the Water Forum Agreement to meet planned future growth within the Placer-Sacramento region, maintain reliable water supply while reducing diversions of surface water from the American River in future dry years to preserve the river ecosystem, and enhance groundwater conjunctive management to help sustain the quality and availability of groundwater.	Outcomes of this study could help with improved groundwater and management in the region and reduced effects on groundwater levels and quality.
Harvest Water	Regional San	Project is currently in design. All CEQA documentation is complete.	Harvest Water is being developed by Regional San and has the potential to deliver up to 50,000 AFY of drought-resistant recycled water to irrigate more than 16,000 acres of permanent agriculture and habitat conservation lands near the Cosumnes River and Stone Lakes National Wildlife Refuge. This recycled water would be used in lieu of pumping groundwater. Additionally, Harvest Water proposes to implement wintertime irrigation and wildlife-friendly recharge basins in the project area where the soils are suitable, to provide further groundwater recharge.	Project will offset groundwater use in the area near the intake facilities, helping the groundwater basin move toward and manage for groundwater sustainability and increasing groundwater levels.
In-Delta Storage Project (Delta Wetlands Project)	DWR and Reclamation	Draft Supplemental Report to 2004 Draft State Feasibility Study In-Delta Storage Project completed in 2006.	The In-Delta Storage Project, described in the 2004 Draft State Feasibility Study, would store about 217,000 AF of water in the south Delta for a wide array of water supply, water quality, and ecosystem benefits. The project would consist of two reservoir islands (Webb Tract and Bacon Island), two habitat islands (Holland Tract and Bouldin Island) and four integrated facilities (two facilities on each of the storage islands). Water storage would be created on the islands by strengthening existing levees and building new embankments inside the existing levees. The integrated facilities would control water diversions and releases into and out of the reservoir islands. The facilities-control structures would be	Project is inconsistent with Contra Costa County General Plan Policy for Agricultural Lands and Delta Protection Commission's Land Use Plan Principles for Agriculture and Recreation. Project will also result in conversion of existing agricultural land. Reservoir islands might affect shallow groundwater levels and agricultural drainage patterns.

Program/Project	Agency	Status	Description of Program/Project	Effects on Groundwater Resources
			consolidated to combine all operational components needed to make diversions and releases. The components of each facility would include a fish screen, a transition pool, three inlet/outlet structures, a midbay, a pumping plant and associated conduit, a bypass channel and engineered embankments. This project has been redefined under the Delta Wetlands Project.	
Shasta Lake Water Resources Investigation	Reclamation	Final EIS completed in 2015. Final Feasibility report completed in 2020.	A multiple purpose plan to modify Shasta Dam and Reservoir to increase survival of anadromous fish populations in the upper Sacramento River; increase water supplies and water supply reliability; and, to the extent possible through meeting these objectives, include features to benefit other identified ecosystem, flood damage reduction, and related water resources needs that could result in additional storage capacity of 256,000 to 634,000 AF.	Program identifies water supply plans to maintain and possibly increase water supply reliability for CVP water users, which would indirectly benefit groundwater resources by helping reduce the amount of groundwater that needs to be pumped for agricultural irrigation.
North-of-the-Delta Offstream Storage Investigation	DWR and Reclamation	Draft EIR/EIS completed in 2017. Summary of project description information released in 2021.	Provides offstream storage in the northern Sacramento Valley for improved water supply and water supply reliability, improved water quality, and enhanced survival of anadromous fish and other aquatic species. All alternatives include a new reservoir at the Sites location, with various facilities for water conveyance.	Program identifies water supply plans to maintain and possibly increase water supply reliability for CVP and non-CVP water users. This would help with decreasing the reliance on groundwater supply in dry years.
Upper San Joaquin River Basin Storage Investigation	Reclamation	Draft EIS published in August 2014.	Contributes to restoration of the San Joaquin River, improves water quality of the San Joaquin River, and facilitates additional conjunctive management and water exchanges that improve the quality of water deliveries to urban communities.	Program identifies water supply plans to maintain and possibly increase water supply reliability for CVP and non-CVP water users. This would help with decreasing the reliance on groundwater supply in dry years in the Export Service Areas within the San Joaquin and Tulare groundwater basins.
Riverside-Corona Feeder Conjunctive Use Project	WMWD and Reclamation	Final Supplemental EIS and EIR published in 2011. Final Supplemental EIR/EIS completed in 2012.	Allows WMWD to purchase water from SWP and store up to 40,000 AF of water in the San Bernardino basin area and Chino basin and to extract the water from the groundwater basins. The facilities would convey local water supplies and deliver treated imported water.	Program would maintain and possibly increase water supply reliability for SWP water users, especially in drier years. This program would allow for better conjunctive use and management.
Seawater Desalination	Metropolitan Water	Final Subsequent EIR completed in	Water treatment plant would provide up to 50 mgd of desalinated water.	Program would maintain and possibly increase water

Program/Project	Agency	Status	Description of Program/Project	Effects on Groundwater Resources
Project at Huntington Beach	District of Orange County	2010. Awaiting permits.		supply reliability for SWP water users. This would help with decreasing the reliance on groundwater supply.
Carlsbad Seawater Desalination Plant	San Diego County Water Authority and other water suppliers	Desalination plant is currently operating.	Water treatment plant provides up to 50 mgd of desalinated water.	Program would maintain and possibly increase water supply reliability for SWP water users. This would help with decreasing the reliance on groundwater supply.
Emergency Storage Project	San Diego County Water Authority	Project is operational.	Increases the amount of water stored locally. New water storage and pipeline connections distribute water throughout the region if imported water supplies are reduced. The Emergency Storage Project is expected to meet the county's emergency water needs through 2030.	Program would maintain and possibly increase water supply reliability for SWP water users. This would help with decreasing the reliance on groundwater supply.
Del Puerto Canyon Reservoir	Exchange Contractors, DPWD	Final EIR was certified in 2020 but a CEQA lawsuit filed. The Bureau of Reclamation is currently working on an EIS. Design is pending.	DPWD and the Exchange Contractors are partnering to construct and operate the Del Puerto Canyon Reservoir, an 800-acre reservoir that would store up to 82,000 AF of water. The project will deliver water from the Delta-Mendota Canal into the new reservoir, where it will be stored and released on a carefully managed basis. The reservoir would allow water to be delivered into storage during wetter periods until it is needed in drier periods for irrigation, groundwater recharge, or wildlife beneficial uses (up to 60,000 AFY).	Project will provide additional surface water to offset current groundwater use in the Delta-Mendota Groundwater subbasin. Project may increase water supply reliability for CVP water users, which would indirectly benefit groundwater resources by helping reduce the amount of groundwater that needs to be pumped for agricultural irrigation
San Luis Reservoir Expansion	Reclamation	Draft Appraisal Report published in December 2013. Final Supplemental Environmental Impact Statement completed in 2020.	Increased the storage capacity of San Luis Reservoir (behind B.F. Sisk Dam) to improve the reliability of CVP/SWP water supplies dependent on San Luis Reservoir. Seismic risks under the dam and in the Delta, regulatory constraints to operating Delta export facilities, algae blooms at low water levels, and future climate change have and will reduce the reliability of SWP/CVP deliveries dependent on the San Luis Reservoir.	Program identifies water supply plans to maintain and possibly increase water supply reliability for CVP/SWP water users. This would help with decreasing the reliance on groundwater supply.
South Delta Temporary Barriers Project	DWR	Ongoing Program. Comprehensive Operations Plan and Monitoring Special Study released in 2019.	The program was initiated in 1991 and includes four rock barriers across south Delta channels. The objectives of the project are to increase water levels, improve water circulation patterns and water quality in the southern Delta for local agricultural diversions, and improve operational flexibility of the SWP to help reduce	Program identifies water supply plans to maintain water supply reliability for CVP/SWP water users. This would help with decreasing the reliance on groundwater supply.

Program/Project	Agency	Status	Description of Program/Project	Effects on Groundwater Resources
			fishery effects and improve fishery conditions.	
Implementation of Senate Bill X7-7	DWR	Legislation was adopted in 2009.	This legislation requires the state to achieve a 20% reduction in urban per capita water use by December 31, 2020. Requires each urban retail water supplier to develop urban water use targets; agricultural water suppliers to implement efficient water management practices; and DWR, in consultation with other state agencies, to develop a single standardized water use reporting form.	Reduces water demands for existing water users and reduces projected demands for future growth.
Irrigated Lands Regulatory Program	Central Valley Regional Water Quality Control Board	Program began in 2003 to prevent agricultural runoff from impairing surface waters, and in 2012, groundwater regulations were added to the program.	Regulates discharges from irrigated agricultural lands and prevents agricultural discharges from impairing the waters that receive the discharges. The California Water Code authorizes state and regional water boards to conditionally waive waste discharge requirements if this is in the public interest. On this basis, the Los Angeles, Central Coast, Central Valley, and San Diego regional water quality control boards have issued conditional waivers of waste discharge requirements to growers that contain conditions requiring water quality monitoring of receiving waters. Participation in the waiver program is voluntary; dischargers must file a permit application as an individual discharger, stop discharging, or apply for coverage by joining an established coalition group. The waivers must include corrective actions when impairments are found.	Reduces the potential for groundwater contamination from agricultural practices.
Bay-Delta WQCP Update	State Water Board	Ongoing development.	The State Water Board is updating the 2006 Bay-Delta WQCP in four phases: Phase I: Modifies water quality objectives (i.e., establishes minimum flows) on the Lower San Joaquin River and Stanislaus, Tuolumne, and Merced Rivers to protect the beneficial use of fish and wildlife and (2) modifies the water quality objectives in the southern Delta to protect the beneficial use of agriculture. Phase II: Evaluates and potentially amends existing water quality objectives that protect beneficial uses and the program of implementation to achieve those objectives. Water	Water supplies of water rights users and SWP/CVP water users could be affected if increased instream flow and/or Delta outflow objectives are established in the regulatory process to protect beneficial uses. This could result in increased groundwater pumping and decreased groundwater levels in some areas.

Program/Project	Agency	Status	Description of Program/Project	Effects on Groundwater Resources
			quality objectives that could be amended include Delta outflow criteria. Phase III: Requires changes to water rights and other measures to implement changes to the WQCP from Phases I and II. Phase IV: Evaluates and potentially establishes water quality criteria and flow objectives that protect beneficial uses on tributaries to the Sacramento River.	
Southport Sacramento River Early Implementation Project	USACE	Final EIS, May 2015.	Implements flood risk–reduction measures along the Sacramento River South Levee in the city of West Sacramento. The area of flood risk-reduction extends along the right (west) bank of the Sacramento River south of the Barge Canal downstream 5.6 miles to the South Cross Levee, adjacent to the Southport community of West Sacramento.	Adverse effects on groundwater could result from construction dewatering activities; these effects would be reduced with the implementation of groundwater well-protection measures during construction.

AF = acre-feet; AFY = acre-feet per year; CCWD = Contra Costa Water District; CDFW = California Department of Fish and Wildlife; CEQA = California Environmental Quality Act; CVP = Central Valley Project; Delta = Sacramento–San Joaquin Delta; DPWD = Del Puerto Water District; DPWD = Del Puerto Water District; DWR = California Department of Water Resources; EIR = environmental impact report; EIS = environmental impact statement; Exchange Contractors = San Joaquin River Exchange Contractors Water Authority; GSA = groundwater sustainability agencies; GSP = groundwater sustainability plans; mgd = million gallons per day; NEPA = National Environmental Policy Act; NGO = nongovernmental organization; NMFS = National Marine Fisheries Service; Reclamation = Bureau of Reclamation; Regional San = Sacramento Regional County Sanitation District; SGMA = Sustainable Groundwater Management Act; SGMA = Sustainable Groundwater Management Act; State Water Board = State Water Resources Control Board; SWP = State Water Project; USACE = U.S. Army Corps of Engineers; USFWS = U.S. Fish and Wildlife Service;
WMWD = Western Municipal Water District; WMWD = Western Municipal Water District; WQCP = Water Quality Control Plan.

The simultaneous operation of the Delta Conveyance Project along with other projects in the vicinity of the study area are anticipated to have more beneficial effects on groundwater than adverse effects. For a complete analysis of the cumulative effects of operation of the action alternatives on groundwater see the Delta Conveyance Project Draft EIR Chapter 8, *Groundwater* (California Department of Water Resources 2022).

3.12 Hazards, Hazardous Materials, and Wildfire

This section describes the affected environment for hazards, hazardous materials, and wildfire and analyzes effects that could occur in the study area from construction, operation, and maintenance of the action alternatives, as well as the No Action Alternative. Mitigation and minimization measures that would avoid, minimize, rectify, reduce, or compensate potentially adverse effects are included as part of each action alternative. Additional information on the affected environment, methods, and the anticipated effects of the action alternatives can be found in Delta Conveyance Project Draft EIR Chapter 25, *Hazards, Hazardous Materials, and Wildfire* (California Department of Water Resources 2022).

3.12.1 Affected Environment

The study area for the analysis of hazards, hazardous materials, and wildfire includes the construction footprint and a 0.25-mile buffer beyond the construction footprint to include sites with known or suspected hazardous materials contamination. Existing and proposed schools in the study area were also identified because children are generally more susceptible to the adverse effects of exposure to toxic chemicals and other pollutants. Airports within 2 miles of the construction footprint were also identified to assess the risk of the action alternatives interfering with aircraft operations due to the presence of high-profile construction equipment and the potential for the action alternatives to increase the risk of bird-aircraft strikes.

The study area includes a multi-use landscape, with agriculture accounting for approximately 75% of land use in the study area. Other land uses include industrial/manufacturing, transportation, recreation, habitat conservation, and residential. The study area also contains a variety of roads, transportation facilities, waterways and canals, utilities, petroleum production and processing facilities, urban lands, and other structures.

The Delta Conveyance Project Draft EIR Chapter 25, *Hazards, Hazardous Materials, and Wildfire*, Section 25.1, *Environmental Setting* (California Department of Water Resources 2022), presents a detailed description of naturally occurring hazards and hazards from past and present human activities (e.g., agricultural practices, oil and gas production, mining, urban development, and hazardous materials transportation) known to be present in the study area.

3.12.2 Environmental Consequences

This section describes the assessment methods used to analyze potential environmental effects and identifies the direct, indirect, and cumulative effects associated with hazards, hazardous materials, and wildfire during construction, operation, and maintenance of the action alternatives, as well as the No Action Alternative.

3.12.2.1 Methods for Analysis

Potential effects resulting from the action alternatives would be generated and/or created by reasonably foreseeable accident conditions involving the release of hazardous materials; routine transport, use, and disposal of hazardous materials; construction activities; and routine operation and maintenance activities. The analysis methodology was developed by reviewing previous documents prepared for the study area, including the Department of Toxic Substances Control's EnviroStor, the State Water Resources Control Board's GeoTracker databases for tracking hazardous waste facilities and sites, engineering project reports and technical memorandums, preliminary engineering drawings pertaining to the construction, operation, and maintenance of the water conveyance-facilities.

The baseline for hazards and hazardous materials includes known hazardous materials facilities and sites that currently exist in the study area. Potential adverse effects related to hazards and hazardous materials were assessed by identifying recognized environmental conditions[23] in the study area.

Construction of the action alternatives could cause effects associated with the creation of hazards and accidental release of hazardous materials, as well as the routine transport, use, and disposal of hazardous materials. Specifically, potential effects would occur if construction resulted in one of the following conditions.

- Encountered contaminated soils, sediment, or groundwater resulting from historical land use practices.
- Released hazardous constituents into the environment as a result of the disturbance of pipelines or other subsurface infrastructure.
- Increased the risk of releases from vehicles carrying hazardous materials to construction sites and from rerouting vehicles carrying hazardous materials around the construction activities.
- Improperly used and/or disposed of hazardous materials.

Engineering drawings found in the Delta Conveyance Final Draft Engineering Project Reports (Delta Conveyance Design and Construction Authority 2022a, 2022b) were reviewed for information on operation and maintenance activities, frequencies, and materials, and expected operations and maintenance parameters that may present hazards to operations and maintenance workers, the public and the environment. These were evaluated to determine if these activities could expose workers, the public, or the environment to hazards or hazardous materials.

Delta Conveyance Project Draft EIR Chapter 25, *Hazards, Hazardous Materials, and Wildfire*, Section 25.3.1, *Methods for Analysis* (California Department of Water Resources 2022), provides additional details on the methods used to analyze potential environmental effects associated with hazards, hazardous materials, and wildfire during construction, operation, and maintenance of the action alternatives.

No Action Alternative

The No Action Alternative describes expected future conditions resulting from a continuation of existing policies and programs by federal, state, and local agencies in the absence of the action alternatives. The No Action Alternative considers projects, plans, and programs that would be reasonably expected to occur in the foreseeable future if the action alternatives were not approved and the purpose and need were not met. Many of these projects, such as construction of desalination plants or water recycling facilities, would involve construction of facilities that would require

[23] A *recognized environmental condition* is defined as hazardous substances or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances into structures or into the ground, ground water, or surface water of a property.

ground-disturbing activities by individual public water agencies to ensure local water supply reliability for its constituents.

Water agencies participating in the Delta Conveyance Project have been grouped into four geographic regions. The water agencies within each geographic region would likely pursue a similar suite of water supply projects under the No Action Alternative. Construction of water supply projects under the No Action Alternative would result in construction of new or expanded facilities (e.g., desalination plants, water recycling facilities, groundwater recharge and recovery systems, etc.) that could result in exposing people and the environment to hazards and hazardous materials through various means described below.

Construction could involve ground-disturbing activities that would require equipment for earthmoving. The use of these types of equipment and vehicles would involve the handling and use of different quantities of commonly used materials, such as fuels, lubricants, and oils, to operate equipment. Accidental releases of small quantities of these substances during construction could result in a potential safety hazard through soil, water, or air contamination.

Hazardous emissions and accidental release or combustion of hazardous materials near schools could result in health risks or other dangers to students. This could occur for any of the project types, regardless of region if the project is near schools or other sensitive receptors.

During construction, contaminated soils, sediments, and groundwater may be encountered where historical releases have occurred, such as former gasoline stations, farms, mining sites. Ground-disturbing activities in these areas could expose workers and the public to contaminants that are harmful to human health. Also, demolition of older buildings and handling of certain structure components have the potential to release lead particles and asbestos fibers to the air where they may be inhaled by construction workers and the public.

Construction or operations of any of the project types, regardless of region, that include equipment or structures 200-feet tall within 2 miles of an airport, would have the potential to interfere with the airspace of an airport. Other water reliability projects might consider surface water storage as a means to provide flexibility during dry years. If located within 2 miles of a public airport, the creation of large waterbodies could serve as a wildlife attractant, potentially endangering local aircraft due to the possibility of bird strike incidents.

It is unlikely operations for any of the project types would impair or interfere with any adopted emergency response or evacuation plans. However, during construction, projects could cause temporary changes in emergency access because of potential lane closures or detours that could result in interference with the designated evacuation routes and emergency service vehicles.

Project proximity to various wildfire responsibility and risk locations determines the potential for wildland fire risks. Project construction would involve the use of heavy equipment, welding, and other activities that have potential to ignite fires. Increase in human presence in a wildland/urban interface also has the potential to increase fire risks (e.g., smoking, handling of combustible chemicals).

These effects could occur for any of the project types. The magnitude of effect would be determined by the size of the project, the location, and compliance with the local CUPA, Cal/OSHA, DTSC, and USEPA regarding the use, storage, and disposal of hazardous materials.

3.12.2.2 Effects and Mitigation

Impact HAZ-1: Create a Substantial Hazard to the Public or the Environment through the Routine Transport, Use, or Disposal of Hazardous Materials

No Action Alternative

Projects under consideration in the study area could have effects related to hazards and hazardous materials. Construction, operation, and maintenance of these projects involve the occasional use of potentially hazardous materials, such as fuels, lubricants, solvents, and oils, to operate equipment. Accidental releases of these substances could contaminate soils and degrade the quality of surface water and groundwater, or be released into the air (e.g., fumes, dust), resulting in a potential public safety hazard. However, use of potentially hazardous materials is typically intermittent and infrequent. Further, because each of the projects implemented under the No Action Alternative would be required to undergo an environmental compliance process (i.e., pursuant to NEPA and or/ CEQA), it is assumed that these projects would comply with applicable laws and regulations related to hazards and hazardous materials (e.g., regulations enforced by California Unified Program Agencies (CUPA) and California Division of Occupational Safety and Health (Cal/OSHA) related to the transport, use, and disposal of hazardous materials. In addition, it is assumed that projects would comply with site-specific stormwater pollution protection plans (SWPPPs) and implement standard best management practices, which would further reduce the potential for accidental spills or fires involving the use of hazardous materials or equipment.

All Action Alternatives

Construction of any of the action alternatives would involve the routine transport, use, and disposal of different quantities of commonly used hazardous materials, such as fuels, lubricants, and oils, to operate equipment. Fuel, lubricants, and other hazardous materials stored on-site would be used in equipment, such as compressors, generators, pile drivers, cranes, forklifts, excavators, pumps, or soil compactors. Hazardous materials, including paints, solvents, and sealants, would be used in construction of water-conveyance facilities features (e.g., intakes, pumping plants, conveyance piping). Equipment maintenance activities during ongoing operations would likely include rebuilding pumps or motors, maintaining equipment hydraulic systems, making minor engine repairs and routine lubrication, and replacing worn parts. Spills and releases could occur during transfer and use of these materials in the construction footprint and over water or adjacent to waterways. Spills and other accidental releases of degreasers, fuels, oils, or lubricants could result in minor, temporary hazards to workers immediately adjacent to these releases.

The transport, use, and disposal of hazardous materials during construction would be temporary and would not be considered routine. During operations and maintenance, these activities would be compliant with regulations enforced by CUPA and Cal/OSHA and with other applicable laws and regulations, as discussed in Appendix G, *Potentially Relevant Laws, Regulations, and Programs*. The action alternatives include environmental commitments such as EC-2: *Develop and Implement Hazardous Materials Management Plans*, which would provide detailed information on hazardous materials used and stored and protocols to reduce likelihood of a spill of toxic chemicals, EC-3: *Develop and Implement Spill Prevention, Containment, and Countermeasure Plans*, which requires that personnel be trained in emergency response and spill containment techniques, and Project Component 3B.2.1: *Disposal of Reusable Tunnel Material*, which includes testing of RTM to further reduce exposure to the potential of hazardous materials. In addition, the implementation of

Environmental Commitment EC-4b: *Develop and Implement Stormwater Pollution Prevention Plans*, as described under the SWPPP would further reduce the potential for accidental release or exposure during construction and operation through weekly site inspections and maintaining equipment and materials necessary for spill cleanup.

While there would be no difference in the nature of the potential effects between the action alternatives, the magnitude of potential effects may be greater under Alternatives 2b, 3, 4b, and DWR's Preferred Alternative because construction of these alternatives would occur over a longer duration (13 years) than Alternative 1 (12 years).

Based on the information presented above, including the proposed environmental commitments, the potential for construction of all action alternatives to create a substantial hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials does not appear to be significant.

Impact HAZ-2: 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

No Action Alternative

Any future levee construction, improvements, and maintenance, and habitat restoration project would involve ground-disturbing activities and/or could require dewatering areas during construction. Ground-disturbing activities such as excavation and dewatering could expose workers to previously unknown soil and/or groundwater contaminants, respectively. Structure demolition could result in the release or disturbance of hazardous building materials such as asbestos or lead-based paint. Compliance with the same regulatory scheme described above, however, would reduce the potential to expose workers or the environment to contaminants. It is assumed that project proponents would apply required measures such as health and safety plans for workers, soil and groundwater testing where contamination is indicated, and would consult government databases of hazardous materials facilities to identify potentially contaminated sites. These measures would reduce the potential to expose workers or the environment to contaminants.

All Action Alternatives

Construction of any of the action alternatives could create a hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials during construction of conveyance facilities. Potential effects include exposure to potentially toxic substances used for equipment and vehicle use and maintenance during construction; adverse health effects from handling RTM, soil conditioners, and contaminated soil and/or groundwater from previously unidentified waste sites, gas, and oil wells; exposure to soil and or groundwater contamination from the use of agricultural chemicals; exposure to flammable gasses and hydrocarbons during tunneling; and exposure to heavy metals and other soil contaminants near railroad tracks. Small quantities of potentially toxic substances (such as petroleum and other chemicals used to operate and maintain construction equipment) would be transported to and from the area during construction.

Compliance with standard best management practices as part of the SWPPP, testing RTM in accordance with requirements of the Central Valley Regional Water Quality Control Board and the Department of Toxic Substance Control, preconstruction surveys to identify gas and oil wells, implementing gas monitoring and fire prevention requirements as mandated by Cal/OSHA, use of preferred designated hazardous materials routes, and implementing Mitigation Measure HAZ-2: *Perform a Phase I Environmental Site Assessment Prior to Construction Activities and Remediate* by conducting a phase I environmental site assessment in conformance with the American Society for Testing and Materials Standard Practice E1527-05 prior to construction would reduce the severity of potential adverse effects. The action alternatives also include environmental commitments such as EC-2: *Develop and Implement Hazardous Materials Management Plans*, which includes protocols for proper handling and storage of contaminated soil, EC-3: *Develop and Implement Spill Prevention, Containment, and Countermeasure Plans*, which requires compliance with applicable legal requirements in relation to recovered materials. The project also includes best management practices for the disposal of RTM, which includes testing of RTM to further reduce exposure to hazardous materials (Appendix C, *Description of the Proposed Project and Alternatives*).

Based on the information presented above, including proposed environmental commitments, the potential for construction of all action alternatives to create a significant hazard to the public or the environment from the release of hazardous materials does not appear to be significant.

Impact HAZ-3: Expose Sensitive Receptors at an Existing or Proposed School Located within 0.25 Mile of Project Facilities to Hazardous Materials, Substances, or Waste

No Action Alternative

The potential for hazardous emissions and accidental release of hazardous materials near existing and proposed schools is similar for most projects involving the use and storage of hazardous materials during either construction or operations. Projects would undergo environmental review and be required to identify and assess the risks to nearby schools and other sensitive receptors prior to project construction or implementation. It can also be assumed that these projects would comply with applicable laws and regulations related to hazards and hazardous materials.

All Action Alternatives

Except for DWR's Preferred Alternative, there are no public or private K–12 schools within 0.25 mile of proposed water-conveyance facilities. Construction of DWR's Preferred Alternative would occur within 0.25 mile of Mountain House Elementary School (3950 Mountain House Road, Byron). Construction activities could result in the release of hazardous emissions or entail the use of hazardous materials, substances, or waste within 0.25 mile of Mountain House Elementary School. However, compliance with applicable laws and regulations regarding the use and storage of hazardous materials enforced by regulatory agencies such as CUPA and Cal/OSHA, along with implementation of Environmental Commitments EC-2: *Develop and Implement Hazardous Materials Management Plan,* which would provide detailed information on hazardous materials used and stored and protocols to reduce likelihood of a spill of toxic chemicals, EC-3: *Develop and Implement Spill Prevention, Containment, and Countermeasure Plans*, which requires that personnel be trained in emergency response and spill containment technique, and implementation of best management practices as described under the SWPPP (Environmental Commitment EC-4b: *Develop and Implement Stormwater Pollution Prevention Plans*) would reduce the potential for accidental release of or exposure to hazardous materials near the school.

Based on the information presented above, including proposed environmental commitments, the potential for the construction of all action alternatives to release hazardous emissions or hazardous materials near existing and proposed schools would not be significant.

Impact HAZ-4: Be Located on a Site That Is Included on a List of Hazardous Materials Sites Compiled Pursuant to Government Code Section 65962.5 and, as a Result, Create a Substantial Hazard to the Public or the Environment

No Action Alternative

Some projects could be constructed near site(s) that are listed as hazardous materials sites (i.e., Cortese sites). If not previously remediated, ground disturbance or dewatering activities on parcels with potential contaminants, could expose the public or environment to significant hazards. However, projects would be required to undergo environmental review which would identify hazardous waste sites before construction. Existing regulations would ensure that sites containing hazardous materials be cleaned up to existing regulatory standards prior to development.

All Action Alternatives

A preliminary search of the DTSC Hazardous Waste and Substances Sites ("Cortese List"), compiled pursuant to California Government Code Section 65962.5, revealed there are sites in, or within 0.25 mile, of the construction footprint. Majority of the hazardous materials sites identified were related to leaking underground storage tanks and oil and/or gasoline pipeline leaks. Most of the identified sites have completed remediation and their cases have been closed.

The potential for construction activities to encounter hazardous materials at a Cortese site is increased where remediation has not been completed or verified. The following four sites within or near the construction footprint have the potential to expose workers and the public to hazardous materials.

- Southern Pacific Pipeline Shell and KMEP Petroleum Pipeline sites in the eastern alignment for Alternatives 3, and 4b.
- Chevron, Holey-Byron Road, Chevron Old Valley Pipeline, and the Chevron Bruns Property site in the Southern Complex for action Alternatives 1, 2b, 3, and 4b.
- Chevron Bruns Property site in the South Delta Conveyance/Southern Complex for Alternatives 1, 2b, 3, and 4b.
- Stockton Naval Communication Station site in the Bethany Reservoir alignment for DWR's Preferred Alternative.

Compared to the No Action Alternative, ground-disturbing activities or dewatering in areas where Cortese sites that have not been sufficiently remediated could result in exposure of workers and the public to contaminants harmful to human health. Operation and maintenance activities under all action alternatives would occur within the same footprint as construction and would occur after identified Cortese sites were evaluated and, if needed, remediated. Operations and maintenance activities would not expose workers, the public, or the environment to hazardous materials from a known Cortese site because operations and maintenance activities would occur within the same footprint as construction. Additionally, implementation of Mitigation Measure HAZ-2: *Perform a Phase I Environmental Site Assessment Prior to Construction Activities and Remediate,* would require preconstruction investigations to determine the potential for encountering contaminants.

Based on the information presented above, including the proposed mitigation measure, the potential for construction of all action alternatives to encounter hazardous materials and create a substantial hazard to the public or the environment does not appear to be significant.

Impact HAZ-5: Result in a Safety Hazard Associated with an Airport or Private Airstrip

No Action Alternative

Other water reliability projects might consider surface water storage as a means to provide flexibility during dry years. If located within 2 miles of a public airport, the creation of large waterbodies could serve as a wildlife attractant, potentially endangering local aircraft due to the possibility of bird strike incidents. These projects would undergo environmental review that would analyze the potential for the project to interfere with airport operations. If a potential adverse effect is identified project proponents would be required to consult with airports prior to construction. Also, projects would comply with Federal Aviation Administration regulations reducing the potential for conflicts between projects and airport operations.

All Action Alternatives

Eleven public and private airports/heliports are within 2 miles of the construction footprint of all action alternatives. Airspace safety hazards occur when project components, such as buildings or construction equipment, encroach on the airspace of an airport runway. Construction, operations, and maintenance of the action alternatives would not include equipment or structures that would have the potential to interfere with the airspace of these airports. The action alternatives would not require equipment that would exceed 200 feet. Also pursuant to the State Aeronautics Act, the applicant would adhere to Federal Aviation Administration and California Department of Transportation (Caltrans) recommendations, which would reduce the potential for adverse effects on air safety, as would compliance with the recommendations of the federal Obstruction Evaluation/Airport Airspace Analysis (14 CFR Part 77).

Near the Byron Airport where height restrictions are for structures over 100 feet tall, consultation with the Contra Costa Airport Land Use Commission prior to initiating construction activities would ensure any potential effects on the Byron Airport would be minimized.

Byron Airport is also located within 1 mile of the Southern Complex. The Southern Complex includes the Southern Forebay with a water surface of approximately 750 acres. Located northwest of the existing Clifton Court Forebay, the addition of a large waterbody could serve as a bird attractant. More birds near airports could increase the possibility of airplane-bird strikes. Mitigation Measure HAZ-5: *Wildlife Hazards Management Plan and Wildlife Deterrents* would reduce hazards to aircrafts from birds by requiring consultation with the Contra Costa Airport Land Use Commission, and, if deemed necessary, preparation of a Wildlife Hazards Management Plan by the Byron Airport, and wildlife deterrent measures to reduce, minimize, and/or avoid wildlife hazards on air safety.

Based on the information presented above, including proposed mitigation measures, the potential for all action alternatives to result in a safety hazard associated with an airport or private airstrip does not appear to be significant.

Impact HAZ-6: Impair Implementation of or Physically Interfere with an Adopted Emergency Response Plan or Emergency Evacuation Plan

No Action Alternative

Projects involving construction could result in short- term, temporary traffic delays on existing roads potentially interfering with implementation of an emergency response plan and delay emergency responders. Projects would require environmental review which would identify potential conflicts with a local jurisdiction's emergency plans or evacuation routes. If needed, projects would prepare TMPs, which could include measures such as signage, notifications, flaggers, and coordination with local jurisdictions. Preparation of TMPs and compliance with existing local requirements would ensure continued emergency and evacuation route access.

All Action Alternatives

Each local jurisdiction in the study area has policies, regulations, and plans related to emergency response and evacuation. Local emergency response plans identify specific routes for emergency evacuations. Construction of any action alternative could result in temporary traffic delays on existing roads used to access water-conveyance facilities and infrastructure, and consequently, could interfere with implementation of an emergency response plan and delay emergency responders. Effects of the action alternatives on emergency plans and evacuation routes would be reduced by transportation facility improvements, including construction of access roads to serve the action alternatives, early coordination with local jurisdictions, emergency facilities, and compliance with all local plans pertaining to emergency evacuations. Mitigation Measure TRANS-1, which requires preparation and implementation of a TDM plan, would further reduce potential effects on emergency responders. Operations and maintenance of facilities could increase traffic on local roads; however, these activities would be spread over 24 hours and consist of a relatively low number of individuals with few vehicles and equipment and, therefore, would not likely affect emergency access or evacuation routes.

Based on the information presented above, including proposed mitigation measures, the potential for all action alternatives to impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan does not appear to be significant.

Impact HAZ-7: Expose People or Structures, Either Directly or Indirectly, to a Substantial Risk of Loss, Injury, or Death Involving Wildland Fires

No Action Alternative

Construction and maintenance activities for any project could involve the use of flammable chemicals, such as fuels and solvents, which could be inadvertently ignited by sparks from equipment/machinery if proper safety measures were not employed. Projects would require environmental review, which would identify if conditions near a project would result in exposure of people or structures to risk of wildfire. It is assumed that projects would comply with all pertinent fire prevention laws and regulations including Cal/OSHA fire prevention and safety standards. These standard fire safety and prevention measures would reduce risks associated with exposure to wildfire.

All Action Alternatives

Construction of any action alternative would involve using heavy equipment, welding, and conducting other activities that have potential to ignite wildland fires. Construction of any action alternative would involve the presence of personnel and equipment, both of which could inadvertently start a fire. The magnitude of potential effects may be greater under Alternatives 3, 4b, and DWR's Preferred Alternative because construction of this alternative would take longer and thereby require the presence of personnel and equipment for a longer duration. Operations and facility maintenance would consist of activities such as painting, cleaning, repairs, and other routine tasks. Some of these activities would involve the use of flammable chemicals, such as fuels and solvents, which could be inadvertently ignited by sparks from equipment/machinery if proper safety measures were not employed.

No portion of the study area would be in or near an area designated as a High or Very High Fire Hazard Severity Zone. Additionally, measures to prevent and control wildland fires would be implemented during construction, operation, and maintenance of the water-conveyance facilities in full compliance with Cal/OSHA standards for fire safety and prevention. EC-5: *Develop and Implement a Fire Prevention and Control Plan* would further reduce effects related to wildland fires.

Based on the information presented above, including the proposed environmental commitment, the potential for all action alternatives to expose people or structures, either directly or indirectly, to a substantial risk of loss, injury, or death involving wildland fires does not appear to be significant.

3.12.2.3 Cumulative Analysis

Simultaneous construction of the Delta Conveyance Project and other projects in the vicinity could result in hazards to the public through the routine transport, use, or disposal of hazardous materials, or the release of hazardous materials into the environment. However, effects from minor spills or drips would be avoided by thoroughly cleaning up minor spills as soon as they occur. While foreseeable projects have the potential to cause similar effects, it is assumed these projects would also implement similar best management practices and follow all regulations regarding the transport, disposal, and handling of hazardous wastes during construction. Furthermore, because any of the action alternatives would result in the remediation and cleanup of certain hazardous sites and locations in the study area, conditions would improve as a result.

The plans, policies, and programs included in the cumulative analysis are summarized in Table 3.12-1, along with their anticipated effects regarding hazards and hazardous materials and wildfire.

Table 3.12-1. Plans, Policies, and Programs Included in the Cumulative Analysis

Program/Project	Agency	Status	Description of Program/ Project	Effects on Hazards, Hazardous Materials, and Wildfire
Lower Mokelumne River Spawning Habitat Improvement Project	EBMUD	Ongoing	Placement of 4,000 to 5,000 cubic yards of salmonid spawning gravel annually for a 3-year period at two specific sites, and then annual supplementation of 600 to 1,000 cubic yards thereafter.	Hazardous material effects associated with the use of chemicals, such as diesel fuel and oil in machinery during construction. Wildfire effects due to increased presence of construction personnel.

Program/Project	Agency	Status	Description of Program/ Project	Effects on Hazards, Hazardous Materials, and Wildfire
Lookout Slough Tidal Habitat Restoration Project	DWR and Ecosystem Investment Partners	DWR certified EIR November 2020	Tidal restoration project located in the Cache Slough area of the Delta northwest of Liberty Island. Project goals are to restore approximately 3,400-acre site to a tidal wetland, creating habitat and producing food for delta smelt and other listed fish species.	Hazardous material effects associated with the use of chemicals, such as diesel fuel and oil in machinery during construction. Wildfire effects due to increased presence of construction personnel.
Lower Yolo Ranch Restoration Project	DWR and SFCWA	Ongoing	Project is near Liberty Island in the Delta and would restore about 1,670 acres on a site that has historically been used for pasture/cattle grazing.	Hazardous material effects associated with the use of chemicals, such as diesel fuel and oil in machinery during construction. Wildfire effects due to increased presence of construction personnel.
Lower Cache Creek/Woodland Flood Risk Management Project	City of Woodland, USACE, DWR, CVFPB	Ongoing	Project would identify and implement flood-risk-reduction measures to meet the state's urban level of protection requirements. Project components include secondary earthen levees and a diversion channel to redirect overland flood flows into the Yolo Bypass, modification of the Cache Creek Settling Basin to allow conveyance of flood flows into the Yolo Bypass, and various bridge and/or culvert improvements to facilitate conveyance of flood flows in the diversion channel.	Hazardous material effects associated with the use of chemicals, such as diesel fuel and oil in machinery during construction. Wildfire effects due to increased presence of construction personnel.

EBMUD = East Bay Municipal Utility District; DWR = California Department of Water Resources; SFCWA = State and Federal Contractors Water Agency; USACE = U.S. Army Corps of Engineers; CVFPB = Central Valley Flood Protection Board.

Although the action alternatives and the cumulative projects would introduce new facilities and personnel into the study area, it would not contribute to wildland fire risk because the action alternatives would develop and implement a fire prevention and control plan that would further reduce effects related to wildland fires. Additionally, existing regulations would be in place to minimize fire hazards. These measures reduce fire risks associated with construction and operations. Similar practices can be assumed for foreseeable projects in the area. Consequently, the risk of loss, injury, or death involving wildland fires as a result of construction, in concert with other foreseeable projects, would be low.

3.13 Land Use

This section describes the affected environment for land use and analyzes effects that could occur in the study area from construction, operation, and maintenance of the action alternatives, as well as the No Action Alternative. Mitigation and minimization measures that would avoid, minimize, rectify, reduce, or compensate potentially adverse effects are included as part of each action alternative. Additional information on the affected environment, methods, and the anticipated effects of the action alternatives can be found in Delta Conveyance Project Draft EIR Chapter 14, *Land Use* (California Department of Water Resources 2022).

3.13.1 Affected Environment

The study area primarily comprises the statutory Delta, as delineated under the Delta Protection Act (Wat. Code § 12220), as well as a few areas east and southwest of this boundary to include areas around Bethany Reservoir for DWR's Preferred Alternative.

Existing land uses in the study area are identified and characterized based on recent aerial imagery and county and city general plans. General plan land use designations for six counties and four cities are discussed in Appendix G, *Potentially Relevant Laws, Regulations, and Programs*. Several unincorporated towns are also in the study area; however, county designations, goals, and policies guide land use in these communities. The study area includes land under the jurisdiction of Alameda, Contra Costa, Sacramento, San Joaquin, Solano, and Yolo Counties. Table 3.13-1 characterizes the existing land uses for each county in the study area.

Table 3.13-1. Existing Land Uses in the Study Area

Jurisdiction	Acres in Study Area	Cities	Unincorporated Towns	Existing Land Uses
Alameda County	6,348	N/A	N/A	Agricultural, Open Space, Bethany Reservoir
Contra Costa County	105,975	Antioch, Brentwood, Oakley, Pittsburg,	Bay Point, Bethel Island, Byron, Discovery Bay, Knightsen	Agricultural, Rural, Suburban Residential, Commercial, Light Industrial, Open Space, Franks Tract State Recreation Area
Sacramento County	120,304	Sacramento, Elk Grove, Isleton	Courtland, Freeport, Hood, Ryde, Locke, Walnut Grove	Agricultural, Rural, Suburban Residential, Commercial, Light Industrial, Open Space, Stone Lakes National Wildlife Refuge, Brannan Island State Recreation Area, Lower Sherman Island Wildlife Management Area
San Joaquin County	313,997	Lathrop, Lodi, Stockton, Tracy	Country Club, Discovery Bay, Lincoln Village, Mountain House,	Agricultural, Open Space, Rural Residential

Jurisdiction	Acres in Study Area	Cities	Unincorporated Towns	Existing Land Uses
			Terminous, Thornton.	
Solano County	92,388	N/A	N/A	Agricultural, Open Space, Suburban Residential, Rural Residential, Suisun Marsh
Yolo County	88,490	West Sacramento	Clarksburg	Yolo Bypass Wildlife Area

N/A = not applicable.

Predominantly, the areas where land use effects would occur coincide with the temporary and permanent footprints of disturbance associated with construction of water-conveyance and related facilities. Although the study area includes several cities, towns, and communities within the broader geography of the statutory Delta, local land use effects are analyzed only within and adjacent to the temporary and permanent footprints of disturbance associated with the construction of each action alternative. Appendix G, *Potentially Relevant Laws, Regulations, and Programs,* provides a detailed description of the goals, objectives, and policies from the general plans and other regulations and plans of agencies with jurisdiction over land uses in the study area.

3.13.2 Environmental Consequences

This section describes the assessment methods used to analyze potential environmental effects and identifies the direct, indirect, and cumulative land use effects associated with the action alternatives, as well as the No Action Alternative.

3.13.2.1 Methods for Analysis

Potential temporary, permanent, direct, and indirect land use effects were assessed based on the compatibility of constructing and operating the action alternatives with the existing and planned land uses in the study area. For purposes of determining the potential acreages of land uses affected, a base map of designated land uses in the study area was generated from an aggregate of generalized land use designations from county and city general plans. For purposes of determining land use compatibility, analysts reviewed aerial imagery to identify existing structures in the study area. Structures include residences, storage or support facilities relating to agricultural operations, recreational (both public and private) facilities, and other types of infrastructure.

Generally, state and federal agencies, as well as some local or regional agencies involved with the location or construction of facilities for the production, generation, storage, treatment, or transmission of water, are not subject to local land use regulations, and inconsistency with a specific local land use regulation is not by itself an adverse effect on the environment.[24] Project compatibility and potential effects on planned future land uses were assessed by reviewing land use designations, goals, and policies described in Appendix G, *Potentially Relevant Laws, Regulations, and Programs.*

The evaluation of effects of construction activities considered all of the construction activities together because the effects of specific construction activities would not have markedly different

[24] See, e.g., *Hall v. Taft* (1956), 47 Cal.2d 177, 183; *Town of Atherton v. Superior Court* (1958) 159 Cal.App.2d 417, and *Lawler v. City of Redding* (1992) 7 Cal.App.4th 778, 784.

effects. Features of the proposed facilities that would remain following the completion of construction activities, such as the intake sites (e.g., sedimentation basin, pumping buildings), shaft pad sites, transportation infrastructure improvements (e.g., roadway widenings, new/expanded roadway interchanges), and Southern Forebay (e.g., pumping plant, reservoir embankments, the forebay proper) were evaluated for permanent effects on land use because changes in land use occurring as a result of construction and operation of these facilities would last the lifetime of the operation of the selected action alternative. Activities or physical footprints resulting in effects limited to the period of active construction at a given site are temporary or short-term effects. Indirect land use effects may also arise from changes in access to parcels of land.

No Action Alternative

Under the No Action Alternative, lands would largely continue to be used in a similar manner as under existing conditions. DWR would continue to operate the SWP to divert, store, and convey SWP water consistent with applicable laws and contractual obligations. Similarly, under the No Action Alternative, current operations of the CVP would be maintained. The No Action Alternative takes into account projects, plans, and programs that would be reasonably expected to occur in the foreseeable future if none of the action alternatives were approved and the proposed action's purpose and need were not met.

Water agencies participating in the Delta Conveyance Project have been grouped into four geographic regions. The water agencies within each geographic region would likely pursue a similar suite of water supply projects under the No Action Alternative. Construction of water supply projects under the No Action Alternative would result in construction of new or expanded facilities (e.g., desalination plants, water recycling facilities, groundwater recharge and recovery systems) that could result in changes to land use.

Many of these projects, such as of desalination plants or water recycling facilities, would involve construction of facilities which would require changes to existing land uses by individual public water agencies to ensure local water supply reliability for its constituents. While it cannot be anticipated what ultimate suite of projects would be constructed and operated under the No Action Alternative, generally, they may result in land use effects if they result in the conversion of land for the construction and operation of water supply–reliability projects in locations where they do not exist currently and where such uses may run counter to the existing land use designations, goals or policies or where the projects may require the displacement of existing structures or create a permanent new feature in an existing community.

3.13.2.2 Effects and Mitigation

Impact LU-1: Incompatibility with Applicable Land Use Designations, Goals, and Policies as a Result of the Proposed Action

No Action Alternative

Foreseeable land use changes associated with the No Action Alternative in the study area could be incompatible with applicable land use designations, goals, and policies. Habitat restoration or development projects would take place on land governed by policies designed to avoid or mitigate environmental effects, as identified in the Delta Protection Commission's *Land Use and Resource Management Plan for the Primary Zone of the Delta* (LURMP) (Delta Protection Commission 2010) and the DSC's *Delta Plan* (Delta Stewardship Council 2019). The *Delta Plan* policies most closely associated with land use are ER P2 (Restore Habitats at Appropriate Elevations), ER P3 (Protect Opportunities to Restore Habitat), DP P1 (Locate New Urban Development Wisely), and DP P2 (Respect Local Land Use When Siting Water or Flood Facilities or Restoring Habitats). Depending on its location and other characteristics, habitat restoration and urban development projects may result in incompatibilities with these policies and with local land use plans.

All Action Alternatives

Construction of the water-conveyance infrastructure for any of the action alternatives would result in temporary and permanent changes in land use in the study area, which may be incompatible with the general land uses presently designated in these areas. The total area of temporary land use changes ranges from 1,235 acres for Alternative 2b, to 1,457 acres for Alternative 3. The total area of permanent land use acquisition ranges from 1,277 acres for DWR's Preferred Alternative, to 2,924 acres for Alternative 1. Most land that would be temporarily and permanently devoted to construction of the water-conveyance facilities is designated for agricultural use. The area of agricultural land temporarily used for construction ranges from 924 acres for Alternative 2b to 1,293 acres for DWR's Preferred Alternative. The area of agricultural land permanently used for water-conveyance facilities ranges from 648 acres for Alternative 4b, to 1,255 acres for Alternative 1. Depending on the action alternative considered, effects on agricultural land uses account for anywhere between 75% and 93% of total temporary land used and 31% to 88% of total permanent land used. See Section 3.2, *Agricultural Resources*, for a detailed evaluation of potential effects on agricultural lands and activities in the study area.

A notable portion of all land that would be temporarily and permanently used for the construction of the water-conveyance facilities is generally designated for recreational use. The area of recreational land use temporarily used for construction of the action alternatives ranges from 24 acres for DWR's Preferred Alternative, to 185 acres for Alternative 1. The area of recreational land permanently devoted to water-conveyance facilities ranges from 0 acres for DWR's Preferred Alternative, to 1,237 acres for Alternative 3. See Section 3.16, *Parks and Recreation*, for a detailed evaluation of potential effects on recreation in the study area. In addition to agricultural and recreational land use designations, the action alternatives would use small amounts of lands generally designated for open space, public/semi-public, residential, and industrial use.

LURMP policies that apply to the action alternatives include Land Use P-7 and P-14 and Agriculture P-2. Land Use P-7 declares that new structures should be set back from levees. Intake structures require contact with water and cannot feasibly be set back from levees. Additionally, Land Use P-14 states that agricultural lands converted to water impoundment may not result in seepage of water and that such conversions must mitigate associated risks and effects. The Southern Forebay constructed for Alternatives 1, 2b, 3, and 4b would avoid and mitigate for the effects of seepage, as described in Section 3.11, *Groundwater*, which presents effects and mitigation measures related to forebay design that would ensure compatibility with this policy. LURMP Policy Agriculture P-2 suggests that agricultural land conversion should occur first where productivity and values are lowest. As discussed in Section 3.2, *Agricultural Resources*, some higher-value agricultural land would be converted under construction and operation of proposed water-conveyance facilities. While incompatibilities with LURMP policies Land Use P-7 and Agriculture P-2 could occur, actions taken by the state are not subject to consistency with the LURMP.

Indirect effects on land use may also arise through incompatibilities with land subject to Williamson Act contracts or in Farmland Security Zones. Section 3.2, *Agricultural Resources*, discusses the potential for conflicts with Williamson Act contracts or in Farmland Security Zones.

Some of the construction activities may also result in incompatibilities with airport land use plans. Where those incompatibilities may result in hazards, they are discussed in Section 3.12, *Hazards, Hazardous Materials, and Wildfire.*

Operation and maintenance of these structures and facilities would not convert additional existing designated land uses to an incompatible use or conflict with existing land use plans and policies beyond the effects anticipated to occur during construction.

Table 3.13-2 presents the area of temporary and permanent surface disturbance from the construction of the water-conveyance facilities and the general land designations on which they would occur, and the number of acres that would be affected.

1 **Table 3.13-2. Land Use Designations (acres) inside the Water-Conveyance Footprints**

	Temporary Effects								Permanent Effects							
County	Agriculture	Commercial	Industrial	Open Space	Public/ Semi-Public	Recreation	Residential	Subtotal	Agriculture	Commercial	Industrial	Open Space	Public/ Semi-Public	Recreation	Residential	Subtotal
Alternative 1. Central Alignment, 6,000 cfs, Intakes B and C																
Alameda	–	–	–	–	4	–	–	4	41	–	–	–	18	–	–	58
Contra Costa	184	0	–	1	35	185	–	406	143	0	–	20	104	1,237	–	1,504
Sacramento	694	0	–	3	–	–	7	705	431	0		0	0	0	15	446
San Joaquin	224	3	0	75	–	–	–	302	641	4	2	269		–	0	917
Subtotal	1,102	3	0	79	39	185	7	1,416	1,255	4	2	289	122	1,237	15	2,924
Alternative 2b. Central Alignment, 3,000 cfs, Intake B																
Alameda	–	–	–	–	4	–	–	4	40	–	–	–	18	–	–	58
Contra Costa	184	0	–	1	35	185	–	406	143	0	0	20	104	1,237	0	1,504
Sacramento	520	0	–	3	–	–	5	528	179	0	–	0	0	0	6	185
San Joaquin	220	3	0	75	–	–	–	298	571	4	2	269	–	–	0	846
Subtotal	924	3	0	79	39	185	5	1,235	933	4	2	289	122	1,237	6	2,593
Alternative 3. Eastern Alignment, 6,000 cfs, Intakes B and C																
Alameda	–	–	–	–	4	–	–	4	41	–	–	–	18	–	–	58
Contra Costa	184	0	–	1	35	185	–	406	146	0	0	20	104	1,265	0	1,535
Sacramento	663	0	–	4	–	–	7	674	460	0	–	0	0	0	12	472
San Joaquin	338	1	0	30	3	–	–	373	326	2	2	48	7	–	0	386
Subtotal	1,185	2	–	35	42	185	7	1,457	973	3	2	68	129	1,265	12	2,452
Alternative 4b. Eastern Alignment, 3,000 cfs, Intake B																
Alameda	–	–	–	–	4	–	–	4	41	–	–	–	18	–	–	58
Contra Costa	184	0	–	1	35	185	–	406	143	0	0	20	104	1,237	0	1,504
Sacramento	519	0	–	4	–	–	4	527	179	0	–	0	0	0	3	182
San Joaquin	299	1	0	30	3	–	–	334	286	2	2	48	7	–	0	346
Subtotal	1,001	2	0	35	42	185	4	1,271	648	2	2	68	129	1,237	3	2,090

County	Temporary Effects								Permanent Effects							
	Agriculture	Commercial	Industrial	Open Space	Public/ Semi-Public	Recreation	Residential	Subtotal	Agriculture	Commercial	Industrial	Open Space	Public/ Semi-Public	Recreation	Residential	Subtotal
DWR's Preferred Alternative. Bethany Reservoir Alignment, 6,000 cfs, Intakes B and C																
Alameda	159	0	–	–	8	–	7	173	226	0	–	–	93	–	5	323
Contra Costa	24	–	–	1	5	24	–	53	–	–	–	–	0	–	–	0
Sacramento	700	0	–	4	–	–	7	711	514	0	–	0	0	0	12	526
San Joaquin	410	1	–	29	11	–	1	451	385	2	–	30	11	–	0	427
Subtotal	1,293	2	–	33	24	24	14	1,390	1,125	2	–	30	103	0	17	1,277

Sources: City of Antioch 2003; City of Brentwood 2014; City of Elk Grove 2021; City of Isleton 2000; City of Lathrop 2017; City of Lodi 2021; City of Manteca 2021; City of Oakley 2015; City of Pittsburg 2021; City of Rio Vista 2021; City of Sacramento 2021; City of Stockton 2021; City of Tracy 2021; City of West Sacramento 2021; County of Alameda 2021; County of Contra Costa 2021; County of Sacramento 2021a; County of San Joaquin 2021; County of Solano 2021; County of Yolo 2021.

Notes: Acreages are rounded; acreage less than 0.5 but more than 0.0 have been rounded to 0. Additional information about land use designations by county can be found in Section 14.1.1.1, *Existing Land Uses in the Study Area*.

cfs = cubic feet per second.

Compensatory mitigation actions would result in the creation of wetlands and other habitats on Boudin Island, the I-5 ponds (Ponds 6, 7, 8), and tidal and channel margin habitat in the North Delta Arc. Earthmoving, and revegetation would be the primary activities for compensatory mitigation. Much of the potential land area where activities may take place is existing open space or agricultural land or recreational land uses occurring in open space areas. Some of the proposed mitigation efforts to protect terrestrial biological resources would specifically preserve existing land uses.

Activities included as part of implementation of compensatory mitigation would require developing temporary facilities, such as staging areas, access haul roads, work areas, and borrow sites, which may result in temporary incompatibilities with designated land uses. It is generally estimated that site preparation work (e.g., excavation, grading, levee reinforcement) to construct the marsh and seasonal wetland habitats would take 2 years, although it may take several years more for the newly constructed wetland habitats to fully establish. For channel margin habitat, it is projected that roughly 4,500 linear feet of improvements could be constructed annually (i.e., it would take more than 6 years to improve approximately 5 miles of channel margin habitats). Operation and maintenance activities of habitat restoration areas could include monitoring of vegetation and natural structures and various land management activities. These maintenance activities would likely occur within the restored habitat footprint or in the immediate vicinity within riverine channels and would not result in the permanent conversion of additional land because access roads to locations requiring maintenance activities would already be established during construction activities.

Some of the construction of the compensatory mitigation may result in incompatibilities with land use plans, including earthmoving and temporary facilities such as staging areas, access haul roads, work areas, and borrow sites. The resulting restored habitat is unlikely to be incompatible with existing land uses.

While actions taken by the state are not subject to consistency with the LURMP, based on the information presented above, the potential for the action alternatives to have incompatibilities with applicable land use designations, goals, and policies does not appear to be significant.

Impact LU-2: Conflicts with Existing Land Uses (including Displacement of Existing Structures) as a Result of Construction of the Project

No Action Alternative

Changes to land use related to urban development and habitat restoration projects identified under the No Action Alternative would be expected to conflict with existing land uses. Habitat restoration or urban development would directly affect land uses within the study area by both temporarily converting existing land uses during construction and permanently converting existing land uses. Indirect effects would primarily happen as a result of incompatibility with adjacent land uses or the loss or increased difficultly of access to parcels. However, due to land use restrictions in the Primary Zone of the Delta, activities creating conflicts with existing land uses would likely be limited to a small percentage of the total land area within the study area. Land use changes under the No Action Alternative would not be anticipated to result in the physical division of any existing communities in the study area.

All Action Alternatives

Construction of action alternatives could directly affect land uses in the study area by both temporarily converting existing land uses during construction and permanently converting existing land uses (including displacement of existing structures and residences) because of the construction of permanent features of the facility. Field investigations would not be anticipated to result in displacement of any existing structures, and most would be within the footprint of the water-conveyance features being constructed; however, the West Tracy Fault Study would occur outside the footprint.

Construction of water-conveyance features associated with all action alternatives would directly affect land use in the study area by temporarily converting land currently under agricultural, commercial, industrial, open space, public/semi-public, recreation, and residential uses to temporary work areas, including material and equipment laydown, material stockpiles, stormwater retention basins, parking areas, bus drop-off/pick-up areas, temporary access pathways, and areas to accommodate construction contractor trailers or portable buildings. Although these work areas are temporary, most of the effects are considered permanent because it likely will not be possible to return land to the prior existing land use.

Construction of water-conveyance features associated with all action alternatives would also directly affect land use in the study area by permanently converting land currently under agricultural, commercial, industrial, open space, public/semi-public, recreation, and residential uses to permanent water-conveyance facilities, including access roads, intakes and associated facilities, pumping plants, control structures, new forebays, RTM areas, and footings for electric transmission line towers. Although RTM areas are considered permanent surface effects for the purposes of the effects analysis, a portion of the RTM would be removed from the Twin Cities Complex and Southern Complex for construction of other project features.

Between 61 and 74 permanent structures would be removed within the water-conveyance facility footprint under the action alternatives. Table 3.13-3 summarizes the estimated number of structures affected by alternative, and Delta Conveyance Project Draft EIR Mapbooks 14-1–14-3[25] (California Department of Water Resources 2022) show the distribution of these effects. These sites would not be located in existing communities, but, where residential structures would be removed, they would be located in areas of scattered residences in agricultural areas. Displacement of existing residents is addressed in Section 3.17, *Socioeconomics*.

Table 3.13-3. Estimated Water-Conveyance Conflicts with Existing Structures

Alternative	Residential	Recreational	Storage/Support	Other	Total
1	17	2	37	18	74
2b	13	1	33	17	64
3	18	3	37	13	71
4b	14	2	33	12	61
5	15	3	40	13	71

Source: California Department of Water Resources 2022, Appendix 23B, *Air Quality and GHG Analysis Activity Data.*

[25] Mapbooks for the Draft EIR related to EIS Section 3.13, *Land Use,* are available for public viewing at https://cadwr.box.com/s/hgwh05rqoilcgkrcckaew8vc65ia5b89.

Alternative 1 would result in the removal of the greatest number of permanent structures (274) and Alternative 4b would result in the removal or relocation of 61 permanent structures.

Temporary effects on existing land uses would occur because of various field investigations conducted during the preconstruction and construction phases. These field investigations include geotechnical and hydrogeologic sampling and other construction test. Although the field investigations may temporarily interfere with the existing land uses, such as agricultural operations, in the vicinity where sampling is taking place, field-investigation work would not result in permanent incompatibilities with land use plans, policies, or designations, nor would investigations result in the permanent conversion of lands to another land use. Activities such as these field investigations are generally allowed in all land use designations by policy and regulation. This is also true of activities in areas covered by airport land use plans.

Operation and maintenance of these structures and facilities would not result in effects on existing land uses, nor would it result in the removal or relocation of additional permanent structures beyond the effects anticipated to occur during construction.

Based on the information presented above, the potential for the action alternatives to have substantial conflicts with existing land uses (including displacement of existing structures) does not appear to be significant.

Impact LU-3: Create Physical Structures Adjacent to and through a Portion of an Existing Community That Would Physically Divide the Community as a Result of the Proposed Action

No Action Alternative

Land use changes under the No Action Alternative would not be anticipated to result in the physical division of any existing communities within the study area.

All Action Alternatives

Construction of the action alternatives could directly affect land uses within the study area through the construction of permanent features of the facility. Effects could occur if operation of water-conveyance facilities resulted in the loss or increased difficulty of access from one portion of an existing community to another. The following analysis identifies the potential effect on existing communities from proposed facilities by alternative. Where no facilities would be constructed in the vicinity of a community, no effect would occur. Because field investigations are anticipated to be short term, temporary activities resulting in no permanent effect, compensatory mitigation sites would be located away from existing communities, and tunnel construction would be subsurface, these are not anticipated to result in effects on land use. The communities described below are those where facilities would be constructed in or near the community. No effect is anticipated.

Potentially Affected Communities—Central Alignment (Alternatives 1 and 2b)

Freeport

Facilities to be constructed running through the community of Freeport would be overhead and underground power lines and subsurface facilities. These facilities would not divide the community.

Hood

No facilities would be constructed in the community of Hood. Facilities would be located east of the community. Additionally, intakes would be north and south of Hood.

Terminous

Facilities to be constructed along road rights-of-way north of the community of Terminous would be overhead power lines. These facilities would not divide the community.

Regatta Park and Discovery Bay

Facilities to be constructed along SR 4 on the southern edge of Regatta Park and Discovery Bay would be overhead power lines. These facilities would not divide these communities.

Lodi

Facilities to be constructed along SR 12 on the eastern edge of Lodi would be overhead power lines. These facilities would not divide the community.

Brentwood

Facilities to be constructed along the Chestnut Street right-of-way in Brentwood would be overhead power lines. These facilities would not divide neighborhoods within Brentwood.

Potentially Affected Communities—Eastern Alignment (Alternatives 3 and 4b)

Freeport

Facilities to be constructed running through the community of Freeport would be overhead and underground power lines and subsurface facilities. These facilities would not divide the community.

Hood

No facilities would be constructed in the community of Hood. Facilities would be located east of the community. Additionally, intakes would be north and south of Hood.

Lodi

Facilities to be constructed along SR 12 on the eastern edge of Lodi would be overhead and underground power lines. These facilities would not divide the community.

Regatta Park and Discovery Bay

Facilities to be constructed along SR 4 on the southern edge of Regatta Park and Discovery Bay would be overhead power lines. These facilities would not divide these communities.

Brentwood

Facilities to be constructed along the Chestnut Street right of way in Brentwood would be overhead power lines. These facilities would not divide neighborhoods within Brentwood.

<u>Stockton</u>

Facilities to be constructed would be a park-and-ride lot along the south side of Charter Way and new road and railroad bridges over Burns Cut from Port of Stockton. The land for the park-and-ride lot is currently a truck parking lot and the area around the new bridges is industrial. These facilities would not divide this community.

Potentially Affected Communities— DWR's Preferred Alternative (Bethany Reservoir Alignment)

<u>Freeport</u>

Facilities to be constructed running through the community of Freeport would be overhead and underground power lines and subsurface facilities. These facilities would not divide the community.

<u>Hood</u>

No facilities would be constructed in the community of Hood. Facilities would be located to the west of the community. Additionally, intakes would be north and south of Hood.

<u>Lodi</u>

Facilities to be constructed along SR 12 on the eastern edge of Lodi would be overhead power lines. These facilities would not divide the community.

<u>Mountain House</u>

Facilities to be constructed near Mountain House include the Bethany Complex, which would be west of Mountain House. None of the facilities would be in the community of Mountain House and would not divide the community.

As described above, proposed facilities in or near the existing communities would be constructed along road rights-of-way and consist of overhead or underground power lines or subsurface features. None of the action alternatives would result in a physical division of existing communities; therefore, no impact is anticipated.

3.13.2.3 Cumulative Analysis

It is expected that some changes related to land use, including compatibility, communities and neighborhoods, property, and environmental justice, would take place, even though it is assumed that reasonably foreseeable future projects would comply with plans, policies, and regulations and include typical design and construction practices to avoid or minimize potential effects.

Table 3.13-4 lists a selection of the plans, policies, and programs that are germane to the analysis of land use in the study area along with a summary of the effects of those programs, plans, and projects on land use.

1 **Table 3.13-4. Plans, Policies, and Programs Included in the Cumulative Analysis**

Program/Project	Agency	Status	Description of Program/Project	Effects on Land Use
CALFED Levee System Integrity Program	DWR, CDFW, USACE	Ongoing	Protection and maintenance of project and non-project levees and restoration of native vegetation and reuse of dredge material to bolster levee stability.	Potential changes in land use as part of levee improvement projects.
Central Valley Flood Protection Plan	DWR	Ongoing	This plan is a sustainable, integrated flood management plan that reflects a system-wide approach for protecting areas of the Central Valley currently receiving protection from flooding by existing facilities of the SPFC. The plan incorporates the SPFC and Flood Control System Status Update. The first plan was adopted in 2012 and is updated every 5 years. The CVFPP recommends actions to reduce the probability and consequences of flooding. Produced in partnership with federal, Tribal, local, and regional partners and other interested parties, the CVFPP also identifies the mutual goals, objectives, and constraints important in the planning process; distinguishes plan elements that address mutual flood risks; and recommends improvements to the state and federal flood protection system.	Potential changes in land use as part of flood protection actions.
Delta Dredged Sediment Long-Term Management Strategy/Pinole Shoal Management Study	USACE	Ongoing	Maintaining and improving channel function, levee rehabilitation, and ecosystem restoration.	Potential for effects on land use from construction of restoration actions.
Dutch Slough Tidal Marsh Restoration Project	DWR	Construction began May 2018; next phase to begin 2021	Restoration 1,178-acre site in the south Delta to tidal marsh habitat.	The project is not expected to conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project. It would not affect other land use issues, such as physically dividing an established community.
Lookout Slough Tidal Habitat	DWR	Planning phase	Tidal marsh restoration.	Results in permanent

Program/Project	Agency	Status	Description of Program/Project	Effects on Land Use
Restoration and Flood Improvement Project				conversion of existing land uses, including 1,460-acres of Prime Farmland. Would include mitigation to offset land use effects.
Lower Cache Creek/Woodland Flood Risk Management Project	City of Woodland, USACE, DWR, CVFPB	Planning phase	Flood risk reduction program that includes secondary earthen levees and a diversion channel to redirect overland flood flows into the Yolo Bypass.	Potential for effects on land use from construction of levees and channel.
North Delta Flood Control and Ecosystem Restoration Project	DWR	Ongoing	Consistent with objectives contained in the CALFED Record of Decision, this project is intended to improve flood management and provide ecosystem benefits in the North Delta area through actions such as construction of setback levees and configuration of flood bypass areas to create high-quality habitat for species of concern. These actions are focused on McCormack-Williamson Tract and Staten Island. The purpose of the project is to implement flood control improvements in a manner that benefits aquatic and terrestrial habitats, species, and ecological processes. Flood control improvements are needed to reduce damage to land uses, infrastructure, and the Bay-Delta ecosystem that result from overflows caused by insufficient channel capacities and catastrophic levee failures in the project study area. The project area encompasses approximately 197 square miles.	Potential for effects on land use from construction of levees and bypass areas.
Los Vaqueros Reservoir Expansion	Reclamation, DWR, and CCWD	Planning phase	This project consists of enlarging the existing Los Vaqueros Reservoir and constructing related reservoir system facilities to develop water supplies for environmental water management that supports fish protection, habitat management, and other environmental needs in the Delta and tributary river systems, and to improve water supply reliability and water quality for urban users in the San Francisco Bay Area. Los Vaqueros Reservoir is a 100,000-acre-foot off-stream storage reservoir owned and operated by CCWD that is used to store water pumped from the Delta. This storage capacity allows CCWD to improve the water quality delivered to its customers and to adjust the timing of its Delta water diversions	Potential effects on land use from expansion of reservoir.

Program/Project	Agency	Status	Description of Program/Project	Effects on Land Use
			to accommodate the life cycles of Delta aquatic species, thus reducing species impacts and providing a net benefit to the Delta environment. The proposed expansion project would increase the reservoir capacity to 275,000 acre-feet and add a new 470-cfs connection that would allow the Los Vaqueros system to provide water to South Bay water agencies—Alameda County Flood Control and Water Conservation District, Zone 7; Alameda County Water District; and Santa Clara Valley Water District—that otherwise would receive all of their Delta supplies through the existing SWP and CVP export pumps. It also would include construction of a new diversion on Old River with a capacity of 170 cfs. The new and expanded facilities would be operated in coordination with Reclamation and DWR to shift Delta pumping for the three South Bay water agencies from the CVP and SWP Delta export pumps to the expanded Los Vaqueros Reservoir system. In August 2020, Reclamation released its Final Feasibility Report, which documents potential costs and benefits of the expansion of Los Vaqueros Reservoir. The recommended plan described in the report provides for federal cost sharing of up to 25% of project construction costs.	
Sacramento River Deep Water Ship Channel Project	USACE and Port of Sacramento	Planning phase (on hold)	The Sacramento River Deep Water Ship Channel Project is a congressionally authorized project being implemented by USACE and the Port of Sacramento. The proposed project would complete the deepening and widening of the navigation channel to its authorized depth of 35 feet. Deepening of the existing ship channel is anticipated to allow for movement of cargo via larger, deeper draft vessels. Widening portions of the channel would increase navigational safety by increasing maneuverability. The 46.5-mile-long ship channel lies within Contra Costa, Solano, Sacramento, and Yolo Counties and serves the marine terminal facilities at the Port of Sacramento. The Sacramento River Deep Water Ship Channel joins the existing 35-feet-deep channel at New York Slough, thereby	Potential land use effects from widening of the channel.

Program/Project	Agency	Status	Description of Program/Project	Effects on Land Use
			affording the Port of Sacramento access to San Francisco Bay Area harbors and the Pacific Ocean. The project has been on hold since 2014.	
Transfer-Bethany Pipeline with the Los Vaqueros Reservoir Expansion	Reclamation, DWR, and CCWD	Planning phase	The Los Vaqueros Reservoir Expansion Project includes expansion of the Los Vaqueros Reservoir from its current capacity of 160 TAF to 275 TAF, construction of a pipeline between CCWD's Transfer Pump Station and the SWP's California Aqueduct at Bethany Reservoir (the "Transfer-Bethany Pipeline"), upgrades to the existing Transfer Pump Station Facilities, and construction of the Neroly High Lift Station. The proposed project will include a regional intertie (the Transfer-Bethany Pipeline), improved pump stations and pipelines, and could increase the reservoir's capacity up to 275,000 acre-feet. The Transfer-Bethany Pipeline is composed of a new 300-cfs (84-inch-diameter) pipeline would deliver water from the Transfer Facility to the vicinity of Bethany Reservoir for South of Delta partners. The new Transfer-Bethany Pipeline would tie into the California Aqueduct just north of Bethany Reservoir in the Bethany Recreation Area.	Potential land use effects from construction of the pipeline and facilities and expansion of the reservoir.
Twitchell Island - San Joaquin River Setback Levee	DWR	Planning phase	This project will stabilize a threatened section of levee along the San Joaquin River and in doing so, allow for several different types of waterside habitat features to be constructed. An original 2,200-foot section was completed in 2000 and is currently serving as a model for a ~23,000-foot setback spanning the entire San Joaquin River levee plus a proposed 80-acre tidal marsh restoration site on what is known as Chevron Point.	Potential land use effects from new levees and tidal marsh restoration.
West Sacramento Levee Improvements Program	WSAFCA and USACE	Completed	This program would improve the levees protecting West Sacramento to meet local and federal flood protection criteria. The program area includes the entire WSAFCA boundary, which encompasses portions of the Sacramento River, the Yolo Bypass, the Sacramento Bypass, and the Sacramento River Deep Water Ship Channel. The levee system associated with these waterways includes more than 50 miles	Potential land use effects from new levees.

Program/Project	Agency	Status	Description of Program/Project	Effects on Land Use
			of levees in RD 900, RD 537, RD 811, DWR's Maintenance Area 4, and the Sacramento River Deep Water Ship Channel. These levees surround West Sacramento. For the purposes of this program, the levees have been generally divided into nine reaches: Sacramento River Levee North, Sacramento River Levee South, Port North Levee, Port South Levee, South Cross Levee, Deep Water Ship Channel Levee East, Deep Water Ship Channel Levee West, Yolo Bypass Levee, and Sacramento Bypass Levee.	
Winter Island Tidal Habitat Restoration Project	DWR and CDFW	Completed	This project restored tidal connectivity to the interior of Winter Island to create aquatic habitat at intertidal and shallow subtidal elevations, associated high marsh, and riparian habitats on the site to benefit native fish species. The project was intended to partially fulfill the 8,000-acre tidal habitat restoration obligations of DWR, contained within RPA 4 of the 2008 USFWS Delta Smelt BiOp and referenced in RPA I.6.1 of the 2009 (NMFS) Salmonid BiOp, for long-term coordinated operations of the SWP and the CVP. Construction was completed in November 2019.	Land use effects from restoration of aquatic habitat.

BiOp = Biological Opinion; CCWD = Contra Costa Water District; CDFW = California Department of Fish and Wildlife; cfs = cubic feet per second; CVFPP = Central Valley Flood Protection Plan; CVP = Central Valley Project; DMC = Delta-Mendota Canal; DWR = California Department of Water Resources; Intertie = Delta-Mendota Canal/California Aqueduct Intertie; NMFS = National Marine Fisheries Service; RD = Reclamation District; Reclamation = U.S. Bureau of Reclamation; RPA = Reasonable and Prudent Alternative; SPFC = State Plan of Flood Control; SWP = State Water Project; TAF = thousand acre-feet; USACE = U.S. Army Corps of Engineers; USFWS = U.S. Fish and Wildlife Service; WSAFCA = West Sacramento Area Flood Control Area.

Cumulative projects include flood protection projects, habitat and ecosystem restoration projects, and water-conveyance projects proposed in various areas within and adjacent to the Delta. The actual amount of land that may be converted from existing uses to new uses by other projects is not known.

The action alternatives would have minimal effects related to consistency with existing land uses and removal of structures and would not result in changes in land use patterns in the area. Cumulative projects would be unlikely to result in removal of significant numbers of structures or change land use patterns in the area of those projects, as most areas affected by those projects would be rural, agricultural, or open space.

3.14 Navigation

This section describes the affected environment for navigation and analyzes effects that could occur in the study area from construction, operation, and maintenance of the action alternatives, as well as the No Action Alternative. Mitigation and minimization measures that would avoid, minimize, rectify, reduce, or compensate potentially adverse effects are included as part of each action alternative. Additional information on the affected environment, methods, and the anticipated effects of the action alternatives can be found in Delta Conveyance Project Draft EIR Chapter 20, *Transportation* (California Department of Water Resources 2022).

3.14.1 Affected Environment

The study area (i.e., the area in which effects may occur) for navigation consists of the study area as well as marine facilities that serve the Delta (Table 3.14-1). Navigation outside of the study area would not be affected by the action alternatives.

Table 3.14-1. Navigable Waterways in the Study Area

Navigable Waterways in the Study Area
American River—Mouth to Bradshaw Road
Middle River
Old River
Sacramento River Deep Water Ship Channel
San Joaquin River—Mouth to Sycamore Road (7 miles downstream from SR 99 at Fresno)
All waterways not specifically identified above that are subject to the ebb and the flow of the tide, per 33 CFR Section 329.4.

CFR = Code of Federal Regulations; SR = State Route.

3.14.1.1 Marine Facilities

M-5/M-580 Marine Highway Corridor

Marine facilities represent important transportation capacity in the transportation study area. Navigable coastal waters parallel the entire I-5 corridor, including numerous deep rivers, bays, and ports that serve as extensions of the surface transportation system for freight, goods movement, and recreational marine traffic. Figure 3.14-1 illustrates the location of the commercial marine facilities within the transportation study area. These include facilities that are part of the Marine Highway Program overseen by the U.S. Department of Transportation Maritime Division.[26] The designated Marine Highway (M-) corridor that is within the study area vicinity is the M-580 corridor. It connects to the M-84 corridor at Astoria, Oregon, and includes the San Joaquin River and Sacramento River. The corridor connects commercial navigation channels, ports, and harbors in Central California from Sacramento to Oakland.

[26] The Marine Highway Program was fully implemented in April 2010 through publication of a 2010 Final Rule in the *Federal Register* (FR) (75 FR 18095–18107). The Secretary's designations were made pursuant to the Final Rule, as required by the Energy Independence and Security Act of 2007.

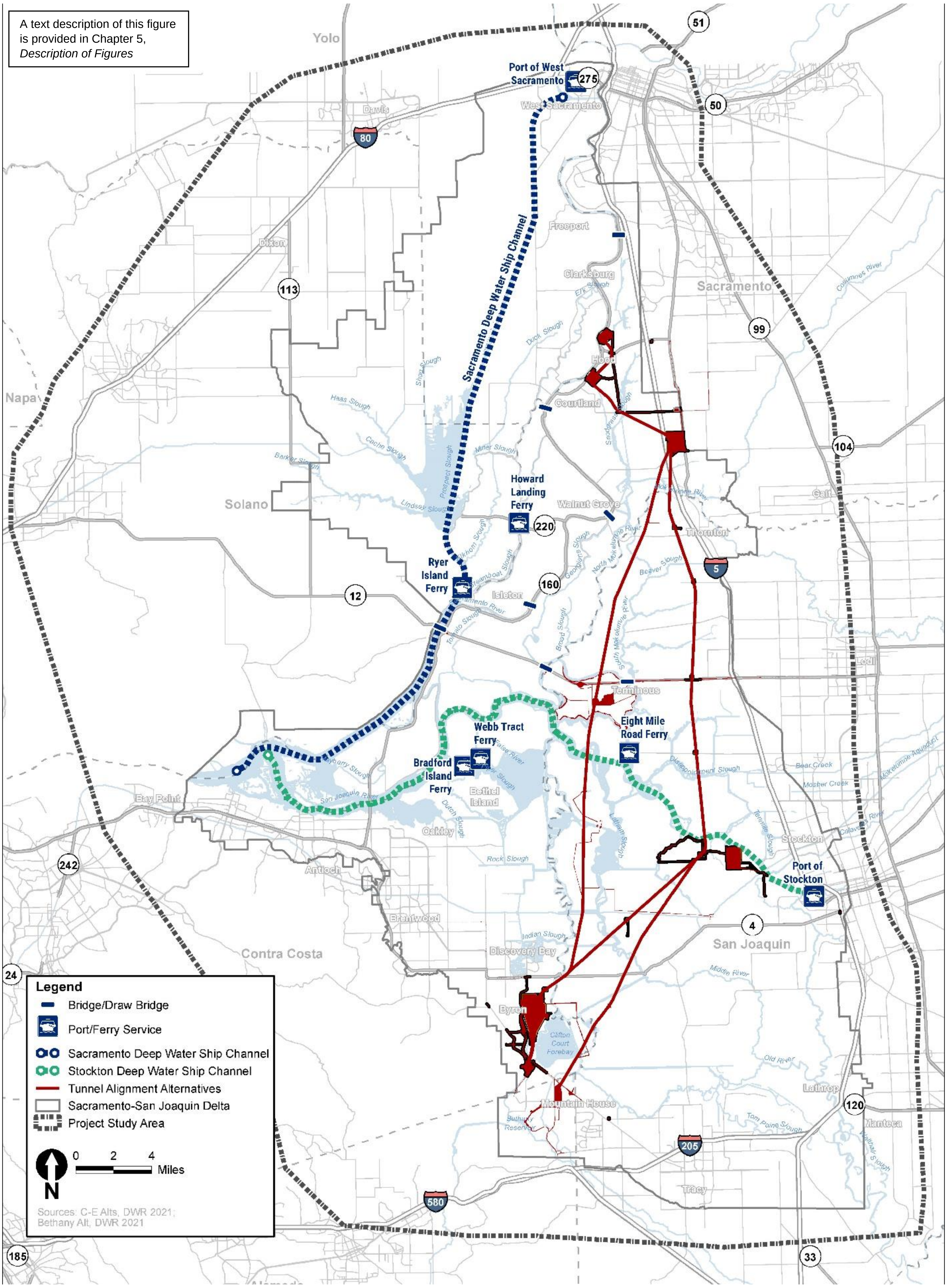


Figure 3.14-1. Marine Facilities

Most commercial barge traffic in the transportation study area travels along the Sacramento River Deep Water Ship Channel, which begins in Sacramento and heads southwest toward Suisun Bay, where the canal ends. Once outside of the channel, ships use the Sacramento River for service to Sacramento or the San Joaquin River for access to the Port of Stockton. Just north of SR 12 (Rio Vista Bridge), the Sacramento River provides a marine waterway connecting Isleton (Isleton Bridge), Walnut Grove (Walnut Grove Bridge), Locke, Courtland (Paintersville Bridge), Hood, Clarksburg, Freeport (Freeport Bridge) and the Port of West Sacramento.

Port of Stockton

The Port of Stockton is located on the Stockton Deep Water Ship Channel, 75 nautical miles due east of the Golden Gate Bridge. The port is a major transportation center with berthing space for 17 vessels, 1.1 million square feet of dockside transit sheds and shipside rail trackage, and 7.7 million square feet of warehousing served by rail. The Port of Stockton has three traveling, multipurpose bridge cranes to handle cargo from vessels direct to truck and rail (Port of Stockton 2021).

River access to the port is through the Suisun Bay, San Joaquin River, and the Stockton Deep Water Ship Channel. The channel connects the Disappointment Slough with the Port of Stockton marine terminal facilities (State Water Resources Control Board 2019), a distance of approximately 14 miles. The Stockton Deep Water Ship Channel has an average depth of 35 feet and an average depth at high tide of 40 feet (Port of Stockton 2021).

The port is approximately 1 mile from I-5 and is easily accessible by other major interstates in the region. It is served by two Class I rail companies: Union Pacific Railroad (UPRR) and BNSF Railway. Rail service is also provided to each warehouse within the port by the port's railroad, operated by the Central California Traction Company.

Port of West Sacramento

The Port of West Sacramento is located in West Sacramento 79 nautical miles northeast of San Francisco via rivers and shipping channels. The port has a mobile harbor crane for handling container cargo.

River access is available by entering the Sacramento River Deep Water Ship Channel from Suisun Bay. The Sacramento River Deep Water Ship Channel connects the marine terminal facilities of the Port of Sacramento along the navigable portion of the Sacramento River to the Contra Costa County boundary, a distance of 46.5 miles (U.S. Army Corps of Engineers 2020). The current channel provides for a navigable depth of 30 feet; USACE has proposed to deepen the channel to a navigable depth of 35 feet. Three rail companies serve the port with a 200-railcar terminal: BNSF Railway, UPRR, and Sierra Northern Railway. The port is adjacent to I-80 and less than 2 miles from I-5. SR 84 is also located within 1 mile of the port (Port of West Sacramento 2021).

Ferry Services

Five public access ferry services operate within the study area. Two of the ferries function as a part of the California highway system and are operated by Caltrans. One of these ferries, the Howard Landing Ferry, is located on SR 220 and crosses Steamboat Slough. The other ferry connects SR 84 in Solano County. The Ryer Island Ferry crosses the Cache Slough. The remaining three ferries transport passengers to private islands. One crosses the Little Connection Slough, another crosses the Middle River to Woodward Island, and the other travels from Jersey Island to both Webb Tract and Bradford Island (California Delta Chambers and Visitors Bureau 2021).

Draw Bridges

Table 3.14-2 shows that five Caltrans draw bridges provide vehicular access over the Sacramento River between the Sacramento River Deep Water Ship Channel/Port of Sacramento to the north and the Suisun Bay/San Francisco Bay to the southwest. The Mokelumne River Bridge on SR 12 (a swing bridge) provides vehicular access over the Mokelumne River, connecting Terminous to the east with I-5 and the San Joaquin River/Port of Stockton to the south and I-80 and the Suisun Bay/San Francisco Bay to the west.

Table 3.14-2. Caltrans Draw Bridges in the Study Area

Bridge ID	Bridge Name	Route	Span (feet)	Year Built	Bridge Type
CA 24C-1	Freeport Bridge	SR 160	655	Built 1929 Rehabilitated 1955	Movable Bascule center section
CA 24-53	Paintersville Bridge	SR 160	588	Built 1923 Rehabilitated 1952	Movable Bascule center section
CA 24C-5	Walnut Grove Bridge	SR 160	302	Built 1950	Movable Bascule center section
CA 24-51	Isleton Bridge	SR 160	624	Built 1923 Rehabilitated 1953	Movable Bascule center section
CA 23-24	Rio Vista Bridge	SR 12	2,890	Built 1944 Rehabilitated 1960	Vertical lift Warren through truss
CA 29-43	Mokelumne River Bridge	SR 12	1,436	Built 1942; Rehabilitated 1978	Swing
CA 29-101	Little Potato Slough Bridge	SR 12	2,980	Built 1991	Swing

SR = State Route.

3.14.2 Environmental Consequences

This section describes the assessment methods used to analyze potential environmental effects and identifies the direct, indirect, and cumulative navigation effects associated with the action alternatives, as well as the No Action Alternative.

3.14.2.1 Methods for Analysis

Potential effects resulting from the action alternatives would be generated and/or created if they were to disrupt marine traffic during construction or operations. For the purposes of this analysis, a marine traffic disruption would occur if construction activities required modification to an existing water channel, markedly interfered with port navigation, and/or markedly increased the volume of barge movement within the study area.

No Action Alternative

The No Action Alternative takes into account projects, plans, and programs that would be reasonably expected to occur in the foreseeable future if the project were not approved and the purpose and need were not met. Construction and operation of water supply–reliability projects have a low potential to affect navigation within the four regions. Table 3.14-3 provides examples of how navigation could be affected.

Table 3.14-3. Examples of Effects on Navigation from Construction and Operation of Projects in Lieu of the Project

Project Type	Potential Navigation Effects	Region(s) in Which Effect Would Likely Occur [a]
Increased/ accelerated desalination	Facilities are likely to be constructed on land and outside of navigable waters. Little potential for effects.	Northern coastal, southern coastal
Groundwater management	Reductions and increases could be seen in surface water levels of navigable waterways depending upon groundwater management and where surface water supply comes from.	Northern coastal, southern coastal
Groundwater recovery (brackish water desalination)	Low to no potential navigation effects.	Northern inland, southern coastal, southern inland
Water recycling	Low to no potential navigation effects.	Northern coastal, northern inland, southern coastal, southern inland
Water use efficiency measures	Low to no potential for navigation effects.	Northern coastal, northern inland, southern coastal, southern inland

[a] See Chapter 2, *Project Description and Alternatives*, Section 2.5, *No Action Alternative*, for a complete definition of the geographic regions.

3.14.2.2 Effects and Mitigation

Impact NAV-1: Disruption of Marine Traffic during Construction

No Action Alternative

Although boat traffic is likely to increase in future years, there would be no project-related change in the characteristics of navigation through Delta channels. No intake facilities or conveyance systems would be constructed that could result in short-term conflicts with users of the navigation corridors in the Delta.

All Action Alternatives

Although some in-water work would be necessary for construction (encroachment during construction ranges from 130.5 feet at Intake B to 122.5 feet at Intake C from the shoulder of SR 160), the Sacramento River would remain open to boat traffic at all times during construction. Prior to construction of the intakes, in-water work areas would be indicated by buoys, signage, or other effective means to warn boaters of their presence and access restrictions. Warning devices and signage (e.g., “boats keep out” or “no wake zone” labeled buoys) would comply with the U.S. Coast Guard Private Aid to Navigation requirements (U.S. Coast Guard 2012) and would be effective at all times, including non-daylight hours and periods of dense fog. The width of the river near the intakes would allow passage of the types of boats typically observed on the Sacramento River.

Construction of the action alternatives would not require modification to existing deep water channels, interfere with Port of Stockton navigation, or markedly increase the volume of barge movement within the study area, such that existing marine traffic would be disrupted because project barges would be used only a small number of days (12 to 30 days depending on the action alternative) and would not conflict with port navigation (Delta Conveyance Design and Construction Authority 2022a, 2022b, 2022c). Under all action alternatives, tugboats and barges would be used only to a limited extent during the latter part of intake construction on the Sacramento River to excavate the river bottom, remove dredged spoils following removal of cofferdams, and place riprap along the levee. A limited number of barges would also be used to perform the pile installation method test program, and barges, ships, or boats may be used to conduct overwater borings and testing. Because of this limited use of barges and other vessels for construction and the limited extent of construction into the Sacramento River, the effect on marine navigation would be minor. No barge landings would be required. The barges with a crane and the riprap rock would be anchored at the intake sites for several days while the rock would be placed in a manner similar to flood management repairs of existing levees.

Because of the relatively minor use of tugboats and other marine vessels for the action alternative construction, the potential for effects on the Sacramento River draw bridge operation is expected to be minor and the overall effect on marine traffic and commercial barge use would not be significant. Construction of the compensatory mitigation actions on Bouldin Island and at the I-5 ponds is not expected to conflict with recreation navigation occurring on the Mokelumne River or Little Potato Slough as construction of the planned compensatory mitigation would be primarily on the landside of the existing levees, apart from creating edge habitat to compensate for the loss of aquatic habitat. Once established, the compensatory mitigation sites would require monitoring and maintenance that would not conflict with navigation on adjacent waterways.

Based on the information presented above, the potential for the action alternatives to disrupt marine traffic during construction does not appear to be significant.

Impact NAV-2: Potential Effects on Navigation from Changes in Surface Water Elevations Caused by Construction of Water-Conveyance Facilities

No Action Alternative

Construction of reasonably foreseeable projects under the No Action Alternative is not anticipated to result in changes to surface water elevations as a result of construction on in-water features.

All Action Alternatives

All action alternatives would produce similar changes to Sacramento River Basin flows. Construction of the intakes would be accomplished using temporary cofferdams at each location. Cofferdams would isolate each construction area from the Sacramento River and would be used to dewater the construction area. The cofferdams would be placed in a configuration to reduce hydraulic effects on the Sacramento River. Temporary measures that would be in place during certain construction sequences, such as the cofferdam or the temporary jurisdictional levee, would be removed either fully or partially after the completion of applicable construction tasks. While there may be minor increases in WSE at the proposed north Delta intakes during construction, any construction would be done to limit the rise in WSEs and, therefore, avoid a marked increase. Intakes and screens have been designed and located on-bank to minimize changes to river flow characteristics. As a result, boat passage and river use, including Sacramento River tributaries, would not be affected.

Construction of the conveyance facilities under all of the action alternatives would involve construction of intakes in the water and facilities on the land. Construction activities would require excavation, grading, stockpiling. soil compaction, and dewatering that could result in alterations to runoff, drainage patterns, erosion, stream courses, and WSEs during construction of facilities.

Site grading needed to construct any of the proposed facilities has the potential to block, reroute, or temporarily detain and impound surface water in existing drainages, which would result in slight increases and decreases in flow rates, velocities, and water surface elevations. All project features would be designed to not increase peak runoff flows into adjacent storm drains, drainage ditches, or rivers and sloughs. Temporary changes in drainage would be minimized, and in some cases avoided, by construction of new or modified drainage facilities, as described in Appendix C, *Project Description and Alternatives*. These changes would not result in a marked decrease in surface water elevations on any navigable waterways.

Removal of groundwater during construction (dewatering) would be required for excavation activities. Groundwater removed during construction would be diverted to an on-site water treatment plant at each location and tested to determine if it would require treatment prior to reuse or discharge from the site. On-site reuse would be maximized to reduce peak runoff rate from the site (Appendix C, *Project Description and Alternatives*), and discharged to local drainage channels or rivers. This would result in a small, localized increase in flows and WSEs in the receiving channels. The increase in flows and WSEs in the receiving channels and rivers would not affect navigation. Construction of the intakes would be accomplished using temporary cofferdams at each location. Cofferdams would isolate each construction area from the Sacramento River and would be used to dewater the construction area. Although intakes have been designed and located on-bank to minimize changes to river flow characteristics, some localized water elevation changes would occur upstream and adjacent to the intake structure and training walls due to facility location within the river. These localized surface elevation changes would be minimal, even under flood flow conditions. Because increases in water elevation is entirely localized, downstream surface elevation changes during intake construction would be insignificant and changes to river depth and width at any location will be insignificant.

The intake facilities (fish screens and supporting structures) would be designed to maintain existing flow capacity in the Sacramento River during both the construction and operation phases. This would ensure unacceptable increases in river WSEs under flood-flow conditions, reverse flow areas, areas of high velocities that could result in scour, and reflection of flood waves toward other levees would be avoided. As a result, boat passage and river use, including the Sacramento River tributaries, would not be affected.

Based on the information presented above, the potential for the action alternatives to affect navigation due to changes in surface water elevations from construction activities does not appear to be significant.

Additional information regarding changes to WSEs can be found in Delta Conveyance Project Draft EIR Chapter 5, *Surface Water*.

Impact NAV-3: Potential Effects of Navigation from Changes in Surface Elevations Caused by Operation of Intakes

No Action Alternative

Activities associated with operation and maintenance of the existing SWP and CVP systems and facilities upstream of the Delta would continue, but there would be no changes attributable to the action alternatives that could affect navigation in these areas. Construction of wildlife habitat would potentially create localized navigation effects.

All Action Alternatives

Water surface changes and potential effects associated with intake operation would be minimal. The maximum changes in WSEs anticipated under the action alternatives would not likely expose any currently unexposed natural or human-made features that would affect or impede navigation. There would be no new snags or obstructions that would impede navigation. Moreover, even when operating at maximum capacity, the intakes would not alter flows in a way that would affect commercial vessels or recreational watercraft. The intakes are designed to ensure pumping velocities would have minimal effects on aquatic species. Changes in flow velocity would not be perceptible to operators of marine vessels or recreational watercraft and would have no effect on navigation. Water depth and WSEs would not be greatly affected (either localized or downstream of the intake structures) and, therefore, navigation would not be impeded.

Based on the information presented above, the potential for the action alternatives to affect navigation due to changes in surface elevations caused by operation of the intakes does not appear to be significant.

Additional information regarding changes to WSEs can be found in Delta Conveyance Project Draft EIR Chapter 5, *Surface Water*.

Impact NAV-4: Potential Effects on Navigation Caused by Sedimentation from Construction of Intakes

No Action Alternative

Projects and plans under the No Action Alternative that take place in-water all have the potential to cause an increase in sediment loads in the river channels of the study area. If a project were to create an uncontrolled discharge of sediment into the river, sediment could accumulate on the bottom of the river channel and impede navigation. It is assumed that all projects would implement best management practices to control erosion and sediment, as well as undergo the appropriate CEQA/NEPA analysis and permitting processes, which would be required to analyze and minimize those effects.

All Action Alternatives

Construction of the intakes would be accomplished using temporary cofferdams at each location. Cofferdams would isolate each construction area from the Sacramento River and would be used to dewater the construction area. Construction of cofferdams would require sheet pile driving that would result in incremental suspension of bed sediments. The incremental suspension of sediment is expected to only occur as the sheet piles are being installed. As such, these effects would be temporary and would not have an effect on navigation. Sheet piles at the edge of the levee embankment would likely change eddy currents locally, but rock slope in the transition zone would limit those currents and potential changes to bed load dynamics. As a result, erosion and sedimentation into the Sacramento River during intake construction would be minimal.

Moreover, potential sedimentation effects would be further minimized by limiting the duration of in-water construction activities and through implementing the environmental commitments described in Appendix C1, *Environmental Commitments and Best Management Practices,* including Environmental Commitment EC-4a: *Develop and Implement Erosion and Sediment Control Plans,* to control short-term and long-term erosion and sedimentation effects and to restore soils and vegetation in areas affected by construction activities following construction. The plans would include all of the necessary state requirements regarding erosion control, and project proponents would implement best management practices for erosion and sediment control that would be in place for the duration of construction activities. Erosion and sedimentation effects of construction are discussed in more detail in Section 3.10, *Geology, Soils, and Paleontological Resources*.

Based on the information presented above, including proposed environmental commitments, the potential for the action alternatives to affect navigation due to sedimentation from construction of the intakes does not appear to be significant.

Impact NAV-5: Potential Effects on Navigation Caused by Sedimentation from Operation of Intakes

No Action Alternative

No projects considered reasonably foreseeable under the No Action Alternative would involve operation of intakes that would cause notable changes to water column or bed load sediment dynamics.

All Action Alternatives

Diverted water containing sediment suspended in the river water would be collected in a sedimentation basin. Each intake would have one sedimentation basin divided into two cells by a turbidity curtain. Water would flow from the intakes through the sedimentation basin through a flow control structure with radial gates and into the outlet channel and shaft structure that would be connected to the tunnel system.

Operational criteria and design specifications for intake operations would result in no change to water column or bed load sediment dynamics and erosion, and deposition patterns would change little if any during intake operation. The action alternatives would not cause marked long-term changes in total suspended solids (TSS) concentrations in in study area waterbodies relative to existing conditions. Similarly, the proposed compensatory mitigation, which would occur within the Delta, would not result in markedly higher TSS or turbidity in study area waterbodies. Any newly created wetlands or enhanced habitat would also filter stormwater to remove solids and either improve or have little to no effect on TSS and turbidity relative to existing conditions.

Environmental Commitment EC-15: *Sediment Monitoring, Modeling, and Reintroduction Adaptive Management* would be implemented to monitor and model Sacramento River sediment entrainment, establish performance criteria, and develop and implement a sediment reintroduction plan, if determined necessary relative to the performance criteria.

Based on the information presented above, including proposed environmental commitments, the potential for the action alternatives to affect navigation due to sedimentation from operation of the intakes does not appear to be significant.

3.14.2.3 Cumulative Analysis

The cumulative analysis considered the range of programs and projects in the study area and adjacent export areas that might have cumulative effects when implemented concurrently with the action alternatives. The reasonably foreseeable plans, policies, and programs included in the cumulative analysis are summarized in Table 3.14-4, along with their anticipated effects regarding navigation.

Table 3.14-4. Plans, Policies, and Programs Included in the Cumulative Analysis

Program/ Project	Agency	Status	Description of Program/Project	Effects on Navigation
Sacramento Deep Water Ship Channel Project	U.S. Army of Corps of Engineers and Port of Sacramento	On hold	This Congressionally authorized project would complete the deepening and widening of the navigation channel to its authorized depth of 35 feet. Deepening of the existing ship channel is anticipated to allow for movement of cargo via larger, deeper draft vessels. Widening portions of the channel would increase navigational safety by increasing maneuverability. The 46.5-mile-long ship channel lies within Contra Costa, Solano, Sacramento, and Yolo Counties and serves the marine terminal facilities at the Port of Sacramento. The Sacramento Deep Water Ship Channel joins the existing 35-feet-deep channel at New York Slough, thereby affording the Port of Sacramento access to San Francisco Bay Area harbors and the Pacific Ocean.	This marine highway corridor could be affected, particularly for commercial barges, during construction work on the ship channel.
Delta Dredged Sediment Long-Term Management Strategy/Pinole Shoal Management Study	USACE	Ongoing	Maintenance and improvement of channel function, levee rehabilitation, and ecosystem restoration.	Could alter the existing drainage pattern of sediment reuse sites.
Bay-Delta Water Quality Control Plan Update (Delta Outflows, Sacramento River and Delta Tributary Inflows, Cold Water Habitat and	State Water Board	Planning phase	Would establish flow objectives for the Sacramento River and its tributaries, Delta eastside tributaries (including the Calaveras, Cosumnes, and Mokelumne Rivers), Delta outflows, and interior Delta flows.	Could modify surface water flow patterns, increase instream flows, increase minimum

Program/ Project	Agency	Status	Description of Program/Project	Effects on Navigation
Interior Delta Flows)				Delta outflows.
Delta Flood Protection Fund	DWR	Ongoing	Provides funding to levee maintaining agencies for their use to maintain and improve critical levees in the Delta.	Could modify surface water flow patterns or alter the existing drainage pattern.

DWR = California Department of Water Resources; State Water Board = State Water Resources Control Board; USACE = U.S. Army Corps of Engineers.

Construction of cumulative projects within the Delta could result in cumulative effects on navigation systems because of increases in marine traffic or barge use. Marine highway corridors between the ports of Oakland, Stockton, and Sacramento could be affected if commercial barges are used to transport materials to construction sites during work on the ship channel. Although it is difficult to determine when major infrastructure projects would be constructed, the cumulative effect may be considerable if these projects occur during the same time frame and location as the action alternatives because the magnitude of effects would be greater. If these projects occurred sequentially, the construction-related effects could be drawn out for an extended period. If one local area experiences several large construction projects simultaneously, there could be considerable localized effects. The effects would be relatively similar between the action alternatives.

3.15 Noise

This section describes the affected environment for noise and vibration and analyzes effects that could result from construction, operation, and maintenance of the action alternatives, as well as the No Action Alternative. Mitigation and minimization measures that would avoid, minimize, rectify, reduce, or compensate potential effects are included as part of each action alternative. Additional information on the affected environment, methods, and the anticipated effects of the action alternatives can be found in Delta Conveyance Project Draft EIR Chapter 24, *Noise and Vibration* (California Department of Water Resources 2022).

The large-scale operation of the SWP, including the facilities proposed in the action alternatives, is outside USACE authority under CWA Section 404, Section 408, and RHA Section 10. Therefore, the Draft EIS focuses only on those actions under USACE authority. Project operations are discussed briefly and qualitatively throughout the Draft EIS, and readers should refer to the Delta Conveyance Project Draft EIR (California Department of Water Resources 2022) for a more in-depth analysis of operations of the action alternatives and associated effects on the environment.

3.15.1 Affected Environment

This section describes the affected environment for noise and vibration in the areas surrounding construction sites and locations of infrastructure associated with the action alternatives. The study area for noise is defined as all land within a 2-mile radius of construction sites and locations of new infrastructure related to the action alternatives. This 2-mile buffer is used to describe the distance that potential levels of noise from construction areas would attenuate below existing ambient levels. The area of vibration effects from construction of the action alternatives would be localized within a smaller buffer (less than 0.1 mile) inside the study area and would not be discernible outside the study area.

Delta Conveyance Project Draft EIR Chapter 24, *Noise and Vibration*, Section 24.1, *Environmental Setting* (California Department of Water Resources 2022) presents a detailed description of existing noise conditions in the study area, which includes western portions of Sacramento and San Joaquin Counties, and eastern portions of Yolo, Contra Costa, Solano and Alameda Counties. Much of the study area consists of open space, which is typical of a quiet, rural setting. Many of these open areas are used for agriculture, and tractors, farm equipment and crop-dusting aircraft are intermittent sources of noise in many of these areas. Vehicle traffic noise is a source of noise from highways and arterial roads traverse the study area, such as I-5, I-205, Byron Highway, SR 4 and SR 12. Noise from aircraft overflights also contributes to ambient noise levels. On interconnected waterways in the study area, motorized boats are an intermittent source of noise. Vibration in the study area may occur on an occasional basis in areas directly adjacent to construction sites where heavy equipment is used. Freight trains are an intermittent source of vibration in the immediate areas surrounding UPRR rail lines that cross the study area. In areas with average soil conditions, vibration from freight trains is generally not noticeable more than 200 feet from the track (Federal Transit Administration 2018:135).

3.15.2 Environmental Consequences

This section describes the assessment methods used to analyze potential environmental effects and identifies the direct, indirect, and cumulative effects associated with noise during construction of the action alternatives. The analysis contained in this section describes effects on human receptors and associated land uses. For a discussion of noise and vibration effects specific to aquatic biological resources, refer to Section 3.4, *Fisheries and Aquatic Habitat*. For a discussion of noise and vibration effects specific to terrestrial biological resources, refer to Section 3.5, *Natural Communities, Special-Status Terrestrial Species, and Wetlands and Other Waters.* For a discussion of noise and vibration effects specific to recreational resources, refer to Section 3.16, *Recreation*.

3.15.2.1 Methods for Analysis

Noise

Noise levels from construction of intakes, shaft sites and facilities were modeled using the SoundPLAN 8.2 acoustical modeling software, implementing International Organization for Standardization (ISO) Standard 9613-2: *Acoustics—Attenuation of Sound during Propagation Outdoors—Part 2 General Method of Calculation for Propagation Modeling*. The standard is designed to calculate sound pressure levels under "average" meteorological conditions that are favorable to propagation. The standard applies downwind and temperature inversion conditions to predict reasonable worst-case sound levels. Sound propagation values in the model used mixed hard/soft ground over land areas and hard ground over water areas. Noise analysts modeled each feature and calculated sound levels at sensitive receptor locations identified GIS within 2 miles of features such as intake sites, shaft sites, levee improvement areas, and concrete batch plants. The model generated a geographic grid map of sound levels around features to draw sound level contours for intake features, shaft sites, levee improvement areas, and south Delta areas for visualization of sound levels from construction in the surrounding area from each given feature. The model calculated noise levels at receptor locations identified from GIS analysis.

Noise levels from construction of linear features such as roads and utility corridors were calculated using standard acoustical methods to develop a combined source level from the three loudest pieces of equipment being used in one location. Noise levels as a function of distance were calculated using point-source attenuation from the combined source, accounting for the ground type (hard or soft) at the construction site. Noise from heavy equipment during construction of linear features would affect different locations at different times, as equipment progresses from the beginning to the end of each construction corridor. As such, a receptor at a given location along a construction corridor would be exposed to increased noise levels from heavy equipment for a short period of time. For linear features, noise levels are reported as a function of distance from the equipment source.

Traffic noise emissions from data tables developed from FHWA Traffic Noise Model Version 2.5 (TNM) (Federal Highway Administration 1998, 2004) were used to develop model predictions of noise levels from traffic. Traffic noise levels on new haul roads, access roads, and existing roads were modeled using calculated TNM noise emissions methods to estimate distance to the 60, 65, and 70 A-weighted decibel (dBA) day-night average sound level (L_{dn}) traffic noise contours. Haul truck volumes for each haul route were provided as an attachment to the Engineering Project Report (EPR) (Delta Conveyance Design and Construction Authority 2022a, 2022b). The EPR expressed truck volumes in terms of a volume histogram of projected truck volumes by month, for each feature. The noise analyst converted monthly truck volumes to average daily traffic (ADT) of trucks using a factor of 10% of monthly volumes, conservatively assuming that truck traffic will vary on a daily basis, up to double the volume of an average day (assuming a month equals 20 work days, 5% of trucks a day would be evenly distributed across the month).

Vibration

The noise analysis calculated levels of vibration from heavy equipment using typical equipment source levels published by Federal Transit Administration (FTA), and standard acoustical methods. Vibration levels as a function of distance were calculated using point-source attenuation from each type of equipment, assuming average soil conditions.

Additional information on the methods of analysis and evaluation of construction activities can be found in Delta Conveyance Project Draft EIR Chapter 24, *Noise and Vibration*, Section 24.3.1.2, *Evaluation of Construction Activities* (California Department of Water Resources 2022).

Thresholds of Significance

The action alternatives would be considered to have a significant effect if they would result in any of the conditions listed below.

- Generation of substantial temporary or permanent increase in ambient noise levels in the vicinity of the action alternatives in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.
    - **Noise during Construction (Heavy Equipment, Pile Driving, Tugboats)**

      Between the hours of 7:00 a.m. and 10:00 p.m., noise levels during project construction would be considered to exceed daytime noise criteria where overall equipment noise levels are predicted to exceed 60 dBA on an hourly L_{eq} basis, AND overall equipment noise levels are predicted to increase by 5 dB or more relative to existing daytime ambient noise levels at sensitive receptor locations, as determined through a sound-level monitoring program.

      Between the hours of 10:00 p.m. and 7:00 a.m., noise levels during project construction would be considered to exceed nighttime noise criteria where overall equipment noise levels are predicted to exceed 50 dBA on an hourly L_{eq} basis, AND overall equipment noise levels are predicted to increase by 5 dB or more relative to existing nighttime ambient noise levels at sensitive receptor locations, as determined through a sound-level monitoring program.

      If these criteria are exceeded, the effects analysis evaluated the temporal frequency, duration, and intensity of construction noise to determine whether a significant noise effect requiring mitigation would occur.
    - **Noise from New Rail Infrastructure**

      Effects from train activity on new rail spurs, grade crossings, and associated rail infrastructure would be considered significant if noise levels from new train activity would result in a "severe impact" as defined by FTA. The criteria used are from FTA guidance (Federal Transit Administration 2018:25).
    - **Noise from Increased Traffic on Haul Roads**

      An effect from increased traffic on haul roads would be considered significant if it results in a distinctly noticeable change relative to existing conditions based on the average increase in traffic noise over existing ambient levels. An increase of 5 dB over existing levels is a discernible change (Federal Highway Administration 2011:10). The existing ambient sound-level values are based on sound-level monitoring or existing traffic volume data from counts conducted on state roads by Caltrans or on county roads by the respective counties.

If this criterion is exceeded, the effects analysis evaluated the temporal frequency, duration, and intensity of increased traffic to determine whether a significant noise effect requiring mitigation would occur.

- Generation of excessive groundborne vibration or groundborne noise levels.
  - **Vibration during Construction**

    Groundborne vibration from heavy equipment such as pile drivers or TBMs would be considered to result in a significant effect if vibration levels are predicted to exceed FTA construction vibration damage criteria of 0.20 PPV for "non-engineered timber and masonry buildings" or 0.12 PPV for "buildings extremely susceptible to vibration damage." The criteria used are from FTA guidance (Federal Transit Administration 2018:182).

    In addition to building damage, the potential for annoyance of building occupants due to vibration was evaluated from criteria developed by Caltrans. Vibration from intermittent sources may be perceptible at a level of 0.04 in/sec PPV (California Department of Transportation 2020:38).

    Groundborne noise from TBMs would be a significant effect if groundborne noise levels inside of buildings exceeds the FTA criteria of 35 dBA for low-frequency vibration (approximately 30 Hertz) (Federal Transit Administration 2018:123).
- Placement of project-related activities in the vicinity of a private airstrip or an airport land use plan, or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, resulting in exposure of people residing or working in the project area to excessive noise levels.

No Action Alternative

The No Action Alternative takes into account projects, plans, and programs that would be reasonably expected to occur in the foreseeable future if the action alternatives were not approved and the purpose and need were not met. Many of these projects, such as construction of desalination plants or water recycling facilities, would involve construction of facilities that would require ground-disturbing activities by individual public water agencies to ensure local water supply reliability for its constituents.

Desalination plants, water recycling facilities, groundwater management facilities and water efficiency projects would be constructed to supply water to the coastal and inland regions of the Delta. In general, more projects would be required in the South Delta, where the additional supply would be needed to meet regional demand for water. Multiple facilities would be built and would require use of heavy equipment for construction of pumping plants, pipelines, structures, access roads and related infrastructure. The construction of each facility would result in a temporary increase in ambient noise along construction sites and haul roads as facilities are built and would likely result in a temporary increase in noise levels above daytime noise limits. Concrete pours requiring continuous work would likely exceed nighttime noise limits at the nearest receptors. Road and utility work may also be required during nighttime hours in some cases. Water supply actions requiring the largest facilities, such as desalination plants and major water recycling/treatment facilities, are expected to generate the most noise because of their size and the time needed for their construction. Other actions with smaller footprints, such as water conservation measures or groundwater storage, are expected to generate less noise when compared to other actions.

Operation of the projects would involve ongoing use of pumps and air handlers, and intermittent use of maintenance equipment. As with construction, the amount of noise generated would be dependent on the type and location of the facility being operated. Projects with exposed infrastructure, such as groundwater injection and extraction pumps, may produce more noise than those water supply projects housed in closed structures. Noise-attenuating features could be incorporated into facility structures to minimize noise from operations.

In addition to foreseeable projects, plans and programs that would occur in lieu of the action alternatives, existing habitat protection, levee maintenance and flood management activities would continue. Under No Action Alternative conditions, ambient traffic noise levels in the vicinity of roads would likely increase relative to existing conditions. The level of increase relative to any receptor would depend on site-specific development, population growth, and socioeconomic factors. An average annual vehicle traffic volume increase of 2%–3% from 2020 to 2040 would result in a noise level increase in the range of 2–3 decibels (dB). An increase of this magnitude would generally not be noticeable over this time horizon.

With regard to levees and flood control, maintenance and repair of levees would continue to periodically require use of heavy equipment for levee improvement projects. Levee failure would require the use of a considerable amount of heavy equipment for emergency flood fighting and clean-up actions, commensurate with the size of the flood. The presence of heavy equipment and associated transportation would be expected to generate noise in the areas they are protecting, but these types of actions would only occur on an emergency basis.

3.15.2.2 Effects and Mitigation

Impact NOI-1: Generate a Substantial Temporary or Permanent Increase in Ambient Noise Levels in the Vicinity of the Project in Excess of Standards Established in the Local General Plan or Noise Ordinance, or Applicable Standards of Other Agencies

No Action Alternative

Projects under consideration in the study area could have effects related to noise. Construction of these projects would involve use of heavy earthmoving equipment and increased use of heavy trucks on haul routes. Operation and maintenance of these projects could involve continuous operation of new facilities and use of maintenance vehicles. The use of heavy equipment associated with these projects would be a source of localized and temporary noise. Nighttime use of heavy equipment would be infrequent but may be required in some cases such as concrete pours and road closures for utility work. Over a longer period, maintenance of these projects may require use of heavy equipment on an occasional basis. In addition to foreseeable projects, plans and programs that would occur in lieu of the action alternatives, existing habitat protection, levee maintenance and flood management activities would continue under No Action Alternative conditions. The effects of noise during construction and operation of individual projects and plan and program implementation under the No Action Alternative are expected to be further evaluated in the subsequent project-level environmental analysis conducted for each individual plan, project, and program as required. Best noise control practices and site-specific noise mitigation would be available to minimize noise during construction and operation, but not all measures would necessarily be feasible to implement in all cases.

Alternative 1

<u>*Intakes B and C*</u>

Construction equipment types at intakes were modeled under different scenarios to describe sound levels at different locations of pile driving when combined with heavy equipment. By modeling different construction equipment configurations and combinations, the model calculated a range of sound levels that each individual receptor would potentially be exposed to over the entire construction period, which is estimated to be 12 years. However, the magnitude of noise levels reported in this analysis would occur on a nonconsecutive basis over this timeframe.

At each intake, temporary in-river cofferdams and permanent training walls would be constructed with interlocking sheet piles. Pile driving would only occur at one intake structure at a given time; however, two vibratory pile drivers may be used simultaneously during building of cofferdams. Impact drivers would only be used where a hard soil layer cannot be penetrated using a vibratory method. Impact pile driving would be done during the in-water work period regulated by NMFS and USFWS. Pile driving would be restricted to the daytime hours between 7:00 a.m. and 7:00 p.m. and would not occur at night. The analysis assumes that nighttime use of heavy equipment would be restricted to certain concrete pours, where continuous working of concrete is required.

The construction process for intake cofferdams is described in the C-E EPR. The conceptual intake cofferdam construction analysis determined that piles would be driven primarily using vibratory methods. According to pile drivability studies in the C-E EPR, for complete construction of an intake cofferdam, vibratory hammers are anticipated to be used for a total of up to 255 hours, for each intake location. Impact hammers would be used only if hard soils are encountered. Based on geotechnical analysis, it is expected that, for each pile, impact driving would be required for a period of 2 minutes, and vibratory driving would be used for the remainder of the time. Accounting for all piles that would be driven for each intake's cofferdam and training walls, impact hammers would be used for a total of up to 18 hours per intake. While the times of pile driving would vary based on timing requirements of in-water work, impact pile driving at intakes would cease once the cofferdam and training wall construction is complete. The balance of the 12-year construction schedule would involve the use of some vibratory pier casing driving and standard heavy equipment to build the rest of the intake components.

Foundation piers for the intake structure would be installed using drilled piers constructed of concrete placed inside starter casings and deeper augured pier excavations. The starter casings would be placed using vibratory driving methods, with permanent piers drilled inside and below the casings. Foundation piers would be installed over a period of 21 months for each intake.

Pile driving would also be done to install sheetpiles for an electrical service building at a central location on the sedimentation basins within the intake site. This location would be further from surrounding receptors, and it is estimated that piles would take a total of about 2 hours of vibratory driving time to install. Noise levels from this feature would be lower overall relative to surrounding receptors than cofferdam construction or general use of heavy equipment on the site.

In addition to construction-phase pile driving, a pilot study would be done prior to construction to test sheet pile installation methods at one of the intake sites. This is discussed below under *Field Investigations—All Action Alternatives*.

On a given day, the amount of pile driving would vary, but may occur at any time within the allowable work hours of 7:00 a.m. to 7:00 p.m. until all pile installations are complete. The vibratory hammer, in combination with other equipment at intakes may produce a level of up to 97 dBA 1-hour L_{eq} as sheet piles are installed. If impact drivers are used, the combined noise level from an impact-hammer pile driver operating simultaneously with noise levels from other equipment would produce a combined maximum level of 110 dBA L_{max} at 50 feet. Assuming an impact driving time of 2 minutes per every 15 minutes, the loudest level under this condition would be 101 dBA 1-hour L_{eq} at a distance of 50 feet. This value assumes the pile hammer would be idle between periods of impact and vibratory driving, as equipment would need to be set up, staged, and realigned during the pile installation process.

Standard heavy equipment would be used to construct the rest of the intake components. Including the initial building of supporting infrastructure such as haul roads and power to the intake locations, use of heavy equipment for construction of intakes would occur over an estimated 12 years. The heavy equipment types assumed used in the model for the intake site are a bulldozer, truck, and an excavator, with a combined sound level of 89 dBA 1-hour L_{eq} at 50 feet, assuming up to 100% equipment utilization. Over time, the riverfront and jurisdictional levees that would be constructed around the intake structure would provide some terrain shielding from heavy equipment and operation activities within the intake work area. As a result, noise levels from heavy equipment would be expected to be reduced over time. However, for this conservative analysis, factors related to facility attenuation during construction are not included in the model.

The existing hourly ambient sound levels are based on the nearest location of noise monitoring, at the south end of the town of Hood. The existing measured ambient daytime sound level is 51 dBA 1-hour L_{eq}, based on the nearest monitoring location. To meet daytime criteria for noise related to the action alternatives that both exceeds 60 dBA 1-hour L_{eq} and increases ambient levels by 5 dB or more, a value of 60 dBA 1-hour L_{eq} is used as the daytime noise limit for intakes and the Twin Cities Complex facilities.

The existing measured ambient nighttime sound level is 47 dBA 1-hour L_{eq}, based on the nearest monitoring location. To meet nighttime criteria for noise related to the action alternatives that both exceeds 50 dBA 1-hour L_{eq} and increases ambient levels by 5 dB or more, a value of 52 dBA 1-hour L_{eq} is used as the nighttime noise limit for intakes and the Twin Cities Complex facilities.

According to the modeling analysis, during periods of vibratory or impact pile driving, up to 117 residences would potentially be exposed to construction noise exceeding the 60 dBA 1-hour L_{eq} daytime noise limit. During intake construction activities other than cofferdam construction, heavy equipment may intermittently exceed the daytime noise limit of 60 dBA 1-hour L_{eq} at a total of 9 residences, with the highest receptor noise level approaching 67 dBA 1-hour L_{eq}. Nighttime use of heavy equipment would be restricted to certain concrete pours, where continuous working of concrete is required. According to modeling, during nighttime work, use of heavy equipment would exceed the 52 dBA 1-hour L_{eq} nighttime limit at up to 147 residences.

Twin Cities Complex Double Launch Shaft and Concrete Batch Plant along Lambert Road

Heavy equipment at the Twin Cities Complex launch shaft and the concrete batch plant along Lambert Road were modeled at the perimeter of the site and at interior locations to model a range of sound levels that each individual receptor would potentially be exposed to over the construction period. The types of heavy equipment used in the model are the three loudest types of equipment that may be used near one another at a given time. The heavy equipment types used in the model for the Twin Cities site are a bulldozer, a truck, and an excavator, with a combined sound level of 89 dBA 1-hour L_{eq} at 50 feet, assuming up to 100% equipment utilization. Each batch plant at the Lambert site would have a sound level of 84 dBA 1-hour L_{eq} at 50 feet, assuming up to 100% equipment utilization over the term of construction.

The modeling for these features used the same limits as intakes. According to modeling, heavy equipment may intermittently exceed the daytime noise limit of 60 dBA 1-hour L_{eq} at five residences, with the highest noise level approaching 71 dBA 1-hour L_{eq}. Nighttime use of heavy equipment would be restricted to certain concrete pours, where continuous working of concrete is required. Concrete production at the batch plant would be required periodically during nighttime hours for tunnel shaft pours and intake concrete pours. According to modeling, when night work is required, use of heavy equipment at the same levels of service would exceed the 52 dBA 1-hour L_{eq} nighttime limit at up to 12 residences.

Tunnel Shafts and Levee Improvements along the Central Alignment

Heavy equipment at the tunnel shafts along the central alignment were modeled at the perimeter of each site and at interior locations to model a range of sound levels that each individual receptor would potentially be exposed to over the construction period. Heavy equipment for levee improvements were modeled at each levee improvement location, at nearest locations to surrounding receptors. The types of heavy equipment used in the model are the three loudest types of equipment that may be used near one another at a given time. The heavy equipment types assumed in the model are a bulldozer, a truck, and an excavator, with a combined sound level of 89 dBA 1-hour L_{eq} at 50 feet, assuming up to 100% equipment utilization would occur over the term of construction.

The existing hourly ambient sound levels are based on monitoring conducted at Bouldin Island, which had the lowest average measured levels among these locations. The existing measured ambient daytime sound level is 44 dBA 1-hour L_{eq}, based on the nearest monitoring location. To meet daytime criteria for noise related to the action alternatives that both exceeds 60 dBA 1-hour L_{eq} and increases ambient levels by 5 dB or more, a value of 60 dBA 1-hour L_{eq} is used as the daytime limit for tunnel shafts and levee improvements along the central alignment.

The existing measured ambient nighttime sound level was 46 dBA 1-hour L_{eq}, based on the nearest monitoring location. Since this value is higher than the daytime measured value, the lower value of 44 dBA 1-hour L_{eq} is used to be conservative, because typically daytime levels are lower than nighttime levels. To meet the nighttime criteria for noise related to the action alternatives that both exceeds 50 dBA 1-hour L_{eq} and increases ambient levels by 5 dB or more, a value of 50 dBA 1-hour L_{eq} is used as the nighttime limit for tunnel shafts and levee improvements along the central alignment.

According to modeling, heavy equipment may intermittently exceed the daytime limit of 60 dBA 1-hour L_{eq} at 247 residences, with the highest noise level approaching 64 dBA 1-hour L_{eq}. This would occur during levee improvements on Bouldin Island. Work during nighttime hours would consist only of certain concrete pours that would need to be done continuously. All nighttime work would be done at shaft sites. According to modeling, when nighttime work is required, use of heavy equipment would exceed the 50 dBA 1-hour L_{eq} nighttime limit at up to five residences.

Southern Complex and South Delta Facilities

Heavy equipment used during construction of the Southern Complex, pumping plants, reusable RTM stockpile and South Delta Conveyance Facilities was modeled both at the perimeter of each feature and at interior locations to describe the range of sound levels that each individual receptor would potentially be exposed to over the entire period of construction.

Construction of the emergency spillway and outlet structure of the Southern Forebay and the California Aqueduct Control Structure would require temporary installation of sheet piles, which would be removed after in-water work is complete. Pile driving would be done using vibratory methods. The vibratory installation method in combination with other heavy equipment at the Southern Complex and South Delta Conveyance Facilities may produce a level of up to 97 dBA 1-hour L_{eq} as sheet piles are installed.

For general construction exclusive of pile driving, the heavy equipment types assumed in the model are a bulldozer, a truck, and an excavator, with a combined sound level of 89 dBA 1-hour L_{eq} at 50 feet, assuming up to 100% equipment utilization. Multiple batch plants would supply concrete for continuous pours over the course of construction. Each batch plant at the Southern Complex would have a sound level of 84 dBA 1-hour L_{eq} at 50 feet, assuming up to 100% equipment utilization.

The existing hourly ambient sound levels are based on monitoring conducted around Clifton Court Forebay. The existing measured ambient daytime sound level is 44 dBA 1-hour L_{eq}, based on the nearest monitoring location at Clifton Court Forebay. To meet daytime criteria for noise related to the action alternatives that both exceeds 60 dBA 1-hour L_{eq} and increases ambient levels by 5 dB or more, a value of 60 dBA 1-hour L_{eq} is used as the daytime noise limit for the Southern Complex and South Delta Conveyance Facilities.

The existing measured ambient nighttime sound level is 38 dBA 1-hour L_{eq}, based on the nearest monitoring location at Clifton Court Forebay. To meet nighttime criteria for noise related to the action alternatives that both exceeds 50 dBA 1-hour L_{eq} and increases ambient levels by 5 dB or more, a value of 50 dBA 1-hour L_{eq} is used as the nighttime noise limit for the Southern Complex and South Delta Conveyance Facilities.

According to modeling, heavy equipment may intermittently exceed the daytime noise limit of 60 dBA 1-hour L_{eq} at up to two receptors, with the highest receptor noise level approaching 72 dBA 1-hour L_{eq}. Nighttime use of heavy equipment would be restricted to certain concrete pours, where continuous working of concrete is required. According to modeling, when nighttime work is required, use of heavy equipment would exceed the 50 dBA 1-hour L_{eq} nighttime limit at six residences during operation of the concrete batch plants and pours at the pumping plant and Byron Tract working shaft and four residences during pours at the south forebay outlet structure double launch shaft and the California Aqueduct double reception shaft.

Construction of Bridges, New Access Roads, Road Improvements, and Park-and-Ride Lots

Road construction would require building of new bridges and reconstruction of some existing bridges for facility access roads to central conveyance corridor facilities. Piles and piers would be installed for bridge supports and trestles. The model assumes an average percentage of time pile driving would be active (up to 17% of the time during pile installation), accounting for equipment set up time when the pile hammer would be idle. The total number of days required for pile installation at bridges would vary between 4 and 45 days. Pile driving would only be done during daytime hours of 7:00 a.m. to 7:00 p.m., and vibratory driving would be used where possible, although it is anticipated impact pile driving would be required for bridge support piles. Accounting for all bridges, the daytime limit would be exceeded at up to 450 residences for a period of up to 45 days.

For road construction, the model conservatively assumes simultaneous use of a grader, a roller, and a paver. Assuming up to 100% equipment utilization for a given hour of day, the combined noise level of these pieces of equipment within work areas is 90 dBA 1-hour L_{eq} at 50 feet. Analysis of potential heavy equipment noise levels from construction of roads and park-and-ride lots assumes that the three loudest equipment types may be used within the same area at the same time.

The results indicate that noise-sensitive land uses within 700 feet of an active road construction area could be exposed to heavy equipment noise in excess of the daytime (7:00 a.m. to 10:00 p.m.) noise limit of 60 dBA 1-hour L_{eq}. The nighttime limit of 50 dBA 1-hour L_{eq} would be exceeded at a distance of 1,600 feet. However, construction of roads would affect different locations at different times, as equipment progresses over time from the beginning to the end of the road alignment. As such, noise levels at a given location are expected to exceed the indicated limits for a short period of time. Park-and-ride lots would be constructed over a larger area and would likely result in readily noticeable noise levels for a temporary but longer period of time at the nearest receptors, compared to roads.

Construction of Utilities and SCADA lines

Potential reasonable worst-case equipment noise levels from construction of power transmission and SCADA lines were evaluated by combining the noise levels of the three loudest pieces of equipment that would likely operate at the same time (a crane, a truck, and a drill rig for overhead work; two trucks, and an excavator for installation of underground cables). Assuming up to 100% utilization, the combined noise level is 89 dBA 1-hour L_{eq} at 50 feet. According to modeling, noise-sensitive land uses within 650 feet of an active utility construction area could be exposed to heavy equipment noise in excess of the daytime (7:00 a.m. to 10:00 p.m.) noise limit of 60 dBA 1-hour L_{eq}. The nighttime limit of 50 dBA 1-hour L_{eq} would be exceeded at a distance of 1,600 feet. Construction of utilities and SCADA lines would affect different locations at different times, as equipment progresses over time from the beginning to the end of the utility or SCADA line corridor. As such, noise levels at a given location are expected to exceed the indicated limits for less than a week's time.

Helicopters would be used to install 36 transmission towers to serve the Southern Complex. Helicopters would be required to hover for up to 25 days at 10 hours per day during construction of transmission towers around Clifton Court Forebay. Light- and medium-duty helicopters have a source level of up to 84 L_{max} at a reference distance of 500 feet (Nelson 1987:19/3–19/37). There are no residences within 1,000 feet of the utility corridor where helicopters would be used. Given that noise exposure to helicopters at receptors nearest to the utility corridor would be isolated to a single brief event during daytime hours, helicopters are not considered to contribute significantly to ambient noise levels during construction.

Truck Traffic on Haul Roads

Haul trucks and worker commutes would result in increased traffic noise levels along haul routes, which include existing roads connecting to new roads that would be constructed to access proposed intakes, tunnel shaft sites, and new facilities. For permanent features, concrete mixer trucks would be required on a temporary basis for up to one month during nighttime hours during continuous concrete pours.

Haul Route to New Intake Access Roads, Twin Cities Complex, and Lambert Concrete Batch Plant

The haul route to intakes would include I-5, Lambert Road, and a new haul road that would connect to Lambert Road. Lambert Road would be widened between Franklin Boulevard and the new intake haul road to accommodate intake truck traffic. Approximately 1 mile of Franklin Boulevard north of Twin Cities Road would be shifted slightly to the west for railroad service to the Twin Cities Complex. Traffic noise modeling results indicate that during night concrete pours, the increase in traffic noise would exceed 5 dB along Lambert Road and new intake haul roads. This would exceed the traffic noise increase criterion at one residence on Lambert Road and two residences on Corky Lane for the duration of night concrete pours, which would occur on a nonconsecutive basis for approximately 1 month for each intake.

Haul Route to New Hope Tract Maintenance Shaft

This haul route would construct a new haul road to the shaft site and would include I-5, Walnut Grove Road, Vail Road, and Lauffer Road. According to modeling results, the increase in traffic noise is not expected to exceed the increase criterion of 5 dB above existing levels at receptors along any of the haul route segments.

Haul Route to Staten Island Maintenance Shaft

This haul route would construct a new driveway to the shaft site and would include I-5, Walnut Grove Road, and Staten Island Road. According to modeling results, the increase in traffic noise is not expected to exceed the increase criterion of 5 dB above existing levels at receptors along any of the haul route segments.

Haul Route to Bouldin Island

This route would involve construction of new access roads from SR 12 to Bouldin Island Road. SR 12 would also be widened for additional haul traffic. According to modeling results, the increase in traffic noise is not expected to exceed the increase criterion of 5 dB above existing levels at receptors along any of the haul route segments.

Haul Routes to Mandeville Island Maintenance Shaft and Bacon Island Reception Shafts

This haul route would include SR 4, Lower Jones Road, and Bacon Island Road to serve the Bacon Island shaft site. The route would extend from there to a new access road at Mandeville Island shaft site. According to modeling results, the increase in traffic noise is not expected to exceed the increase criterion of 5 dB above existing levels at receptors along any of the haul route segments.

Haul Routes to Southern Complex

This route would connect new facility access roads on Byron Tract to Byron Highway. According to modeling results, the increase in traffic noise is not expected to exceed the increase criterion of 5 dB above existing levels at receptors along any of the haul route segments.

Temporary Realignment of SR 160

Segments of SR 160/River Road would be temporarily realigned inland at fish screen construction areas at Intakes B and C. Haul trucks are not anticipated to use SR 160 as a haul route. The realigned road would locate traffic on SR 160 further from the nearest residences across the Sacramento River. After construction of the levee is complete, the segment of SR 160 crossing the intake would be relocated within about 100 feet of the same horizontal alignment as the existing SR 160. Because the road would be moved farther from the nearest receptors on a temporary basis and returned to nearly the same alignment once construction is complete, the change in traffic noise from SR 160 would not be noticeable.

Park-and-Ride Lots

New park-and-ride facilities would be used for parking of commuter vehicles and transportation by bus to work sites. Vehicle activity in the park-and-ride lot would include parking of commuter vehicles and operation of buses transporting workers to and from work sites. According to modeling results for the five park-and-ride lots proposed for the action, the increase in noise related to use of park-and-ride lots is not expected to exceed the increase criterion of 5 dB above existing levels at the receptors nearest to the park-and-ride lots, and the increase resulting from operation of park-and-ride lots would result in no effect, as defined by FTA.

Commuter Traffic

Construction employee commuter routes would be distributed among the main arterials, including SR 12 and Byron Highway. Worst-case peak hour traffic noise modeling results are shown in Delta Conveyance Project Draft EIR Chapter 24, *Noise and Vibration*, Table 24-22 (California Department of Water Resources 2022). According to modeling results, the increase in traffic noise is not expected to exceed the criterion of 5 dB above existing levels at receptors along commuter routes, on a peak hour basis.

<u>*New Rail Infrastructure*</u>

New rail spurs extending from UPRR track would be added to move RTM, tunnel segments, and other building materials. This analysis assumes that up to three trains may use each of the new spurs on a given day, with each train consisting of an average of two locomotives and 50 rail cars.

Twin Cities Launch Shaft

At the Twin Cities launch shaft, Franklin Road would be realigned to the west, by a distance of approximately 100 feet. A railroad siding would be added parallel to the UPRR mainline along the northbound side of the realigned section of Franklin Road. Track would be added parallel to the perimeter of the launch shaft facility to provide loading and staging area for rail cars. The new track would be categorized as a rail yard as defined by FTA. The FTA *Noise and Vibration Impact Assessment Manual* indicates that receptors located within 1,000 feet of a rail yard would trigger the need for a quantitative noise analysis (Federal Transit Administration 2018:35). There are two residences to the south of the facility, approximately 150 feet away. Noise measurements obtained at Staten Island are representative of this location, considering similar proximity to arterial roads, and as such a value of 60 dBA L_{dn} is used to describe ambient levels at this location. There are projected to be four train movements per 24-hour day on the Twin Cities rail spurs, which run parallel to the southern perimeter of the facility, and as such, train use at the facility may result in a noise level increase of about 1 dBA compared to existing levels. An increase of this magnitude would not be noticeable above ambient conditions and would be categorized as "no impact" under FTA criteria. The new rail yard would also be located approximately 1,050 feet away from a residence east of Franklin Road, which would be farther than the screening distance indicated by FTA.

There is existing rail activity on the UPRR rail line parallel to Franklin Road. including grade crossings requiring sounding of horns across the intersection of Lambert Road and Franklin Road, and across Mokelumne School Road. New at-grade crossings would be added to the realigned segment of Franklin Road along the eastern perimeter of the facility. Locomotives are required to sound horns within 0.25 mile of at-grade crossings. The grade crossings would both be approximately 1,750 feet from the nearest residence, which is greater than the screening distance of 1,600 feet for quantitative analysis of horn noise. As such, noise from new grade crossings was not considered further.

Southern Complex

At the Southern Complex, a rail spur would extend from UPRR track near the Contra Costa–San Joaquin County line toward the new Southern Forebay. The track would pass within 500 feet of a residence and marina on Clifton Court Road. A sound level measurement of 50 dBA L_{dn} is representative of this area on noise measurements obtained around the perimeter of Clifton Court Forebay. Alternative 1 may result in a noise level increase of up to 5 dBA at this location. For a location with an existing level of 50 dBA L_{dn}, an increase of this magnitude would be categorized as "no impact" under FTA criteria. The remainder of the spur would travel through agricultural or vacant land, with the nearest receptors more than 1,000 feet away.

<u>*Tugboats and Barges*</u>

During construction of permanent components, barges would only be used to deliver and place riprap during the last stages of intake construction. For each intake, a total of one barge would be required for delivery of riprap near the end of the construction period. Barges would travel from north or south along the Sacramento River, with two roundtrips per day (excluding weekends) expected, and each barge may be pulled by up to three tugs to maneuver bends in the river. Assuming a travel speed of 5 knots, noise from three tugs would potentially be noticeable at a shoreline location for up to approximately 9 minutes for each pass by. Noise levels may exceed the daytime standard of 60 dBA 1-hour L_{eq} at a distance of 500 feet from the source. However, tugboat use for Alternative 1 would be infrequent, and the daytime standard of 60 dBA 1-hour L_{eq} at a distance of up to 500 feet would potentially be exceeded by only 1 decibel on an occasional basis.

Post-Construction Reclamation

After construction of permanent features at the intakes, tunnel launch shaft sites, and Southern Complex, temporary construction areas would be restored to be suitable for habitat or agricultural use. Details regarding duration and equipment requirements for reclamation at each of these sites is described in Attachment H of the C-E EPR (Delta Conveyance Design and Construction Authority

2022a:1–77). In general, similar types of equipment would be used during reclamation as for construction of permanent features, such as scrapers, graders, dozers, and trucks. As such, model results for feature would apply to reclamation activities. Model results are discussed above and sound levels by receptor location are shown in Delta Conveyance Project Draft EIR Appendix 24A, *Sound Level Contours* (California Department of Water Resources 2022).

Based on the information presented above, the potential for Alternative 1 to generate a substantial increase in ambient noise levels in excess of established standards may be significant.

Alternative 2b

Under Alternative 2b, one intake would be constructed instead of two to accommodate the design capacity of 3,000 cfs under this alternative. The effects under Alternative 2b would be less than Alternative 1 because Intake B and the Intake B access road would not be built. As such, receptors north of Hood-Franklin Road would be minimally affected by noise from construction and haul trucks, because none of this activity would be serving Intake B work areas, unlike under Alternative 1. However, construction and haul truck activity would result in increased noise levels at receptors located in the vicinity of the intake, conveyance, and South Delta facilities under Alternative 2b, which would exceed daytime noise limits, according to modeling. There would also be nighttime construction noise during continuous concrete pours, which would potentially exceed nighttime noise limits. Therefore, the potential for Alternative 2b to generate a substantial increase in ambient noise levels in excess of established standards may be significant.

Alternative 3

Alternative 3 would be similar to Alternative 1, except the tunnel shafts along the central alignment would not be built. Instead, the tunnel shafts would be built along the eastern alignment, as described below. In addition, different bridges would be constructed for haul routes under the eastern alignment alternatives. The effects on sensitive receptors would be slightly greater than Alternative 1. Therefore, the potential for Alternative 3 to generate a substantial increase in ambient noise levels in excess of established standards may be significant. Additional details on anticipated noise levels associated with construction of project features under Alternative 3 are presented here.

Tunnel Shafts, Lower Roberts RTM Stockpile and Levee Improvements along the Eastern Alignment

Heavy equipment at the tunnel shafts and RTM stockpile along the eastern alignment were modeled at the perimeter of each site and at interior locations to model a range of sound levels that each individual receptor would potentially be exposed to over the construction period. Heavy equipment for levee improvements were modeled at each levee improvement location, at nearest locations relative to surrounding receptors. The types of heavy equipment used in the model are the three loudest types of equipment that may be used near one another at a given time. The heavy equipment types assumed in the model are a bulldozer, a truck, and an excavator, with a combined sound level of 89 dBA 1-hour L_{eq} at 50 feet, assuming up to 100% equipment utilization.

Modeling analysis results indicate heavy equipment may intermittently exceed the daytime noise limit of 60 dBA 1-hour L_{eq} at 24 residences, with the highest receptor noise level approaching 70 dBA 1-hour L_{eq}. Nighttime use of heavy equipment would be restricted to certain concrete pours, where continuous working of concrete is required. According to modeling, when nighttime work is required, use of heavy equipment would exceed the 50 dBA 1-hour L_{eq} nighttime limit at up to 42 residences.

Construction of Road Improvements, New Access Roads, and Park-and-Ride Lots

The modeling approach under Alternative 3 would be the same as Alternative 1.

Road construction would require building of new bridges and reconstruction of some existing bridges for proposed facility access roads to eastern conveyance alignment facilities. Piles and piers would be installed for bridge supports and trestles. The model assumes an average percentage of time pile driving would be active, accounting for equipment set up time when the pile hammer would be idle. The total number of days required for pile installation at bridges would vary between 1 and 9 days. As for other features, pile driving would only be done during daytime hours of 7:00 a.m. to 7:00 p.m. and vibratory driving would be used where possible, although it is anticipated impact pile driving would be required for bridge support piles. Accounting for all bridges, the daytime limit would be exceeded at up to 193 residences for a period from 1 to 9 days.

Construction of Utilities and SCADA Lines

The sound levels under Alternative 3 would be the same as Alternative 1.

Truck Traffic on Haul Roads, Eastern Alignment

Haul traffic would be the same as Alternative 1 for haul routes to new intakes, Twin Cities Complex Launch Shaft, Lambert Road concrete batch plant, and the Southern Complex. Haul traffic would not occur on other features described under Alternative 1. Additional haul routes required for the eastern alignment alternatives are as described below.

Haul Route to New Hope Tract Maintenance Shaft, Eastern Alignment

This haul route would construct a new haul road to the shaft site and would include I-5, Walnut Grove Road, and Blossom Road. Traffic noise modeling results indicate that the increase in traffic noise is not expected to exceed the increase criterion of 5 dB above existing levels at receptors along any of the haul route segments.

Haul Route to Canal Ranch Tract Maintenance Shaft

This route would connect the new maintenance shaft to West Peltier Road. Traffic noise modeling results indicate that the increase in traffic noise is not expected to exceed the increase criterion of 5 dB above existing levels at receptors along any of the haul route segments.

Haul Route to Terminous Tract Reception Shaft

This route would connect the new retrieval shaft to SR 12. Traffic noise modeling results indicate that the increase in traffic noise is not expected to exceed the increase criterion of 5 dB above existing levels at receptors along any of the haul route segments.

Haul Route to King Island Maintenance Shaft

This route would connect the new maintenance shaft to West Eight Mile Road. Traffic noise modeling results indicate that the increase in traffic noise is not expected to exceed the increase criterion of 5 dB above existing levels at receptors along any of the haul route segments.

Haul Route to Lower Roberts Island Launch and Reception Shaft

This haul route would add a new road to the reception shaft site, which would be accessed from West House Road and SR 4. The stockpile area would be accessed via a new bridge and haul road from the Port of Stockton. The modeling results indicate that the increase in traffic noise is not expected to exceed the increase criterion of 5 dB above existing levels at receptors along any of the haul route segments.

Haul Route to Upper Jones Maintenance Shaft

This haul route would construct a new road to the shaft site that would be accessed from South Bacon Island Road and SR 4. The modeling results indicate that the increase in traffic noise is not expected to exceed the increase criterion of 5 dB above existing levels at receptors along any of the haul route segments.

Park-and-Ride Lots

Park-and-ride lots under Alternative 3 would be the same as Alternative 1, except that the Rio Vista lot would not be built.

Lower Roberts Stockpile Area

The new rail spur at Lower Roberts would connect to existing UPRR track at the Port of Stockton. The spur would travel over a new bridge that would be built over Burns Cutoff, leading to the west stockpile and tunnel segment storage area. At the closest point of approach, the new track would be approximately 1,000 feet away from waterfront residences on the other side of the San Joaquin River facing the port. However, the segment of track at this distance is only about 1,000 feet in length and would turn away from the shoreline as the new track leads to the stockpile area. The track would terminate approximately 1,500 feet south of Windmill Cove Road. The rural setting of Lower Roberts Island is similar to Bacon Island, and the existing ambient sound level would be about 52 dBA L_{dn} based on noise measurements obtained at Bacon Island. There are projected to be two train movements per 24-hour day on the Lower Roberts rail spurs, and train use at the facility may result in a noise level increase of about 1 dBA compared to existing levels. An increase of this magnitude would not be noticeable above ambient conditions and would be categorized as "no impact" under FTA criteria.

Alternative 4b

The effects under Alternative 4b would be the same as Alternative 2b for intakes, intake access roads, and the Southern Complex. The effects would be the same as Alternative 3 for tunnel shafts. Therefore, the potential for Alternative 4b to generate a substantial increase in ambient noise levels in excess of established standards may be significant.

DWR's Preferred Alternative

The effects under DWR's Preferred Alternative would be the same as Alternative 1 for intakes and intake access roads. The effects would be the same as Alternative 3 for tunnel shafts, except the Lower Roberts Island shaft would be used as a dual launch shaft, Upper Jones maintenance shaft would be in a different location, and a maintenance shaft at Union Island would be added. RTM stockpiles would be permanent on Lower Roberts Island and at the Twin Cities Complex. The

Southern Complex and South Delta Conveyance Facilities would not be built. Instead, the Bethany Reservoir Pumping Plant would be built to convey flows through a new Bethany Reservoir Aqueduct to a new Bethany Reservoir Discharge Structure along the shoreline of Bethany Reservoir. Overall, the effects in terms of noise levels would be slightly greater than Alternative 3. Therefore, the potential for DWR's Preferred Alternative to generate a substantial increase in ambient noise levels in excess of established standards may be significant. Additional details on anticipated noise levels associated with construction of project features under DWR's Preferred Alternative 3 are presented here.

Tunnel Shafts along the Bethany Reservoir Alignment Option

Heavy equipment at tunnel shafts was modeled at the perimeter of each feature and at interior locations to model a range of sound levels that each individual receptor would potentially be exposed to over the construction period. The types of heavy equipment used in the model are the three loudest types of equipment that may be used near one another at a given time. The heavy equipment types assumed in the model are a bulldozer, a truck, and an excavator, with a combined sound level of 89 dBA 1-hour L_{eq} at 50 feet, assuming up to 100% equipment utilization.

The existing measured ambient daytime sound level is 44 dBA 1-hour L_{eq}, based on the nearest monitoring location at Clifton Court Forebay. To meet daytime criteria for noise related to the action alternatives that both exceeds 60 dBA 1-hour L_{eq} and increases ambient levels by 5 dB or more, a value of 60 dBA 1-hour L_{eq} is used as the daytime noise limit for the Bethany Reservoir Complex.

The existing measured ambient nighttime sound level is 38 dBA 1-hour L_{eq}, based on the nearest monitoring location at Clifton Court Forebay. To meet nighttime criteria for noise related to the action alternatives that both exceeds 50 dBA 1-hour L_{eq} and increases ambient levels by 5 dB or more, a value of 50 dBA 1-hour L_{eq} is used as the nighttime limit for the Bethany Reservoir Complex. According to modeling, heavy equipment may intermittently exceed the daytime limit of 60 dBA 1-hour L_{eq} at 25 residences, with the highest noise level approaching 70 dBA 1-hour L_{eq}. Nighttime use of heavy equipment would be restricted to certain concrete pours, where continuous working of concrete is required. According to modeling, when nighttime work is required, use of heavy equipment would exceed the 50 dBA 1-hour L_{eq} nighttime limit at up to six residences.

Bethany Reservoir Complex

Heavy equipment used during construction of the Bethany Complex, including the Bethany Reservoir Pumping Plant and Surge Basin, Bethany Reservoir Aqueduct, and the Bethany Reservoir Discharge Structure was modeled both at the perimeter of each feature and at interior locations to describe the range of sound levels that each individual receptor would potentially be exposed to over the entire period of construction.

Construction of the Bethany Reservoir Discharge Structure would require installation of sheet piles. Pile driving would be done using vibratory methods. The vibratory method in combination with other heavy equipment at the discharge structure may produce a level of up to 97 dBA 1-hour L_{eq} as sheet piles are installed. For general construction exclusive of pile driving, the heavy equipment types assumed in the model are a bulldozer, a truck, and an excavator, with a combined sound level of 89 dBA 1-hour L_{eq} at 50 feet, assuming up to 100% equipment utilization.

There would be two concrete batch plants at the pumping plant and one controlled low strength material (CLSM) plant along the aqueduct operating continuously during daytime hours at the

Bethany Complex, and these were modeled as fixed sources. Each plant would have a sound level of 84 dBA 1-hour L_{eq} at 50 feet, assuming 100% equipment utilization. Concrete plants would operate during nighttime hours for certain continuous concrete pours at the complex.

The existing hourly ambient sound levels are based on monitoring conducted around Clifton Court Forebay. The existing measured ambient daytime sound level is 44 dBA 1-hour L_{eq}, based on the nearest monitoring location at Clifton Court Forebay. To meet daytime criteria for noise related to the action alternatives that both exceeds 60 dBA 1-hour L_{eq} and increases ambient levels by 5 dB or more, a value of 60 dBA 1-hour L_{eq} is used as the daytime noise limit for the Bethany Complex and associated facilities.

The existing measured ambient nighttime sound level is 38 dBA 1-hour L_{eq}, based on the nearest monitoring location at Clifton Court Forebay. To meet nighttime criteria for noise related to the action alternatives that both exceeds 50 dBA 1-hour L_{eq} and increases ambient levels by 5 dB or more, a value of 50 dBA 1-hour L_{eq} is used as the nighttime noise limit for the Bethany Complex and associated facilities.

According to modeling, heavy equipment may intermittently exceed the daytime noise limit of 60 dBA 1-hour L_{eq} at 12 residences, with the highest noise level approaching 64 dBA 1-hour L_{eq}. Nighttime use of heavy equipment would be restricted to certain concrete pours, where continuous working of concrete is required. According to modeling, when nighttime work is required, use of heavy equipment would exceed the 50 dBA 1-hour L_{eq} nighttime limit at up to 23 residences.

Road Improvements, New Access Roads, and Park-and-Ride Lots

The modeling approach under DWR's Preferred Alternative would be the same as Alternative 1.

Road construction would require building of new bridges and reconstruction of some existing bridges for proposed facility access roads to eastern conveyance alignment facilities. Piles and piers would be installed for bridge supports and trestles. The model assumes an average percentage of time pile driving would be active, accounting for equipment set up time when the pile hammer would be idle. The total number of days required for pile installation at bridges would vary between 1 and 9 days. As for other features, pile driving would only be done during daytime hours of 7:00 a.m. to 7:00 p.m. and vibratory driving would be used where possible, although it is anticipated impact pile driving would be required for bridge support piles. Accounting for all bridges, the daytime limit would be exceeded at up to 163 residences for a period of 4 to 9 days during period of pile driving.

Utilities and SCADA Lines

The modeling approach under DWR's Preferred Alternative would be the same as Alternative 1, except that two transmission towers would be built; one at the existing Tracy Substation and one at the new pumping plant site. Helicopters would not be used.

Truck Traffic on Haul Roads, Bethany Reservoir Alignment

Haul traffic would be the same as Alternative 3 for haul routes to new intakes, Twin Cities Complex launch shaft, Lambert Road concrete batch plant, New Hope Tract maintenance shaft, Canal Ranch Tract maintenance shaft, Terminous Tract reception shaft, and King Island maintenance shaft. There would be no increase in truck traffic on haul routes to the Lower Roberts Island dual launch shaft compared to the launch and reception shaft for Alternative 3. Haul traffic would travel to a different location for the Upper Jones Tract maintenance shaft as compared to Alternative 3, and the Union Island Maintenance Shaft access road would be added. The Southern Complex would not be built. Instead, haul routes would be constructed to access the Bethany Complex and associated facilities. Additional haul routes are as described below.

Haul Route to Lower Roberts Island Dual Launch Shaft

This haul route would add a new road to the shaft site, which would be accessed from West House Road and SR 4. The stockpile area would be accessed via a new bridge and haul road from the Port of Stockton. According to modeling, during night concrete pours, the increase in traffic noise would exceed the criterion of 5 dB above existing levels at receptors along West House Road and the new access road. This would exceed the traffic noise increase criterion at two residences for the duration of night concrete pours, which would occur for approximately 1 week.

Haul Route to Upper Jones Tract Tunnel Maintenance Shaft

This route would include construction of a new haul road that would be accessed from South Bacon Island Road. Traffic noise modeling results indicate that the increase in traffic noise is not expected to exceed the increase criterion of 5 dB above existing levels at receptors along any of the haul route segments.

Haul Route to Union Island Tunnel Maintenance Shaft

This haul route would include Bonetti Road, Clifton Court Road, and Tracy Boulevard. Traffic noise modeling indicate that the increase in traffic noise is not expected to exceed the increase criterion of 5 dB above existing levels at receptors along any of the haul route segments.

Haul Routes to Bethany Complex

This route would connect new facility access roads to Byron Highway. A new interchange would be built on Byron Highway at Lindemann Road, and a new bypass road would be built from West Grant Line Road to Mountain House Road. Additional haul roads would be built parallel to Mountain House Road and from Mountain House Road to Bethany Reservoir, both of which would be more than 1,000 feet away from the nearest receptors, including Mountain House School. The modeling results indicate that the increase in traffic noise is not expected to exceed the increase criterion of 5 dB above existing levels at receptors along any of the haul route segments.

Park-and-Ride Lots

Park-and-ride lots under DWR's Preferred Alternative would be the same as Alternative 1, except that the Rio Vista, Byron, and Bethany lots would not be built.

Field Investigations—All Action Alternatives

Field investigations for the action alternatives would consist of geotechnical borings, tests, and geophysical surveys. These would be done during daytime hours and would include use of drill rigs, heavy trucks, and worker vehicles. Barges would be used for over water testing. These investigations would occur at different locations within the study area at different times. At any given location, use of equipment would be short-term, generally 1 to 2 days in most locations, or up to 20 days where ground improvement or settlement testing would be conducted.

A pilot study would test cofferdam pile installation methods at one of the intake sites. Test piles would be driven from a barge near one of the cofferdam locations, to test pile drivability using impact and vibratory methods up to the required pile tip depth. It is anticipated that sound levels would be measured during the process of pile testing, to determine sound level values using each method and the performance requirements for potential mitigation options. Pile testing is expected to occur at one site selected among the intake locations and would take up to 3 days total. This would occur before the intake construction period, and sound levels during testing would use the same modeling assumptions as the cofferdams in the analysis of Intake B. The pile testing would be short-term and would occur during daytime hours. Aerial surveys may involve use of small aircraft, such as drones, helicopters, or fixed-wing aircraft. These would occur during daytime hours and would only occur for a brief period of time.

Field investigation activities would occur at a given location for a short amount of time during daytime hours and would cease once the testing is complete. However, depending on testing locations. field investigations may potentially exceed the daytime noise limit at nearby receptors. This impact may be significant.

Available control measures may reduce construction noise, but levels of construction noise may potentially remain above the daytime limit at some receptors after implementation of control measures.

Construction of intakes, shaft sites, control structures, levee improvement areas, the Southern Complex (or Bethany Complex under DWR's Preferred Alternative), and related facilities would involve the use of heavy equipment at associated construction sites for several years (up to 14 years), as the tunnels, intakes and complex facilities are built. Heavy equipment noise levels at these construction sites would potentially exceed daytime and nighttime noise limits under all alternatives, but the number of receptors affected would vary. A summary of receptors where daytime and nighttime limits would be exceeded according to modeling is shown in Table 3.15-1.

Table 3.15-1. Count of Receptors Exceeding Construction Noise Level Criteria by Action Alternative

	Total Count of Receptors Exceeding Daytime Noise Level Criteria [a, b]		Total Count of Receptors Exceeding Nighttime Noise Level Criteria [a, b]
Action Alternative	Long-term Buildout of Intakes, Conveyance, and Southern Complex or Bethany Complex [c]	Impact and Vibratory Pile Driving for Intakes, Conveyance, and Southern Complex or Bethany Complex [d]	Concrete Pours [e]
1	14 residences	125 residences	177 residences
2b	7 residences	25 residences	42 residences
3	19 residences	130 residences	214 residences
4b	12 residences	30 residences	79 residences
5	35 residences	143 residences	230 residences

[a] Criteria from California Department of Water Resources 2005:01570-12. Daytime = 7:00 a.m. to 10:00 p.m.; nighttime = 10:00 p.m. to 7:00 a.m.

[b] Receptors for this analysis were located within 2 miles of the construction sites.

[c] Duration of project buildout is estimated to be 12 to 14 years, depending on action alternative. However, the magnitude of noise levels reported in this analysis would occur on a nonconsecutive basis over this timeframe. Levee improvement work, estimated to occur for up to 1 month at a given location, is not included in receptor counts for

long-term buildout because levee work would be short-term relative to each receptor as construction progresses along the alignments of levees.

[d] Duration of pile driving at project facilities is estimated to be up to 21 months, which would be done on a nonconsecutive basis at intakes during facility buildout. For other facilities and bridges, pile driving is estimated to require 1 to 45 days to complete. A description of pile driving for bridge locations is included in Delta Conveyance Project Draft EIR Appendix 24F, *Pile Driving Specifications for New Bridges on Haul Routes* (California Department of Water Resources 2022).

[e] Duration of concrete pours would be 1 week to 1 month for most facilities. Near concrete batch plants, night activity is estimated to occur for up to 4 months.

Construction of roads, park-and-ride lots and utilities would involve use of non-impact heavy equipment on a temporary, short-term basis relative to a given receptor location. Nighttime construction of roads and utilities may be needed in some cases.

Haul trucks and worker commutes would result in increased traffic noise levels along haul routes, which include existing roads connecting to new roads that would be constructed to access proposed intakes, tunnel shaft sites, and new facilities. Truck use on haul routes would be limited to daytime hours, except for certain concrete pours at intakes, shaft sites, South Delta facilities (under all alternatives except DWR's Preferred Alternative), and the Bethany Complex (under DWR's Preferred Alternative). Concrete mixer trucks would use haul routes at night during these concrete pours, which would take up to 1 month to complete for each facility. Accounting for nighttime use of concrete mixer trucks, the modeling results indicate that the increase in traffic noise is not expected to exceed the increase criterion of 5 dB above existing levels at receptors along any of the haul route segments.

The realignment of SR 160 at intakes is not expected to result in a noticeable increase in traffic noise at any nearby receptors. New park-and-ride lots at Charter Way, Byron, and Bethany would be located within 100 feet of the nearest receptors, but the increase in terms of L_{dn} levels from operation of park-and-ride lots is not expected to be noticeable at the nearest receptors.

New rail spurs extending from UPRR track would be added to move RTM, and/or tunnel segments, and other building materials. Noise from train activity on rail spurs may result in an increase of up to 1 dB at Twin Cities Complex launch shaft, up to 5 dB at the Southern Complex (in terms of L_{dn}), and up to 1 dB at the Lower Roberts Island (under Alternatives 3, 4b, and DWR's Preferred Alternative), which is not considered to be a noticeable increase, and would be categorized as "no impact" under FTA guidelines. Tugboats pulling barges are expected to be an intermittent source of noise near the end of the construction of intakes, but only on an infrequent basis.

Under Mitigation Measure NOI-1: *Develop and Implement Noise Abatement Plan Including Site-Specific Measures*, the applicant and contractors would implement best noise control practices and additional measures to reduce noise levels and minimize or avoid effects from equipment noise during construction of water-conveyance features. However, based on constructability considerations, these measures may not be feasible to implement in all cases. Under all action alternatives, effects would remain after implementation of Mitigation Measure NOI-1. More information about Mitigation Measure NOI-1 is in Appendix C3, *Compensatory Mitigation Plan for Special-Status Species and Aquatic Resources*.

Construction of compensatory mitigation at the I-5 ponds and Bouldin Island would involve the use of non-impact heavy equipment. Refer to Appendix C3, *Compensatory Mitigation Plan for Special-Status Species and Aquatic Resources*, for a description of the compensatory mitigation activities. The analysis assumes that the three loudest types of equipment that may be used near one another at a given time, relative to a nearby receptor. The heavy equipment types assumed in the model are a bulldozer, a truck, and an excavator, with a combined sound level of 89 dBA 1-hour L_{eq} at 50 feet, assuming up to 100% equipment utilization.

The sound level results indicate that noise-sensitive land uses within 650 feet of an active construction area could be exposed to heavy equipment noise in excess of the daytime (7:00 a.m. to 10:00 p.m.) noise limit of 60 dBA 1-hour L_{eq}. No nighttime work is expected. However, construction of the compensatory mitigation would affect different locations at different times, as equipment progresses over time over the habitat improvement areas. As such, noise levels at a given location are only expected to exceed the indicated limits for a short period relative to individual receptors. There are two residences located adjacent to I-5 Pond 6, and two residences located adjacent to I-5 Ponds 7 and 8 that could exceed the daytime limit on an intermittent basis. Bouldin Island faces the community of Terminous to the east about 800 feet away, and Brannan Island to the west about 1,000 feet away. Construction may exceed daytime levels on an intermittent basis at the I-5 ponds and at communities facing Bouldin Island. However, once the levee improvements on Bouldin Island are complete, noise levels from construction equipment would likely be lower within the surrounding communities.

Some mitigation measures would involve use of heavy equipment such as graders, excavators, dozers, and haul trucks that would have the potential to expose sensitive receptors (e.g., residences, outdoor parks, schools, agriculture areas) to increased ambient noise effects. Temporary increases in ambient noise levels resulting from implementation of mitigation measures would be similar to effects from construction of the action alternatives and would contribute to construction noise effects of the action alternatives.

Implementation of these mitigation measures would involve the use of non-impact heavy equipment. Construction-related noise would exceed thresholds for daytime and nighttime noise at intakes, shaft sites, the Southern Forebay, Southern Complex, and associated infrastructure under all alternatives. Mitigation Measure NOI-1: *Develop and Implement Noise Abatement Plan Including Site-Specific Measures* will reduce noise levels during construction. However, after implementation of mitigation measures, the duration, frequency, and intensity of noise from heavy equipment is likely to remain above thresholds associated with construction noise.

Based on the information presented above, even with implementation of proposed mitigation measures, the potential for field investigations to generate a substantial increase in ambient noise levels in excess of established standards may be significant under all action alternatives.

Impact NOI-2: Generate Excessive Groundborne Vibration or Groundborne Noise Levels

No Action Alternative

Projects under consideration in the study area could have effects related to groundborne noise and vibration. Construction of these projects could involve ground-disturbing activities, and operation and maintenance of these projects could involve equipment operation and other vibration-generating activities. Construction activities and the use of heavy equipment associated with these projects would be a source of localized and temporary vibration. Over a longer period, some maintenance of these projects may be required on an occasional basis. In addition to foreseeable projects, plans and programs that would occur in lieu of the action alternatives, existing habitat protection, levee maintenance and flood management activities would continue under No Action Alternative conditions. The effects of increased vibration levels during construction and operation of projects and plan and program implementation under the No Action Alternative are expected to be further evaluated and identified in the subsequent project-level environmental analysis conducted for the plans, projects, and programs that would occur to address vibration under the No Action Alternative. Environmental commitments and best management practices would be available to minimize vibration during construction and operation, but these may not be feasible to implement in all cases.

All Action Alternatives

Pile Driving

Sheet piles would be driven at several proposed components, including intake cofferdams, control structures, bypass structures, and bridges where new roads would be built or existing roads would be widened. Pile drivers may produce perceptible levels of groundborne vibration in the immediate vicinity of the pile hammer. Sheet piles would primarily be driven using a vibratory hammer, with impact drivers used only in certain situations where hard soils are encountered. Vibration from intermittent sources may be perceptible at a level of 0.04 inches per second peak particle velocity (PPV), depending on soil conditions. Buildings of fragile construction may be damaged at a vibration level of 0.12 to 0.20 inch per second PPV. Impact drivers produce a level of vibration of 0.04 inch per second PPV at a distance of up to 280 feet under worst-case conditions; however, according to geotechnical studies, impact drivers would rarely be used, and only where vibratory hammers are not able to penetrate layers where hard soils are encountered. Vibratory drivers produce a level of vibration of 0.04 inch per second PPV at a distance of up to 160 feet and 0.12 inch per second PPV at a distance of up to 75 feet. The nearest receptors to intake cofferdams are about 600 feet away. Each of the control structures and bypass structures at the Southern Complex would be located more than 1,000 feet from the nearest sensitive receptor under all alternatives except DWR's Preferred Alternative. The discharge structure and surge basins that would be constructed under DWR's Preferred Alternative would be located more than 1,000 feet from the nearest sensitive receptor. For new bridges to be reconstructed under the action alternatives, pile driving would occur nearer to residences in some locations. The Hood-Franklin bridge would involve driving piles as near as 300 feet away from the nearest residence in the town of Hood, and piles driven for the SR 12 Bridge over Little Potato Slough would occur as near as 400 feet away from the nearest residence in the community of Terminous. According to modeling, vibratory drivers would not exceed vibration criteria for annoyance or building damage at any of these locations. Even if impact drivers are briefly used, vibration levels would still be below these criteria. Therefore, according to modeling, vibration criteria would not be exceeded at any sensitive receptors during construction of the action alternatives.

Non-Impact Heavy Equipment

Construction of water-conveyance facilities, levees, roads, and utilities as well as decommissioning activities would involve the use of non-impact heavy equipment. Non-impact equipment such as dozers generate perceptible levels of vibration within approximately 25 feet from the equipment. No sensitive receptors are within 25 feet of any of the construction areas. During construction of roads and park-and-ride lots, vibratory rollers may be used during rolling of asphalt and construction of embankments, levees, and shaft pads; rollers produce a vibration level of 0.04 inch per second PPV up to 75 feet away from the source. This may produce a perceptible level of vibration at receptors nearest to road and park-and-ride lot construction areas, but vibration at this level would occur only for a short time while the roller is in motion along the asphalt surface. Use of vibratory rollers during construction of embankments and levees may produce a perceptible level of vibration for very short period of time for structures located within 100 feet of work areas, but any perceptible vibration would occur for only a short period of time while equipment is operated near structures. The construction of roads, park-and-ride lots, embankments, levees, and shaft pads would be short-term, and the use of heavy equipment in these locations would cease once construction is complete. Therefore, according to modeling, vibration criteria would not be exceeded at any sensitive receptors during use of heavy equipment for construction.

Tunnel Boring Equipment

Alternatives 1, 2b, 3, and 4b

The use of TBMs during construction would potentially cause groundborne vibration or groundborne noise in the immediate vicinity of tunnel construction areas. Vibration sources include the TBM and conveyors moving soil, equipment, and construction workers between tunnel shaft sites. The depth of the main tunnel crown would be approximately 103 feet below mean sea level at Intake B, with elevation decreasing at a constant rate to 128 feet below mean sea level at the Southern Forebay's South Delta Outlet and Control Structure under all alternatives except DWR's Preferred Alternative, which would end at the Bethany Reservoir Pumping Plant.

Based on the geologic studies conducted to date, the TBM is expected to progress approximately 40 feet per day based on similar tunneling operations, although the rate of tunneling would depend on soil types encountered. The TBM would operate 20 hours per day, 5 days per week.

For both the central and eastern alignment, the types of receptors nearest to the tunnel alignment are seven single-family residential structures within 50 horizontal feet of the tunnel alignment. Two of these structures are along SR 160, three are at the east end of the town of Hood, one is on Lambert Road, and one is located on Walnut Grove Road. Outdoor use areas are generally not considered to be sensitive to vibration. At locations where residences are within 50 feet of the tunnel, the depth of the tunnel crown would be more than 100 feet below the existing ground surface. At the shallowest tunnel depth of 110 feet, groundborne vibration from a TBM is estimated to be 0.003 inch per second PPV, which is well below the vibration perception criterion of 0.04 inch per second PPV and the most stringent building damage criterion of 0.12 inch per second PPV. As demonstrated by measured ground vibration data from modern tunneling projects, the deep soil cover over the tunnel would effectively dampen and absorb propagated energy from the tunnel crown and the tunnel floor.

During tunnel construction, conveyors hauling workers and material inside of the tunnel would produce localized groundborne vibration. However, conveyors would be operated at slow speeds and would not result in excessive vibrations or groundborne noise from the tunnel floor.

Based on the information presented above, the potential for Alternatives 1, 2b, 3, and 4b to generate excessive groundborne vibration or groundborne noise levels does not appear to be significant.

DWR's Preferred Alternative

Effects of tunneling under DWR's Preferred Alternative including tunnel sections north of the Bethany Reservoir Pumping Plant would be similar to Alternative 3. Aqueduct sections under DWR's Preferred Alternative would use a digger shield with an excavator arm to construct short tunnel sections between the pumping plant and discharge structure at Bethany Reservoir. Vibration source data from this type of equipment is assumed to be similar to auger drilling. These tunnels are 1,000 feet away from the nearest receptors and vibration would not be perceptible at this distance.

Heavy equipment use during construction is not expected to exceed vibration criteria for annoyance to receptors or building damage. Therefore, vibration levels during construction would be below the vibration threshold.

Construction of ponds and habitat areas for compensatory mitigation would involve the use of heavy equipment including vibratory rollers, which would be used during construction and alteration of levee embankments. Vibratory rollers may produce perceptible levels of groundborne vibration within about 50 feet of the equipment. Non-impact equipment types such as bulldozers generate perceptible levels of vibration within about 25 feet from the equipment. There are no sensitive receptors located within 50 feet of any of the compensatory mitigation construction areas. Outdoor use areas are generally not considered to be sensitive to vibration.

Based on the information presented above, the potential for DWR's Preferred Alternative to generate excessive groundborne vibration or groundborne noise levels does not appear to be significant.

Impact NOI-3: Place Project-Related Activities in the Vicinity of a Private Airstrip or an Airport Land Use Plan, or, Where Such a Plan Has Not Been Adopted, within 2 Miles of a Public Airport or Public Use Airport, Resulting in Exposure of People Residing or Working in the Study Area to Excessive Noise Levels

No Action Alternative

Projects under consideration in the study area could be conducted in the vicinity of airports. Aircraft operations from these airports contribute to existing noise levels in the study area and would continue to do so in the future. The No Action alternatives would not add sensitive uses that would potentially be affected by aircraft noise. Workers would not be exposed to excessive airport noise. There would be no effect.

All Action Alternatives

There would be no effects related to the influence of noise from aircraft or airports for the action alternatives. The nearest public use airports in the study area are Byron Airport, about 1 mile from the Southern Complex (under Alternatives 1, 2b, 3, and 4b) and about 3 miles from Bethany Reservoir (under DWR's Preferred Alternative), and Franklin Field, 1 mile east of the Twin Cities Complex. The facilities would be outside the 60 L_{dn} noise level contour and outside the airport influence area of each of these airports. Several airports are located in the surrounding area within 10 miles of the Central, Eastern and Bethany Reservoir Alignments, including the Lathrop Airport (Sharpe AAF), Stockton Municipal Airport, Kingdon Airpark, Lodi Airpark, Franklin Field, Clarksburg Airport, Walnut Grove Airport, Lost Isle Seaplane Base, and several private airstrips. Aircraft operations from these airports contribute to existing noise levels in the study area and would continue to do so in the future. However, the action alternatives would not add sensitive uses that would potentially be affected by aircraft noise. Workers would not be exposed to excessive airport noise.

Project facilities would be located outside the 60 L_{dn} noise level contour and outside the airport influence area of the airports nearest to the study area.

Compensatory mitigation would not occur in the vicinity of private or public airports, such that it would expose people residing or working in the area to excessive noise from aircraft or airports. I-5 Ponds 6, 7, and 8 are more than 3 miles west of the nearest airports at Kingdon Airpark and Lodi Airpark. The nearest airport to the compensatory mitigation is the Rio Vista Municipal Airport, about 5 miles northwest of Webb Tract. The compensatory mitigation would not add sensitive uses that would potentially be affected by aircraft noise. Workers would not be exposed to excessive airport noise.

Based on the information presented above, there would be no potential for workers to be exposed to excessive noise levels in the vicinity of airports under any of the action alternatives; therefore, no impact is anticipated.

3.15.2.3 Cumulative Analysis

Implementation of the Delta Conveyance Project would result in noise and vibration effects associated with construction of new intake and conveyance facilities and habitat restoration measures. To assess the contribution of the action alternatives to cumulative noise and vibration conditions, noise and vibration from construction of the action alternatives is evaluated in conjunction with noise and vibration potentially generated by past, present, and reasonably foreseeable future projects within the study area.

Table 3.15-2 summarizes reasonably foreseeable plans, policies, and programs that are anticipated to be implemented and resulting effects on noise and vibration.

Table 3.15-2. Plans, Policies, and Programs Included in the Cumulative Analysis

Program/Project	Agency	Status	Description of Program/ Project	Effects on Noise and Vibration
Delta Dredged Sediment Long-Term Management Strategy	USACE	Ongoing	Maintenance and improvement of channel function, levee rehabilitation, and ecosystem restoration.	Potential increase in temporary construction and traffic noise levels. Negligible effects on vibration.
Delta Levees Protection Program	DWR	Ongoing	Strengthening of existing levees and construction of embankments inside some levees.	Potential increase in temporary construction and traffic noise levels. Negligible effects on vibration.
California EcoRestore	Multiagency (e.g., DWR)	Ongoing	Initiative to coordinate and advance at least 30,000 acres of habitat restoration including land in the Sacramento–San Joaquin Delta.	Potential increase in temporary construction and traffic noise levels. Negligible effects on vibration.
McCormack-Williamson Tract Restoration Project	DWR	Planning phase	Tidal marsh restoration.	Potential increase in temporary construction and traffic noise levels. Negligible effects on vibration.
Sherman Island Restoration Projects	DWR	Planning phase	Wetland Restoration, 3,900 acres.	Potential increase in temporary construction and traffic noise levels, especially in the area of compensatory mitigation. Negligible effects on vibration.

Program/Project	Agency	Status	Description of Program/ Project	Effects on Noise and Vibration
Twitchell Island West End Wetland	DWR	Planning phase	Wetland Restoration, 1,250 acres.	Potential increase in temporary construction and traffic noise levels, especially in the area of compensatory mitigation. Negligible effects on vibration.

DWR = California Department of Water Resources; USACE = U.S. Army Corps of Engineers.

The ongoing projects and programs in the study area would require use of heavy equipment on an ongoing basis; however, the distances between projects are large enough that equipment noise is unlikely to combine to increase noise level noticeably in any given area, although this could occur occasionally. Vibration levels would only be perceptible in the immediate area of heavy equipment use, and these effects are not expected to combine between projects. Due to the distance between projects, the suite of all ongoing projects and programs in the Delta are not expected to collectively result in adverse effects related to noise or vibration. The effects of individual projects on noise and vibration are described in the environmental documentation for each project and would likely have their own mitigation measures.

The Delta Conveyance Project, in combination with other projects that affect noise levels, may potentially result in increased noise levels at sensitive receptors in the noise and vibration study area; however, the level of increase from use of heavy equipment is unlikely to be noticeable, given the distance between cumulative projects and construction work areas for the action alternatives. Vibration levels would only be perceptible in the immediate area of heavy equipment use, and this is not expected to occur under the action alternatives, or in combination with other projects.

3.16 Recreation

This section describes the affected environment for recreation resources and analyzes effects that could occur in the study area from construction, operation, and maintenance of the action alternatives, as well as the No Action Alternative. Mitigation and minimization measures that would avoid, minimize, rectify, reduce, or compensate potentially adverse effects are included as part of each action alternative. Additional information on the affected environment, methods, and the anticipated effects of the action alternatives can be found in Delta Conveyance Project Draft EIR Chapter 16, *Recreation* (California Department of Water Resources 2022).

3.16.1 Affected Environment

The study area evaluated for potential effects on recreation includes portions of the Alameda, Sacramento, Yolo, San Joaquin, and Contra Costa Counties containing the statutory Delta and other areas directly adjacent to the statutory Delta. The areas where recreation effects would occur coincide with the temporary and permanent footprints of disturbance associated with construction of the proposed water-conveyance and related facilities. Although the study area includes some recreation resources within the statutory Delta's broader geography, recreation effects are analyzed only in nearby waterways and within or adjacent to the temporary and permanent footprints of disturbance associated with the construction of each action alternative as well as compensatory mitigation sites such as Bouldin Island and I-5 Ponds 6, 7, and 8.

The Delta contains numerous parks, extensive public lands, and many interconnected rivers, sloughs, and other waterways that offer diverse recreation opportunities. Privately owned commercial marinas and resorts allow access to the waterways and a variety of other recreation opportunities and services. Water-based activities in the Delta include cruising, waterskiing, wakeboarding, using personal watercraft, sailing, windsurfing, and kiteboarding, as well as fishing and hunting (from land and by boat). Land-based recreation activities include hunting, shoreline fishing, wildlife viewing, camping, picnicking, hiking and walking on trails, sightseeing, winery tours and festivals, and visiting historical sites. Private lands also provide several recreation opportunities, particularly nature watching, walking, biking, and hunting. Delta Conveyance Project Draft EIR Chapter 16, *Recreation* (California Department of Water Resources 2022) provides a detailed description of existing public and private recreation facilities in the study area, as well as the range of recreation activities that occur in the study area, and participation trends and projections.

3.16.2 Environmental Consequences

This section describes the assessment methods used to analyze potential environmental effects and identifies the direct, indirect, and cumulative recreation effects associated with the action alternatives and the No Action Alternative.

3.16.2.1 Methods for Analysis

Effects on recreation were assessed by identifying recreation areas that fall within the construction footprint to evaluate whether recreation sites or facilities would be permanently displaced by proposed water-conveyance facilities. In addition, effects on recreation sites or uses within certain distances of construction activity were evaluated to assess the potential for construction-related disturbances to recreation opportunities because of changes to traffic conditions, the visual setting, and noise levels that could occur during construction of the proposed facilities. A site reconnaissance, supplemented with interviews of recreation providers or managers in the recreation business, was conducted to further identify recreation use patterns in the study area.

Effects on recreation that could occur during construction of the action alternatives were evaluated qualitatively. Construction activities could result in short-term (i.e., 2 years or less) loss of recreation opportunities by disrupting use of recreation areas or facilities. A long-term effect (i.e., more than 2 years) could occur if a recreation opportunity is markedly changed or eliminated due to the presence of construction-related activities and noise, or if the opportunity is fully eliminated because of placement of water-conveyance structure(s) on or adjacent to a recreation area or facility. Effects on recreation that could occur because of operations and maintenance of the water-conveyance facilities were also evaluated qualitatively. Operation of the proposed pump stations could result in noise levels that affect recreation use areas. Maintenance activities could result in short-term loss of recreation opportunities by disrupting use of recreation areas or facilities.

No Action Alternative

The No Action Alternative takes into account projects, plans, and programs that would be reasonably expected to occur in the foreseeable future if none of the action alternatives were approved and the proposed action's purpose and need were not met. Water agencies participating in the Delta Conveyance Project have been grouped into four geographic regions. The water agencies within each geographic region would likely pursue a similar suite of water-supply projects under the No Action Alternative.

Public water agencies participating in the Delta Conveyance Project have been grouped into four geographic regions. The water agencies within each geographic region would likely pursue a similar suite of water-supply projects under the No Action Alternative.

Many of these projects, such as desalination plants or water recycling facilities, would require construction activities which may conflict with existing recreation opportunities occurring at or near where the facilities would be located. Depending on location and size, some water-supply facilities may permanently affect existing recreation opportunities.

Table 3.16-1 provides examples of potential effects that would have to be evaluated for most water supply–reliability projects.

Table 3.16-1. Summary of Activities Occurring under the No Action Alternative and Potential Recreation Effects

Project Type	Region [a]	Potential Construction Effects
Increased/ accelerated seawater desalination	Northern coastal, southern coastal	Exhaust emissions and fugitive dust, temporary traffic congestion as well as increased noise from construction equipment, vehicles, employee commutes required for facility construction and pipeline installation could disrupt recreationists in adjacent areas or disrupt recreation access routes (road or trails). This could lead to a reduced quality of experience or short-term displacement of some users who would choose to participate in recreation activities at other locations.

Project Type	Region [a]	Potential Construction Effects
Groundwater management	Northern coastal, southern coastal	Exhaust emissions and fugitive dust, temporary traffic congestion as well as increased noise from construction equipment, vehicles, employee commutes required for possible well drilling or water-conveyance facilities. These activities in specific locations that happen to adjoin recreation use areas or parks could disrupt recreationists in these adjacent areas or disrupt recreation access routes (road or trails). This could lead to a reduced quality of experience or short-term displacement of some users who would choose to participate in recreation activities at other locations.
Water recycling	Northern coastal, northern inland, southern coastal, southern inland	Exhaust emissions and fugitive dust, temporary traffic congestion as well as increased noise from construction equipment, vehicles, employee commutes required for facility construction and pipeline installation could disrupt recreationists in adjacent areas or disrupt recreation access routes (road or trails). This could lead to a reduced quality of experience or short-term displacement of some users who would choose to participate in recreation activities at other locations.
Water Use efficiency measures	Northern coastal, southern coastal, southern inland	Minor amounts of exhaust emissions and fugitive dust, temporary traffic congestion as well as increased noise from construction equipment, vehicles, employee commutes if water-conveyance facilities are constructed. This could disrupt recreationists in adjacent areas or disrupt recreation access routes (road or trails). This could lead to a reduced quality of experience or short-term displacement of some users who would choose to participate in recreation activities at other locations. exhaust emissions and fugitive dust is pipeline or canal construction is required.

[a] See Chapter 2, *Project Description and Alternatives*, Section 2.5, *No Action Alternative*, for a complete definition of the geographic regions.

Desalination projects would most likely be pursued in the northern and southern coastal regions. The southern coastal regions would likely require larger and more desalination projects than the northern coastal region in order to replace the water yield that otherwise would have been received through the Delta Conveyance Project. These projects would be sited near the coast. Groundwater recovery (brackish water desalination) would involve less construction activities and could occur across the northern inland, southern coastal, southern inland regions and in both coastal and inland areas, such as the San Joaquin Valley. Grading and excavation at the desalination and groundwater recovery plant sites would be necessary for construction of foundations, and trenching would occur for installation of water delivery pipelines and utilities.

The northern and southern coastal regions are also most likely to explore constructing groundwater management projects. The southern coastal region would require more projects than the northern coastal region under the No Action Alternative.

Water recycling projects could be pursued in all four regions. The northern inland region would require the fewest number of wastewater treatment/water reclamation plants, followed by the northern coastal region, followed by the southern coastal region. The southern inland region would require the greatest number of water recycling projects to replace the anticipated water yield that it otherwise would have received through the Delta Conveyance Project. These projects would be located near water treatment facilities.

From a comparative perspective, it is anticipated that the greatest conflict with recreation may occur when water-supply projects are constructed in or near coastal areas as these areas are recognized as providing important local and regional recreation opportunities. Other types of water-supply projects considered in this assessment may be less likely to conflict with existing recreation opportunities because of their location and scale.

3.16.2.2 Effects and Mitigation

Impact REC-1: 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

No Action Alternative

Foreseeable programs or projects associated with the No Action Alternative in the study area could involve relocation or temporary closure of some recreation access routes during construction; however, most of the programs and plans in the long run could provide new or improved recreation opportunities such as wildlife viewing or new and improved public access points and trails. Some programs and projects could provide recreation development projects that involve adding facilities (e.g., Clifton Court Forebay Fishing Facility) and those would directly result in the creation of expansion of all new recreation facilities and opportunities. Many of the programs and projects involve habitat restoration or development projects would take place on land governed by policies designed to avoid or mitigate environmental effects of past actions or changes.

All Action Alternatives

None of the action alternatives would result in reconstruction, expansion, or relocation of existing recreation facilities in the Delta. However, under DWR's Preferred Alternative, construction of the new discharge structures on the shoreline of the Bethany Reservoir State Recreation Area in the Southern Complex would introduce new nonrecreational features on shoreline areas currently designated for recreation use by boaters, bicyclists, and other day users such as anglers (as well as for SWP administrative and maintenance use). Construction activities associated with the discharge structure at the reservoir would preclude recreation use and access to about 1,000 feet of the 5.25-mile-long shoreline (including a boater exclusion area along the nearshore area) over the 6-year construction period for that facility. This would represent less than 4% of reservoir shoreline and would not likely lead to any noticeable reduction in recreational use area at the reservoir. This shoreline area is more than 0.5 mile away from the closest boat ramp and developed recreation facilities at the state recreation area. After construction, approximately 200 feet of shoreline area (including a boater exclusion area) would be permanently off-limits to public access. The area that would be occupied by new facilities would be less than 2% of the shoreline area available at the Bethany Reservoir State Recreation Area (SRA). The California Aqueduct Bikeway would continue across the top of the Bethany Reservoir Discharge Structure, and boaters would still be able to use this portion of the reservoir except for the boater exclusion area.

Under Alternatives 3, 4b, and DWR's Preferred Alternative, levee modifications on Lower Roberts Island to reduce potential problems constructing and operating these action alternatives during high-water events would encompass approximately 30 acres, and while they would not directly affect active recreation use areas, construction activities would create noise and potentially dust that would reduce the quality of daytime boating and camping experiences in Turner Cut and at the Tiki Lagoon Marina on Lower Roberts Island.

Mitigation measures, described in Appendix C1, *Environmental Commitments and Best Management Practices*, including EC-16: *Provide Notification of Construction and Maintenance Activities in Waterways* would provide notification of construction and maintenance activities in waterways at nearby affected Delta marinas and public launch ramps. Implementation of Mitigation Measures AES-1a: *Install Visual Barriers between Construction Work Areas and Sensitive Receptors*, AES-1b: *Apply Aesthetic Design Treatments to Project Structures*, and AES-1c: *Implement Best Management Practices to Implement Project Landscaping Plan* would also partially reduce effects by installing visual barriers between construction work areas and sensitive receptors at Lower Roberts Island and Bethany Reservoir SRA and most constructed facilities. These mitigation measures would apply aesthetic design treatments to all structures to the extent feasible and use best management practices to implement a landscaping plan.

The CMP described in Appendix C3, *Compensatory Mitigation Plan for Special-Status Species and Aquatic Resources*, combined with the action alternatives, is not anticipated to adversely affect recreational areas primarily because it is not anticipated to take place in active recreation use areas. With compensatory mitigation, there could be benefits to recreation, such as increasing future opportunities for wildlife viewing through the creation of new and diverse habitats in areas that currently do not host habitat features frequented by wildlife. Construction activities related to implementing the compensatory mitigation involving equipment could create dust and noise or slow traffic, but these effects would be limited and not at recreation sites or primary use areas.

Based on the information presented above, including proposed mitigation measures, the potential for any of the action alternatives to 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 does not appear to be significant.

Impact REC-2: Include Recreational Facilities or Require the Construction or Expansion of Recreational Facilities That Might Have an Adverse Physical Effect on the Environment

No Action Alternative

Foreseeable changes in recreation resource opportunities associated with the No Action Alternative in the study area could involve construction near recreation areas that include activities that could reduce the quality of experiences for recreationists. Auditory, access and visual intrusions on the landscape during construction could adversely affect the quality of experience for some recreationist, particularly boaters on nonpowered watercraft or bicyclists and walkers. Habitat restoration or development projects would take place on land governed by policies designed to avoid or mitigate environmental effects, and thus some of these projects could have positive effects on recreation if wildlife viewing opportunities are increased or public access sites and trails improved or added to the projects. Projects directly addressing recreation or tourism improvements, if implemented, would likely improve local recreation opportunities and could help disperse use across regions in a manner that helps improve the quality of experience for all recreationists.

All Action Alternatives

There are no recreation facilities planned as part of the action alternatives, other than rebuilding a section of the California Aqueduct Bikeway trail that passes through the area that would be occupied by the discharge facility on Bethany Reservoir under DWR's Preferred Alternative. All of the action alternatives would result in the construction of one or two north Delta intake facilities between River Mile (RM) 42 (south of Freeport) and RM 37 (north of the town of Courtland), the Twin Cities Complex, other tunnel launch, reception, and maintenance sites, and the Southern Complex or Bethany Complex. None of these action alternatives have activities that would result in construction, expansion, or relocation of existing recreation facilities in the Delta.

Under DWR's Preferred Alternative, the new discharge structures on shorelines of Bethany Reservoir would introduce new nonrecreational features on a shoreline that is currently designated for SWP administrative and maintenance use as well as recreational use. The California Aqueduct Bikeway that runs through this shoreline and is currently closed for other maintenance would continue across the top of the Bethany Reservoir Discharge Structure. Boaters would still be able to use this portion of the reservoir, except for an area close to the discharge facility, where an exclusion buoy barrier would be erected for public safety.

Under the eastern alignment (Alternatives 3 and 4b), and Bethany Reservoir alignment (DWR's Preferred Alternative), two privately owned marinas along the levees of Lower Roberts Island adjacent to levee construction areas would likely be directly affected by noise and possibly dust from levee construction activities.

To address flood risk, the eastern alignment (Alternatives 3 and 4b) and Bethany Reservoir alignment (DWR's Preferred Alternative) involve targeted repairs and improvements to existing levees on Lower Roberts Island to reduce potential problems from constructing and operating the project during high-water events. There also are levee modifications for Bouldin Island proposed for the central alignment (Alternatives 1 and 2b), but these are not adjacent to recreation sites. On Lower Roberts Island, targeted repairs would primarily involve levee widening and crown raises along the Turner Cut eastern levee adjacent to West Neugebauer Road. All modifications would occur on the levees' landsides. Temporary levee modification access roads would be constructed along the landside toe of the existing levee at current grade level.

Levee modifications on Lower Roberts Island under all eastern and Bethany Reservoir alternatives would encompass approximately 30 acres in areas that would not directly affect active recreation use areas.

Under DWR's Preferred Alternative, significant grading in the Bethany Reservoir SRA would be required to build the Bethany Reservoir Discharge Structure. Constructing a temporary cofferdam in the water near the shore would allow excavation, concrete, and backfill work to be completed on the reservoir bank within an area as much as 25 feet below the reservoir water surface. A 40-foot bridge would be constructed to replace a section of the existing Bethany Reservoir portion of the California Aqueduct Bikeway, allowing it to cross the discharge structure.

Maintenance of the conveyance facilities (i.e., intakes, tunnels, and transmission lines) would be required periodically and would involve painting, cleaning, and repairing structures; annual dredging at sedimentation basin and drying lagoons; vegetation removal and care along embankments; tunnel inspection; and vegetation removal within transmission line rights-of-way. These activities could be visible from the water or land by recreationists in proximity to these features but would not result in any construction or expansion of recreation facilities in response to the new maintenance activities and uses.

Although the compensatory mitigation plan described in Appendix C3, *Compensatory Mitigation Plan for Special-Status Species and Aquatic Resources*, does not act as mitigation for physical effects on, or associated with, recreation resources, its implementation could result in effects on recreation resources. Compensatory mitigation occurring on Bouldin Island and at the I-5 ponds could improve wildlife habitat and diversity and lead to greater wildlife viewing opportunities in those areas compared to current conditions.

Based on the information presented above, including proposed mitigation measures, the potential for any of the action alternatives to include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment does not appear to be significant.

3.16.2.3 Cumulative Analysis

Ongoing programs, plans, and projects in the study area could result have effects on recreation resources. Table 3.16-2 summarizes other existing, ongoing, or new plans and programs in the area that could affect recreation resources and park offerings in the future.

Table 3.16-2. Plans, Policies, and Programs Included in the Cumulative Analysis

Program/Project	Agency	Status	Description of Program/Project	Effects on Recreation Resources
Fish Screen Project at Sherman and Twitchell Islands	CDFW and DWR	Ongoing	The project would install fish screens on up to 10 currently unscreened agricultural intakes used to irrigate state-owned lands on Sherman and Twitchell Islands in the Delta.	This project would result in incremental additions to the amount of infrastructure on neighboring sloughs that could be a small hinderance to boaters when under construction. If screens lead to improvements in local fish populations, angling experiences could be improved.
Lower Sherman Island Wildlife Area Land Management Plan	CDFW	Ongoing	The LSIWA occupies roughly 3,100 acres. The purpose of the LMP is to: 1) guide management of habitats, species, and programs to protect and enhance wildlife values; 2) serve as a guide for appropriate public uses of the LSIWA; 3) serve as descriptive inventory of fish, wildlife, and native plant habitats that occur on or use the LSIWA; 4) provide an overview of the property's operation and maintenance; and 5) present the environmental documentation necessary for compliance with state and federal statutes and regulations, provide a description of environmental effects that may	LMP actions could give rise to management activities that would improve opportunities for certain types of recreation (hunting, fishing, environmental education, boating, and wind sports). and help improve the conditions for wildlife observation activities in the region.

Program/Project	Agency	Status	Description of Program/Project	Effects on Recreation Resources
			occur during plan management, and identify mitigation measures.	
Staten Island Wildlife-Friendly Farming Demonstration	CDFW	Planning phase	Acquisition and restoration of Staten Island (9,269 acres) by The Nature Conservancy to protect critical agricultural wetlands used by waterfowl and Sandhill cranes. The project practices increased habitat availability by flooding 2,500-5,000 acres of corn for a longer duration than previously possible.	The farming demonstration would increase length of times flooding is seen on the island. Could increase recreationists opportunities for viewing Sandhill Cranes.
Central Valley Vision	California State Parks	Ongoing	The Central Valley Vision is a strategic plan for State Parks expansion in the Central Valley. The plan provides a 20-year road map for State Park actions that increase service to valley residents and visitors. The plan outlines options to develop new and improved recreation opportunities, acquire new park lands, and build economic and volunteer partnerships.	Future improvements to state park units could increase opportunities and expand recreation facilities and offerings in and around the Delta region.
Lookout Slough Tidal Habitat Restoration and Flood Improvement Projects	DWR	Planning phase	The proposed project would restore approximately 3,000 acres of tidal wetland, creating habitat that is beneficial to native fish and wildlife. Lookout Slough is adjacent to additional tidal habitat restoration efforts being implemented by the Department of Water Resources, including Yolo Flyway Farms and Lower Yolo Ranch, to create a contiguous tidal wetland restoration complex spanning 16,000 acres in the Cache Slough region. Once completed, the proposed project would be the Delta's largest single tidal habitat restoration project to date.	Various potential actions could improve waterways for boating, fishing, and hunting
Clifton Court Forebay Fishing Facility	DWR	Initial Study/ Mitigated Negative Declaration was circulated for public review	The project consists of installing a fishing pier into Clifton Court Forebay, building other recreation and access improvements, and providing lighting and signage.	This would result in improved angling opportunities at Clifton Court Forebay.

Program/Project	Agency	Status	Description of Program/Project	Effects on Recreation Resources
		starting June 18, 2013.		
North Delta Flood Control and Ecosystem Restoration Project	DWR	Planning phase	The project is intended to improve flood management and provide ecosystem benefits in the north Delta area through actions such as construction of setback levees and configuration of flood bypass areas to create quality habitat for species of concern. The purpose of the Project is to implement flood control improvements in a manner that benefits aquatic and terrestrial habitats, species, and ecological processes. Flood control improvements are needed to reduce damage to land uses, infrastructure, and the Bay-Delta ecosystem resulting from overflows caused by insufficient channel capacities and catastrophic levee failures in the project study area.	This project could result in site-specific repairs or levee upgrades over areas of varying sizes. The levee improvement project could result in some changes in shoreline areas used for dispersed recreation uses, or access to shorelines.
Central Valley Joint Venture Program	CVJV	Ongoing	The CVJV protects and enhances habitats for migrating and resident birds in the Central Valley and focuses on the conservation of waterfowl, wetlands and habitats for birds. The CVJV provides guidance and facilitates grant funding to accomplish its habitat goals and objectives. Integrated bird conservation objectives for wetland habitats in the Central Valley identified in the 2006 Implementation Plan include restoration of 19,170 acres of seasonal wetland, enhancement of 2,118 acres of seasonal wetland annually, restoration of 1,208 acres of semi-permanent wetland, and restoration of 1,500 acres of riparian habitat.	The program could support the restoration and enhancement of waterfowl areas, which would result in improved hunting opportunities and wildlife bird viewing opportunities.
Delta Protection Commission Land Use and Resource Management Plan Update	DPC	Planning phase	DPC is currently updating its Land Use and Resource Management Plan (Management Plan), which was originally adopted in 1995. The	Plan actions would likely give rise to a variety of improved recreation opportunities and offerings in the Delta

Program/Project	Agency	Status	Description of Program/Project	Effects on Recreation Resources
			management plan outlines the long-term land use requirements for the Sacramento–San Joaquin Delta and sets out findings, policies, and recommendations in the areas of environment, utilities and infrastructure, land use, agriculture, water, recreation and access, levees, and marine patrol/boater education/safety programs. The updated management plan will place increased emphasis on the requirement for local government general plans to provide for consistency with the provisions of the Management Plan. The Commission develops priorities and timelines for tasks to be implemented each year, and provides annual progress reports to the Legislature.	along with better management and coordination of recreation offerings.
Delta Plan	DSC	Ongoing	The Delta Reform Act, created by SB X7-1, established the coequal goals for the Delta of "providing a more reliable water supply for California and protecting, restoring, and enhancing the delta ecosystem." (Pub. Resources Code § 29702; Wat. Code § 85054). These coequal goals are to be achieved "in a manner that protects and enhances the unique cultural, recreational, natural resources, and agricultural values of the Delta as an evolving place." (Wat. Code § 85054). The Delta Plan generally provides policies and recommendations to preserve and enhance Delta recreation opportunities.	Plan actions would likely give rise to a variety of improved recreation opportunities and offerings in the Delta along with better management and coordination of recreation offerings.
Great California Delta Trail System	DPC	Planning phase	DPC is leading the planning process for the Great California Delta Trail System. The system will link the San Francisco Bay Trail and trails planned along the Sacramento River in Yolo and Sacramento Counties to present and future trails in and	Trail system could give rise to an improved recreation opportunities, access, and offerings in the Delta and other county shorelines.

Program/Project	Agency	Status	Description of Program/Project	Effects on Recreation Resources
			around the Delta and along shorelines in several counties.	
Recreation Proposal for the Sacramento–San Joaquin Delta and Suisun Marsh	DPR	Proposal released in 2011	The proposal recommends the expansion of the State Park system in the Delta, agency collaboration to expand wildlife viewing, angling, and hunting opportunities in the Delta and Suisun Marsh, and that communities on the edge of the Delta or Suisun Marsh near major transportation routes be developed as "gateways" to provide supplies and recreational information to visitors.	Expanded recreation facilities could lead to additional opportunities for recreationists in the Delta region and improve opportunities for recreationists to choose from.
North American Waterfowl Management Plan	USFWS	Ongoing	A collaborative plan between Canada, the United States, and Mexico to achieve landscape conditions that could sustain and enhance waterfowl populations. The plan has been modified twice since the 1986 Plan to account for biological, sociological, and economic changes that influence the status of waterfowl and the conduct of cooperative habitat conservation. The 2004 Plan is intended to define the needs, priorities, and strategies for the next 15 years, increase stakeholder confidence in the direction of Plan actions, and guide partners in strengthening the biological foundation of North American waterfowl conservation.	Additional preserved lands could improve wildlife viewing opportunities in the Delta.
Stone Lakes National Wildlife Refuge Comprehensive Conservation Plan	USFWS	Ongoing	This is a 15-year management plan. Management programs for migratory birds and other Central Valley wildlife will be expanded and improved and public use opportunities will also be expanded. The number of refuge units open to the public will increase from one to five. In addition, environmental education, interpretation, wildlife observation, wildlife photography, hunting, and	Plan actions may give rise to improved recreational use of the refuge and improved quality of experience for wildlife viewing and interpretive activities.

Program/Project	Agency	Status	Description of Program/Project	Effects on Recreation Resources
			fishing programs will be expanded.	
Staten Island Sandhill crane habitat enhancement	CDFW	Ongoing	Restore and protect sandhill crane habitat, including higher habitat targets. This project has been identified as one of the projects that will be implemented under California EcoRestore.	Plan actions may give rise to improved quality of experience for wildlife viewing and interpretive activities.
Twitchell Island Levee Habitat Restoration Project	CDFW	Planning phase	This project has been identified as one of the projects that will be implemented under California EcoRestore.	Plan actions may give rise to improved quality of experience for wildlife viewing and interpretive activities.

CDFW = California Department of Fish and Wildlife; CVJV = Central Valley Joint Venture; DPC = Delta Protection Commission; DPR = California Department of Parks and Recreation; DSC = Delta Stewardship Council; DWR = California Department of Water Resources; LSIWA = Lower Sherman Island Wildlife Area; SB = Senate Bill; USFWS = U.S. Fish and Wildlife Service.

In addition to these projects, other potential tidal and marsh restoration initiatives in areas such as Lookout Slough could expand waterways for boating, fishing and hunting. Additionally, the applicant may, in the future, construct and operate a behavioral fish barrier at Georgiana Slough that could slightly affect boating in that area during construction and will change local fishing opportunities in and around the barrier facility.

These ongoing projects involve construction or land use changes that would result in cumulative changes to the recreation resources in the Delta. Some of the Delta-specific plans are purposely intending to enhance recreation opportunities and management in the Delta region, and thus, affect recreation resources in the future. The overlay of the Delta Conveyance Project would change the environment upon which Delta-specific plans that plan recreation improvements would consider. The Delta Conveyance Project has features that would change the landscape of several areas of the Delta where recreationists view or sightsee. Project facilities have been generally sited away from most recreation areas, other than the discharge facility under DWR's Preferred Alternative, which is within the Bethany Reservoir SRA. However, none of the facilities, when combined with future plans and actions, would necessarily result less recreation opportunities or necessarily hamper plans to improve recreation conditions and management in the Delta. As described for the future projects in the Delta, many involved improvements to wildlife habitat, some to existing levees and some are specific to recreation planning to or provision of new recreation facilities and areas as well as some changes to land use and the built environment. The future programs and plans have the greatest potential to affect recreation resources and users in the absence of the action alternatives.

Ongoing projects and programs, such as operation of the Delta Cross Channel, the South Delta Temporary Barriers Program, and the Georgiana Slough Nonphysical Fish Screen would also affect water-dependent recreation by potentially changing or hindering boat passage and access to portions of the Delta's waterways when in place. Other ongoing resource management plans, such as controlling nonnative aquatic vegetation, Delta levee protection and repair programs, hatchery and stocking programs, maintenance of channels and sloughs, and other similar projects and programs help maintain access to Delta waterways, keep levees in working order, and keep lands protected.

All of these ongoing activities are part of the existing environmental conditions and would likely benefit recreationists using Delta waterways and shorelands, because these activities would improve the quality of the experience by opening up more areas, reducing hazards.

Overall, implementing ongoing programs and projects in combination with the action alternatives would not result in significant changes to recreation resources, because the Delta has more than 100 developed recreation sites and these changes would likely only involve, or markedly affect a few of these facilities at any one time. There would be an incremental contribution of effects from the action alternatives, which primarily would be associated with construction activities. No recreation facilities would be constructed under the action alternatives, and there would be little spillover demand for recreation uses since construction and permanent workforce staff would likely continue to recreate in places they currently frequent.

3.17 Socioeconomics

This section describes the affected environment for socioeconomics and public health and analyzes effects that could occur in the study area from construction, operation, and maintenance of the action alternatives, as well as the No Action Alternative. Mitigation and minimization measures that would avoid, minimize, rectify, reduce, or compensate potentially adverse effects are included as part of each action alternative. Additional information on the affected environment, methods, and the anticipated effects of the action alternatives can be found in Delta Conveyance Project Draft EIR Chapter 17, *Socioeconomics,* and Chapter 26, *Public Health* (California Department of Water Resources 2022).

3.17.1 Affected Environment

3.17.1.1 Socioeconomics

The socioeconomics study area primarily consists of six counties: Contra Costa, Sacramento, San Joaquin, Solano, Yolo, and Alameda, as a small portion of Alameda County lies in the statutory Delta and includes Bethany Reservoir. The study area includes portions or all of the cities of Sacramento, Isleton, Elk Grove, West Sacramento, Rio Vista, Pittsburg, Antioch, Oakley, Brentwood, Stockton, Lathrop, Manteca, Tracy, and Lodi.

The description of the study area below focuses on community character, social and economic characteristics, population, housing, employment, and income at regional levels. The data in this chapter, including all dollar estimates, reflect conditions as of January 2020.

Socioeconomic conditions in the study area related to population and housing, employment and labor force trends, prominent business and industry types, government and finance are described below. An additional discussion of the recreation and agriculture sectors based on their contributions to the economy of the Delta region is also provided.

Numerous communities with populations ranging from thousands (e.g., Pittsburg) to a few hundred (e.g., Clarksburg) are in Alameda, Contra Costa, Sacramento, San Joaquin, Solano, and Yolo Counties. Surrounding these communities are farms, ranches, orchards, and vineyards, most of which have residences associated with them that are not in a delineated community but are socially tied to a community through general proximity or public services (e.g., school district boundaries, public service delivery areas). The Delta Reform Act of 2009 designated several unincorporated legacy communities in the Delta, including Bethel Island, Clarksburg, Courtland, Freeport, Hood, Isleton, Knightsen, Rio Vista, Ryde, Locke, and Walnut Grove. These communities exemplify the Delta's unique cultural history and contribute to the sense of the Delta as a place. This unique history led to the formation of the Sacramento–San Joaquin Delta National Heritage Area, the first such designation for any area in California, in 2019.

3.17.1.2 Public Health

For the purposes this analysis, the affected environment for public health refers to existing conditions as they relate to specific drinking water constituents, the bioaccumulation of toxicants in aquatic resources, disease-carrying vectors, and electromagnetic fields (EMF) from proposed transmission lines in the study area. The study area for public health comprises the statutory Delta, which includes parts of Yolo, Solano, Alameda, Contra Costa, San Joaquin, and Sacramento Counties.

The discussion of drinking water constituents of concern includes disinfection byproducts (DBPs), trace metals, and nonbioaccumulative pesticides. Bioaccumulation concerns the uptake of toxicants into the tissues of fish and shellfish and has the potential to affect the health of those who consume fish and shellfish on a regular basis. The discussion of vectors concerns the spread of disease through mosquitoes. EMF generated by power transmission lines concerns the potential for adverse health effects associated with EMF exposure in relation to proposed transmission lines. A detailed discussion of the existing conditions for drinking water constituents, bioaccumulation of toxicants in aquatic resources, disease-carrying vectors, and EMF can be found in Delta Conveyance Project Draft EIR Chapter 26, *Public Health*, Section 26.1.1, *Study Area* (California Department of Water Resources 2022).

3.17.1.3 Population

The demographic composition of the Delta varies greatly. It can be characterized by small towns and dispersed rural residences in the interior of the statutory Delta, and large urban areas on the periphery. In general, the population density of the inner Delta is very low. Most of the population resides in or near the peripheral urban areas. The highest concentration of people is in the urban centers of Sacramento to the north, Antioch and Pittsburg to the west, and Stockton and Tracy to the southeast. The small rural communities of Freeport, Isleton, and Thornton are in the interior of the statutory Delta.

The population in the interior of the Delta mostly resides in several rural communities: Clarksburg, Courtland, Hood, Isleton, and Walnut Grove/Locke/Ryde (Delta Protection Commission 2012).

The population of the Delta is relatively diverse because of its unique cultural history, the presence of seasonal farm workers, and increasing development within the larger Delta communities. There are high proportions of minority residents in both urban and rural areas. Historically, many of the agricultural areas in the interior of the statutory Delta exhibit high proportions of minority residents, including Hispanics, Asians, and African Americans, because of a combination of historical and recent settlement trends.

3.17.1.4 Economy

The economy of the interior of the statutory Delta generally revolves around agriculture and tourism. This contrasts with the economies of the more urban and suburban communities on the periphery of the Delta region that are generally tied to the more urban, diversified economies of Sacramento and the San Francisco Bay Area and are less dependent on tourism and agriculture.

After agriculture, tourism and recreation are the next most important economic drivers in the Delta (Visser et al. 2018). The Delta is a recreation destination for boating, fishing, waterskiing, and windsurfing.

3.17.1.5 Regional Profiles

Key socioeconomic characteristics of each county and the main communities in the Delta region are described based on available data, as presented in the following sections.

Alameda County

A small portion of Alameda County lies within the statutory Delta. Alameda County lands in or near the statutory Delta are largely agricultural cropland and grazing land. The Bethany Reservoir and associated facilities are in the Alameda County portion of the statutory Delta.

Alameda is the seventh most populous county in California, with an estimated total population of over 1.6 million in 2018. The county has 14 incorporated cities and several unincorporated communities. Cities include Oakland, Alameda, Berkeley, Hayward, Fremont, Livermore, and Pleasanton. No Alameda communities are within the statutory Delta. Livermore is Alameda County's closest city or community to the statutory Delta, at about 20 miles away from the Bethany Reservoir facilities over the Altamont pass. It is difficult to determine how many Alameda County residents live within the statutory Delta because the zip code with this portion of the county overlaps with multiple counties.

Alameda County's population is overwhelmingly concentrated in the cities, especially those in the east San Francisco Bay region, and the demographic characteristics of the county reflect diversity in culture, income, and ethnicity. Alameda County is now one of the most ethnically diverse regions in the Bay Area and the nation, with 68% of residents reporting a minority race. The 2014–2018 average per capita income in Alameda County is about $46,000 (in 2020 dollars), and the median household income is $96,100, with 10.6% of the population living below the poverty level. Both the per capita income and median household income of the county are higher than the state, and the percentage of persons living below the poverty level is lower than that of the state (U.S. Census Bureau 2018a).

From 2010 through 2019, the county's labor force grew at a rate of 0.9%, with 844,400 residents in the labor force as of 2019. Of these, 819,700 are employed, resulting in an unemployment rate of 2.9%, which is lower than the statewide unemployment rate of 4% (California Employment Development Department 2020a). Alameda County's economy is diverse, including manufacturing, retail, and services sectors. Business, professional, health, and educational services are the largest sectors of the economy, along with government and trade (California Employment Development Department 2020b). As of January 1, 2020, Alameda County had 0.6 million housing units, of which 319,000 were single-family and 285,000 were multifamily units. Alameda County's residential vacancy rate was 5.3% (California Department of Finance 2020a).

Contra Costa County

The southwestern portion of the Delta lies in Contra Costa County, which extends from the Delta on its eastern and northeastern boundary to San Francisco Bay and San Pablo Bay on the west. Identified communities in Contra Costa County that are in the statutory Delta are Bay Point, Discovery Bay, and Knightsen. Communities in Contra Costa County that are partially in the statutory Delta include Antioch, Bethel Island, Brentwood, Byron, Oakley, and Pittsburg.

As of 2018, approximately 328,000 people, almost 29% of the county's population, reside in communities located partially or completely in the statutory Delta. Of these, Antioch has the largest population, at 110,730 residents, and Byron has the smallest, at 1,348 residents (U.S. Census Bureau 2018b).

Approximately 60% of the county's population is between the ages of 20 and 64. The county as a whole is 56% minority,[27] with communities that are partially located in the statutory Delta ranging from 25% (Knightsen) to 85% (Bay Point) minority composition (U.S. Census Bureau 2018b).

Approximately 20% of residents in the communities of Antioch, Bay Point, Brentwood, Discovery Bay, Oakley, and Pittsburg are in the age range of 5 to 19 years, with larger proportions between the ages of 20 and 64. In contrast, Bethel Island, an age-restricted community, is the only one of these communities with approximately 20% in the age range of 65 years and above (U.S. Census Bureau 2018b). Most residences in these communities are owner-occupied (U.S. Census Bureau 2018c).

The 2014–2018 average per capita income in Contra Costa County is $47,265 (in 2020 dollars), and the median household income is $97,296, with 9.1% of the population living below the poverty level.[28] The communities that are partially located in the statutory Delta are similar in income profile to the county as a whole and have from 7% to 19% of the population living below the poverty line. Both the per capita income and median household income of the county are higher than the state, and the percentage of persons living below the poverty level is lower than that of the state (U.S. Census Bureau 2018a).

From 2010 through 2019, the county's labor force grew at a rate of 0.8%, with 561,700 residents in the labor force as of 2019. Of these, 544,500 are employed, resulting in an unemployment rate of 3.1%, which is lower than the statewide unemployment rate of 4% (California Employment Development Department 2020a). Contra Costa County is home to a wide range of businesses. Various major corporations have their headquarters in the county, including Chevron and Bio-Rad Laboratories Inc. (Infogroup 2020). The county has a heavy industrial and manufacturing sector. Business, professional, health, educational, and government services are the largest sectors of the economy (California Employment Development Department 2020b).

Sacramento County

Sacramento County extends from the low Delta lands between the Sacramento and San Joaquin Rivers north to about 10 miles beyond the State Capitol and east to the foothills of the Sierra Nevada. The Sacramento, Mokelumne, and San Joaquin Rivers form the southern border of Sacramento County in the Delta.

The Delta lies in the southwestern region of the county. Sacramento County communities completely within the statutory Delta include Courtland, Freeport, Hood, Isleton, Locke, and Walnut Grove. Additionally, the City of Sacramento lies partially within the statutory Delta. As of 2018, 497,815 people, or 33% of Sacramento County's population, reside in communities lying at least partially within the statutory Delta. Most of the county population resides in Sacramento and its suburbs

[27] CEQ defines the term *minority* as persons from any of the following U.S. Census Bureau categories for race: Black/African American, Asian, Native Hawaiian and Other Pacific Islander, and American Indian or Alaska Native. Additionally, for the purposes of this analysis, the term *minority* also includes all other nonwhite racial categories, such as "some other race" and "two or more races." The CEQ also concluded that persons identified by the U.S. Census Bureau as ethnically Hispanic, regardless of race, should be included in minority counts (Council on Environmental Quality 1997).

[28] The U.S. Census Bureau defines the term *poverty level* by using the Office of Management and Budget's Statistical Policy Directive 14. Income thresholds are used to determine who is in poverty. If a family's total income is less than a specified threshold, the family is considered to be in poverty. Poverty levels do not vary geographically (U.S. Census Bureau 2016).

outside the statutory Delta. Of Sacramento County's eight communities that lie at least partially in the statutory Delta, Sacramento has the largest population, with 495,011 residents; however, most of the population does not live within the statutory Delta. Freeport and Hood have the smallest populations, each with fewer than 400 residents (U.S. Census Bureau 2018b).

Approximately 60% of the county's population is between the ages of 20 and 64. The total minority population in the county is about 55%; however, in the communities that are totally located in the Delta, the percentage of the population identified as minority ranges from 0% (Freeport) to 90% (Hood) (U.S. Census Bureau 2018b).

Approximately 15% of residents in the communities of Hood, Isleton, Sacramento, and Walnut Grove are in the age range of 5 to 19 years, with larger proportions between the ages of 20 and 64. The community of Freeport is the only one of these communities with approximately 15% in the age range of 65 years and above (U.S. Census Bureau 2018b). In Freeport, Hood, and Sacramento, fewer than half of housing units are owner-occupied. In Courtland, Isleton, and Walnut Grove, most homes are owner-occupied units (U.S. Census Bureau 2018c).

The 2014–2018 per capita income in Sacramento County is $32,509 (in 2020 dollars), and the median household income is $66,346, with 15.8% of the population living below the poverty line. The income figures are lower in Sacramento County than those for the state, and the level of poverty is higher than the state average percentage of persons living below the poverty line. The communities in the statutory Delta have a range in percentages of persons living below the poverty line: 0% to about 27% (U.S. Census Bureau 2018a).

From 2010 to 2019, the Sacramento County labor force annual growth rate was 0.5%, with 712,400 residents in the labor force as of 2019 with an unemployment rate of 3.7%, slightly lower than the state unemployment rate of 4% (California Employment Development Department 2020a). The top employers of Sacramento County include Caltrans and Sutter Medical Center (Infogroup 2020).

San Joaquin County

Communities in San Joaquin County that are in the statutory Delta include Terminous and the cities of Lathrop, Stockton, and Tracy. As of 2018, the San Joaquin County population living in communities lying at least partially within the statutory Delta was 416,893, about 57% of the county's population. Of San Joaquin County's communities partially or entirely located in the Delta, Stockton has the largest population at 306,283, followed by Tracy with 88,806 residents. Terminous is smallest, with a population of 411. The county also includes the town of Mountain House, on the border with Alameda near the Bethany reservoir, with a population of 15,645 in 2018.

Approximately 57% of the county's population is between the ages of 20 and 64. The population of the county is about 68% minority. In communities that lie at least partially within the statutory Delta, the minority population ranges from 24% in Terminous to 79% in Stockton.

Approximately 20% of residents in the communities of Lathrop, Stockton, and Tracy are in the age range of 5 to 19 years, with larger proportions between the ages of 20 and 64. In the community of Mountain House, over 30% of the population is between the ages of 5 and 19. In contrast, the community of Terminous is the only one of these communities with approximately 20% in the age range of 65 years and above (U.S. Census Bureau 2018b). Of all these communities, only in Stockton are less than half of homes owner-occupied housing units (U.S. Census Bureau 2018c).

The 2014–2018 per capita income in San Joaquin County is $27,145 (in 2020 dollars), and the median household income is $63,484, with 15.9% of the population living below poverty level. These income figures are lower than the California average and this poverty rate is higher than the state. Of the communities that are in the statutory Delta, the percentage of persons living below the poverty line ranged from 5% in Mountain House to about 21% in Stockton (U.S. Census Bureau 2018a).

In 2019, there were 327,100 residents in the county's labor force. Of these, 307,800 persons were employed, resulting in an unemployment rate of 5.9%. This unemployment rate is greater than the state's unemployment rate of 4% (California Employment Development Department 2020a). Major employment sectors in the county include educational and health services, private services, local government, and goods-production (California Employment Development Department 2020b).

Solano County

Located approximately 45 miles northeast of San Francisco and 45 miles southwest of Sacramento, Solano County supports a mix of agricultural and suburban areas. It covers 909 square miles, including 84 square miles of open water and 675 square miles of rural land (County of Solano 2009). The southeastern part of Solano County lies in the statutory Delta. Rio Vista is the only community in Solano County identified in this analysis as lying partially or completely within the statutory Delta and representing only about 2% of the county's population.

Approximately 61% of the county's population is between the ages of 20 and 64. The total minority population of the county is about 61% while the minority population of Rio Vista is about 24%.

Fewer than 9% of residents in Rio Vista are in the age range of 5 to 19 years, with 46% between the ages of 20 and 64 and 44% aged 65 or older (U.S. Census Bureau 2018b). Approximately 80% of homes in Rio Vista are owner-occupied housing units (U.S. Census Bureau 2018c).

The county's 2014–2018 per capita income is $34,989, and the median household income is $80,577. The percentage of persons living below the poverty level is 10.4%. While the per capita income of Solano County is lower than the state average, the median household income surpasses that of the state and the poverty rate is lower that the statewide rate. The community of Rio Vista has 12% of residents living below the poverty line (U.S. Census Bureau 2018a).

In 2019, Solano County reported 209,500 residents in the labor force. Of these, 201,700 persons were employed, resulting in an unemployment rate of 3.8%, lower than the state unemployment rate of 4% (California Employment Development Department 2020a). Solano County restricts urban residential and commercial development outside cities, thus preserving approximately 80% of the land for open space or agricultural use. The top employers include Genentech Inc. and Solano County (Infogroup 2020).

Yolo County

The southeast portion of Yolo County lies in the statutory Delta. The communities in Yolo County that are in the statutory Delta include Clarksburg and West Sacramento. In 2018, the population of these communities was approximately 53,000, accounting for about 25% of the county population. Of Yolo County's two communities in the statutory Delta, West Sacramento has the larger population, with 52,826 residents, while Clarksburg supports 442 residents.

Approximately 61% of the county's population is between the ages of 20 and 64. The total minority population of the county is about 53%. In communities that lie at least partially within the statutory Delta, the minority population ranges from 34% in Clarksburg to 54% in West Sacramento.

About 21% of residents in the communities of Clarksburg and West Sacramento are in the age range of 5 to 19 years, with larger proportions between the ages of 20 and 64 (U.S. Census Bureau 2018b). In Yolo County as a whole, as well as in the communities of Clarksburg and West Sacramento, approximately half of housing units are owner-occupied (U.S. Census Bureau 2018c).

Yolo County's 2014–2018 per capita income is $33,845 (in 2020 dollars), and the median household income is $68,444. The percentage of persons living below the poverty level is 19.6%. The per capita income and median household income are both lower than state levels, and the poverty rate is higher than the statewide rate. Clarksburg has 0% of people living below the poverty line while West Sacramento has over 16% (U.S. Census Bureau 2018a).

In 2019, Yolo County reported 108,700 residents in the labor force. Of these, 104,200 persons were employed, resulting in an unemployment rate of 4.1%, slightly higher than the state unemployment rate of 4% (California Employment Development Department 2020a). Yolo County is home to the Port of West Sacramento, whose leading export is rice, a top agricultural product produced in the county, and leading import is cement (City of West Sacramento 2019). Government, as well as trade, transportation, and utilities are leading sources of employment (California Employment Development Department 2020b).

3.17.1.6 Population of the Delta

Population and Growth Trends

The Delta Protection Commission's *Economic Sustainability Plan for the Sacramento–San Joaquin Delta* reported a growth rate of about 54% within the statutory Delta between 1990 and 2010, as compared with a 25% growth rate statewide during the same period (Delta Protection Commission 2012). The report also indicated that population growth had occurred in the Secondary Zone of the Delta but stayed about the same in the Primary Zone as shown in Delta Conveyance Project Draft EIR, Figure 14-1 (California Department of Water Resources 2022), and that population in the central and south Delta areas had decreased since 2000.

Growth projections through 2060 indicate that all counties in the Delta region are projected to grow at a faster rate than the state. Total population in the Delta region counties is projected to grow at an average annual rate of 1.0% through 2030 (California Department of Finance 2020b).

Population density varies widely across the Delta region. Analysis done for the Delta Risk Management Strategy (California Department of Water Resources 2008) indicated several Delta islands with fewer than 20 residents. In contrast, some cities are wholly or partly within the statutory Delta (e.g., Sacramento and Stockton) and have densities exceeding 4,000 residents per square mile. Smaller communities in the Delta, such as Walnut Grove and Knightsen, have population densities lower than 200 residents per square mile (U.S. Census Bureau 2020).

Age Distribution

The *Economic Sustainability Plan for the Sacramento–San Joaquin Delta* described a relatively young age class throughout the statutory Delta with a slightly older population within the Primary Zone

(Delta Protection Commission 2012). Most communities in the statutory Delta had an age distribution consistent with that of the counties and state. However, a few communities, such as Bethel Island, Terminous, and Rio Vista, had a greater percentage of the population at or near retirement age (U.S. Census Bureau 2018b).

3.17.1.7 Housing in the Delta Region

Housing Unit Trends

As of January 1, 2020, there are approximately 2 million housing units within Delta region counties, representing 14.6% of the housing units in the state. From 2010 to 2020, the Delta region counties experienced a 0.5% average annual growth in the total number of housing units. This is about the same as the state growth rate (California Department of Finance 2020a).

Housing density varies greatly across the Delta region, corresponding to the variation in population density. Some Delta islands contain fewer than five housing units. As a result, many areas in the statutory Delta contain fewer than 20 housing units per square mile (California Department of Finance 2020a). In contrast, cities that are wholly or partly within the statutory Delta, such as Sacramento and Stockton, contain approximately 1,000 housing units per square mile.

Housing Type Trends

A multi-family home is a single building that is designed to accommodate more than one family living separately. Single-family residence means a detached structure maintained and used as a single dwelling unit. Single-family attached homes are included with multifamily housing in this section. Of the Delta region counties, Sacramento County has the highest number of single-family homes, and Alameda County has the highest number of multi-family homes. As of January 1, 2020, Sacramento County has 375,821 single-family homes, and Alameda has 284,540 multi-family homes. Yolo County has the fewest single-family and multi-family homes during the period, with 46,671 single-family units and 28,150 multi-family units at the start of 2020. San Joaquin and Yolo Counties account for the greatest annual growth rate in single-family homes over the period with 0.7% and 0.6%, respectively. Alameda County accounts for the greatest annual growth rate for multi-family housing at 0.8%.

Housing Vacancy Rates

The vacancy rate is the percentage of all available housing units that are vacant or unoccupied. This is calculated as the difference between total and occupied housing units, divided by total housing units. Of the Delta region counties, San Joaquin County has the highest vacancy rate. As of January 1, 2020, San Joaquin County's vacancy rate is 5.7%. Yolo County has the lowest vacancy rate during the period, with 3.8%. Sacramento and San Joaquin Counties experienced the greatest change in vacancy rate between 2010 and 2020 (-2.2% and -2.3%, respectively).

Employment, Labor Force, and Industry in the Delta Region

Employment, labor, and industry trends are discussed at a broad level for the Delta region counties. In 2019, California's Employment Development Department reported a labor force of 2,763,800 people for the Delta region counties. This is compared with 19,408,300 people in California's labor force; thus, Delta region counties make up about 14% of the state's total labor force. Alameda County is the largest contributor, with a labor force of 844,400. This is followed by Sacramento

County (712,400) and Contra Costa County (561,700). In 2019, San Joaquin County registered 327,100 people in the labor force, while Yolo and Solano Counties registered 108,700 and 209,500, respectively. All counties' labor force numbers grew from 2017 to 2019, while unemployment rates went down.

The number of people living in poverty in the Delta region is largely consistent with the income data. Contra Costa County has the lowest percentage of the population living below the poverty level, at 9%. Yolo County, with a slightly higher per capita income and median household income than San Joaquin County, still registers the highest percentage of the population living below the poverty level, at 20%. Sacramento and San Joaquin Counties follow at 16%. These percentages are higher than those of the state, which had 14% of the population living below the poverty level.

Delta Conveyance Project Draft EIR Chapter 29, *Environmental Justice*, Section 29.2.1, *Identification of Environmental Justice Populations in the Study Area*, provides greater detail regarding the distribution of low-income populations within the Delta counties (California Department of Water Resources 2022).

3.17.1.8 Government and Finance in the Delta Region

Total revenues and expenditures vary among the six Delta region counties because of their size, population, level of commercial and industrial development, land uses, and the level and types of services provided. Revenue ranges from approximately $427 million in Yolo County for fiscal year (FY) 2018–2019 to nearly $3.7 billion in Contra Costa County (California State Controller's Office 2019).

3.17.1.9 Economic Character of Recreation in the Statutory Delta

The recreation industry in the statutory Delta is composed primarily of boating, fishing, hunting, camping, and agritourism activities. Specific businesses directly support recreation in the statutory Delta, including marinas, boat rentals, guide services, and wineries. Other businesses, such as hotels, restaurants, specialty stores, and sporting goods retailers, provide general recreation and tourism goods and services to users in the statutory Delta, including recreationists, among others.

The recreation-oriented focus of the Delta leads to an interdependent relationship between the different businesses. Fishing guides and boaters depend on the marinas for supplies and fuel. Marinas without food services rely on local food markets or restaurants to serve visitors. Restaurants and wineries depend on hotels to provide accommodations for overnight or extended visits. All the businesses depend on visitors and tourists spending time and money in the statutory Delta.

3.17.1.10 Economics of Agriculture in the Statutory Delta

Agriculture is one of the more important sectors of the economy in the statutory Delta. Related information on agricultural land use, soils, and production practices is provided in Delta Conveyance Project Draft EIR Chapter 15, *Agricultural Resources*, Sections 15.1.1.2, *Study Area Crop Types and Distribution* through 15.1.1.4, *General Crop Production Practices and Characteristics*, which summarize agricultural land uses and production practices using information from county, state, and federal sources (California Department of Water Resources 2022).

3.17.2 Environmental Consequences

This section describes potential direct and indirect socioeconomic effects that would result with implementation of each action alternative. The assessment within the study area included potential effects on community character and cohesion, population, housing, employment, income, and fiscal effects on local governments. In addition, particular focus was placed on the economic effects of potential changes in agricultural production and recreational activity. Action alternatives are not anticipated to cause changes in water deliveries in areas upstream of the Delta.

3.17.2.1 Methods for Analysis for Socioeconomics

Part of the socioeconomic analysis is based upon results of hydrologic and water quality analytical model simulations of the existing conditions, the No Action Alternative, and action alternatives. For this Draft EIS, operations of Alternatives 1, 2b, 3, 4b, and DWR's Preferred Alternative were analyzed for future conditions at the year 2040. Under 2040 conditions, it is anticipated that sea level rise will occur and hydrology in the Delta watershed will change because of upstream effects of climate change, as described in Delta Conveyance Project Draft EIR Chapter 6, *Water Supply*, Section 6.3, *Water Supply Changes* (California Department of Water Resources 2022). This analysis compares conditions under implementation of the alternatives with existing conditions (without sea level rise and climate change) and the No Action Alternative (with sea level rise and climate change).

The analysis of socioeconomics separates effects of the construction phase and the operations-and-maintenance phase for each of the action alternatives. The construction phase is assumed to include the effects associated with temporary construction and field investigation jobs and both the permanent and temporary construction footprint of each of the action alternatives. The operations-and-maintenance phase is assumed to include the effects associated with maintenance jobs, and the continued effects of the project occurring after completion of construction activities. This allows the analysis to distinguish between the long-term agricultural and operations-and-maintenance effects, and the short-term construction-related effects.

Delta Regional Employment and Income

Analytical Approach

Regional economic effects include changes in characteristics like regional employment and income. These are described in greater detail in Delta Conveyance Project Draft EIR Appendix 17A, *Regional Economic Effects of Water Conveyance Facility Construction* (California Department of Water Resources 2022).

IMPLAN is a computer database and modeling system used to create input-output models for any combination of United States counties. IMPLAN is the most widely used input-output model system in the United States. It provides users with the ability to define industries, economic relationships, and projects to be analyzed. It can be customized for any county, region, or state, and used to assess the "ripple effects" or "multiplier effects" caused by increasing or decreasing spending in various parts of the economy.

IMPLAN includes the following elements.

- Estimates of county-level final demands and final payments developed from government data.
- A national average matrix of technical coefficients.

- Mathematical tools that help the user formulate a regional model.
- Tools that allow the user to change data, conduct analyses, and generate reports.

The regional IMPLAN analysis was also used to estimate the employment and income changes associated with changes in agricultural production in the Delta region. This includes agricultural acreage in the construction footprint and farmland on Bouldin Island, which could be removed as part of the CMP.

Assumptions and Limitations

The IMPLAN analysis used a grouping of the Delta counties, which includes a broader and more self-sufficient range of economic activities than using IMPLAN for each individual county. Although a small part of Alameda County overlaps the statutory Delta, Alameda County is not included in the IMPLAN analysis. The geographic limitations and socioeconomic differences between Alameda County and the other Delta region counties make it unlikely that more workers from Alameda County would commute for the action alternatives than from other counties outside of the Delta region.

The IMPLAN database is large, incorporating up to 546 sectors. IMPLAN is periodically updated as more and better data become available, but it is not possible to check every number in its database for accuracy.

Data Sources

IMPLAN uses a system of national accounts for the United States based on data collected by the U.S. Department of Commerce's Bureau of Economic Analysis, the U.S. Department of Labor's Bureau of Labor Statistics, and other federal and state government agencies.

The model estimates regional economic changes in employment during construction, operation, and maintenance of the conveyance facilities, as well as employment related to compensatory mitigation. The direct employment data were provided by the applicant. Changes in agricultural acreage were developed using construction and facilities footprint analysis and are described in Delta Conveyance Project Draft EIR Chapter 15, *Agricultural Resources* (California Department of Water Resources 2022).

Analysis Metrics

The analysis of regional economic effects is presented quantitatively or qualitatively as follows.

- Quantitative estimates of changes in annual regional construction and agricultural employment.
- Quantitative estimates of changes in annual regional construction and agricultural labor.[29] Income.
- Qualitative description of changes in employment and income in other industries.

[29] IMPLAN's labor income includes all forms of employment income, including employee compensation (wages and benefits) and proprietor income. These are estimates based on typical regional employment.

Delta Community

Analytical Approach

Analysis of the Delta community specifically addresses population, housing, and social and community effects. This uses results of the IMPLAN model described above in *Delta Regional Employment and Income*.

Social and community effects were qualitatively evaluated with consideration of effects on established communities whose character could be most directly influenced by activities of the action alternatives based on total population, economic composition, proximity to water-conveyance features, and the nature of the activities. This assessment focused on communities in the statutory Delta, where the direct effects of the action alternatives would occur and where social and community effects could be greatest. Social and community effects elsewhere in the study area are anticipated to be minor because they would be spread over a large, heavily populated area and among many communities.

Population and Housing Effects

Estimates for potential population increase and housing demand during the construction, operation, and maintenance phases of each alternative were calculated based on changes in employment, the approximate share of workers who may decide to relocate, and typical household size. The data for changes in employment were drawn from the analysis of Delta regional employment and income. Refer to the *Delta Regional Employment and Income* section above for a description of that methodology.

Social and Community Effects

The assessment of social and community effects is based on comparing each action alternative to the existing conditions or No Action Alternative. The methodology specifically identified how physical changes from the action alternative could result in social and economic effects within communities.

Data Sources

Existing conditions estimates and No Action Alternative projections for population and housing were obtained from the California Department of Finance and the U.S. Census Bureau, and are described in Section 3.17.1, *Affected Environment*. The availability of housing was assessed using vacancy rate and number of dwellings by type from the California Department of Finance (2020a).

Analysis Metrics

The analyses of effects on Delta communities' population, housing, and character are presented quantitatively or qualitatively.

- Quantitative estimates of changes in population.
- Quantitative estimates of housing supply and quantity demanded.
- Qualitative description of potential changes in community character.

Local Delta Governments Fiscal Conditions

Fiscal effects on local Delta governments would occur from changes to property tax, sales tax, or assessment revenue resulting from implementation of an action alternative.

Analysis Metrics

The analysis of fiscal effects on local Delta governments are presented qualitatively.

- Qualitative description of changes in tax revenue due to changes in employment and spending during construction and operations phases.
- Qualitative description of potential changes due to forgone property tax revenue from lands affected during construction and operations phases.

Delta Recreational Economics

The analysis of the economic effect of changes in Delta recreation used results from Delta Conveyance Project Draft EIR Chapter 16, *Recreation,* Section 16.3.3.2, *Impacts of the Project Alternatives on Recreation Resources*. This chapter assessed if there would be any changes to recreational opportunities resulting from facilities construction, operation, or compensatory mitigation (California Department of Water Resources 2022).

These changes, along with their anticipated economic effects, are discussed qualitatively in Section 3.17.1.5, *Economy*, and are based on the discussion and analysis included in Delta Conveyance Project Draft EIR Chapter 16, *Recreation*, Section 16.3.3.2, *Impacts of the Project Alternatives on Recreation Resources* (California Department of Water Resources 2022). While these discussions estimate recreational effects on the statutory Delta as a whole, it is possible that recreational opportunities and quality in specific areas within the Delta would be affected by activities of the action alternatives more than the Delta as a whole.

Analysis Metrics

The analyses of Delta recreational economics will provide a qualitative description of changes in recreational economics during construction and operations phases.

Delta Agricultural Economics

The analysis of the economic effect of changes in Delta agricultural production used results from a geospatial analysis of changes in acreage resulting from conveyance facilities construction (temporary) and operation (permanent). Additionally, the potential effects on agricultural economics as a result of the CMP for Bouldin Island are summarized. The analysis includes irrigated acreage in the statutory Delta, as well as irrigated acreage adjacent to the statutory Delta in or near the construction footprint.

Quantitative estimates were made of the change in the value of agricultural production. Estimates were based on the acreage changes and per-acre crop revenue information summarized in Delta Conveyance Project Draft EIR Chapter 17, *Socioeconomics*, Section 17.1.1.7, *Economics of Agriculture in the Statutory Delta* (California Department of Water Resources 2022).

Data Sources

Acreage removed from production by crop category is based on a geospatial analysis of the footprint and local crop data (Land IQ 2018). Yields and prices typical for agricultural products in the region comes from USDA NASS, and representative production cost data come from University of California Cooperative Extension reports. These are presented in Delta Conveyance Project Draft EIR Chapter 17, *Socioeconomics*, Section 17.1.1.7, *Economics of Agriculture in the Statutory Delta* (California Department of Water Resources 2022).

Analysis Metrics

In summary, the following quantitative and qualitative comparisons are provided.

- Quantitative estimates of changes in value of agricultural production.
- Qualitative estimates of changes in production costs.
- Qualitative estimates of changes in value of agricultural facilities and investment.

3.17.2.2 Methods for Analysis for Public Health

The potential effects on public health considered in the analysis focused on the following.

- A qualitative determination as to whether the alternative actions would result in an increase in the public's risk of exposure to vector-borne diseases.
- Qualitative assessments to determine whether construction and operations of the action alternatives would affect drinking water quality as represented by an exceedance in water quality standards (as applicable) for constituents of concern, specifically, trace metals of human health and drinking water concern (i.e., aluminum, arsenic, iron, and manganese); DBPs due to increases in the DBP precursors, dissolved organic carbon (DOC) and bromide; and non-bioaccumulative pesticides in surface waters.
- A qualitative evaluation regarding the potential effect on public health due to a potential for increases in methylmercury bioaccumulation in fish in the study area.
- The methodology for determining whether people, specifically sensitive receptors (i.e., those at residences, schools, hospitals, parks, and fire stations) would be exposed to new sources of EMF in the study area due to operation of the action alternatives entailed identifying the locations of sensitive receptors within 300 feet of the proposed 69 kilovolt (kV) and 230 kV power transmission lines using GIS methods. Also considered in the analysis is the general medical and scientific uncertainty as to the potential health effects of EMFs on receptors in proximity to power transmission lines. As discussed in Delta Conveyance Project Draft EIR Chapter 26, *Public Health*, Section 26.1.1, *Study Area*, this uncertainty extends to people working in areas with high magnetic fields (California Department of Water Resources 2022). Accordingly, the potential for health effects on construction workers is not considered in this analysis because this population would likely receive lower overall exposure to EMF over time from proposed transmission lines in the study area during construction of the action alternatives than those sensitive receptors residing within 300 feet of the proposed transmission lines. Because there are no proposed temporary aboveground or underground transmission lines of 69 kV capacity or greater required for construction, exposure of sensitive receptors to EMF due to construction of the action alternatives was not considered in the analysis.

3.17.2.3 No Action Alternative

Under the No Action Alternative, socioeconomic conditions in the Delta would continue largely as those described in Section 3.17.1, *Affected Environment.* This alternative includes continued SWP/CVP operations, maintenance, enforcement, and protection programs by federal, state, and local agencies, as well as projects that are permitted or under construction. Over the long term, communities and socioeconomic conditions in the Delta would be subject to risks associated with climate change, sea level rise, seismic activity, and other phenomena.

Public water agencies participating in the Delta Conveyance Project have been grouped into four geographic regions. The water agencies within each geographic region would likely pursue a similar suite of water supply projects under the No Action Alternative. Climate change, sea level rise, and earthquake risk would continue to affect SWP supplies, so water agencies would take other actions to continue to deliver water. Many of these projects, such as construction of desalination plants or water recycling facilities, would involve construction of facilities which could have socioeconomic effects.

Table 3.17-1 summarizes examples of potential socioeconomic effects that would result from these projects.

Table 3.17-1. Examples of Potential Socioeconomic Effects as a Result of Activities Occurring under the No Action Alternative

Project Type	Region [a]	Potential Construction-Phase Effects
Increased/ accelerated desalination	Northern coastal, southern coastal	Construction of new desalination facilities and conveyance would create increased construction-related employment, which in turn could lead to increased population and housing demand. Reduced quality of experience or displacement of recreational activities in the area could lead to effects on recreational economics. It is unlikely that these projects would affect agricultural economics. Effects on recreational economics, along with any disruption to community gathering places, could further lead to effects on community character. Any major changes in local spending or land use could lead to effects on local government fiscal conditions.
Groundwater recovery (brackish water desal)	Northern inland, southern coastal, southern inland	Construction of new desalination facilities and conveyance would create increased construction-related employment, which in turn could lead to increased population and housing demand. Reduced quality of experience or displacement of recreational activities in the area could lead to effects on recreational economics. Conversion of farmland could lead to effects on agricultural economics. Effects on recreational and agricultural economics, along with any disruption to community gathering places, could further lead to effects on community character. Any major changes in local spending or land use could lead to effects on local government fiscal conditions.

Project Type	Region [a]	Potential Construction-Phase Effects
Groundwater management	Northern coastal, southern coastal	Activities could create some construction-related employment, although they are not likely to create effects. Reduced quality of experience or displacement of recreational activities in the area could lead to effects on recreational economics. Conversion of farmland could lead to some effects on agricultural economics. Both recreational and agricultural economic effects, along with any disruption to community gathering places, could lead to effects on community character. Any major changes in local spending or land use could lead to effects on local government fiscal conditions.
Water recycling	Northern coastal, northern inland, southern coastal, southern inland	Construction of new water treatment plants could create some construction-related employment. It is unlikely that these would lead to effects on population and housing. Reduced quality of experience or displacement of recreational activities in the area could lead to effects on recreational economics. Conversion of farmland could lead to effects on agricultural economics. Effects on recreational and agricultural economics, along with any disruption to community gathering places, could further lead to effects on community character. Any major changes in local spending or land use could lead to effects on local government fiscal conditions.
Water use efficiency measures	Northern coastal, southern coastal, southern inland	Activities could create some construction-related employment, although they are not likely to create effects. Effects on recreational economics, agricultural economics, community character, and local government fiscal conditions are unlikely.

[a] See Chapter 2, Project Description and Alternatives, Section 2.5, No Action Alternative, for a complete definition of the geographic regions.

Desalination projects would most likely be pursued in the northern and southern coastal regions. The southern coastal regions would likely require larger and more desalination projects than the northern coastal region to replace the water yield that otherwise would have been received through the Delta Conveyance Project. Groundwater recovery (brackish water desalination) could occur across the northern inland, southern coastal, and southern inland regions. Physical construction activities required for desalination and groundwater recovery projects would be similar and could include construction of pipelines, tanks, pumps, electrical equipment, and buildings. Both project types would similarly require long-term operations and maintenance.

Groundwater management projects would occur in the northern and southern coastal regions. Construction activities for each project could include site clearing; excavation and backfill; and construction of basins, conveyance canals, pipelines, diversions, and pump stations. Operational activities may include maintenance and repair of banks, berms, and concrete structures, and removal of debris, sediment, and vegetation.

Water recycling projects could be pursued in all four regions. The northern inland region would require the fewest number of wastewater treatment/water reclamation plants, followed by the northern coastal region, followed by the southern coastal region. The southern inland region would require the greatest number of water recycling projects to replace the anticipated water yield that it otherwise would have received through the Delta Conveyance Project. Water recycling projects would still require a continuous freshwater source for dilution.

Water efficiency projects could be pursued in all four regions and involve a wide variety of project types, such as flow measurement or automation in a local water delivery system, lining of canals, use of buried perforated pipes to water fields, and additional detection and repair of commercial and residential leaking pipes.

Under the No Action Alternative, public health conditions in the Delta would continue largely as those described in Section 3.17.1, *Affected Environment.* This alternative includes continued SWP/CVP operations, maintenance, enforcement, and protection programs by federal, state, and local agencies, as well as projects that are permitted or under construction.

As described above, public water agencies participating in the Delta Conveyance Project have been grouped into four geographic regions. The water agencies within each geographic region would likely pursue a similar suite of water supply projects under the No Action Alternative. Although the types of water supply projects considered would vary somewhat by region, projects would generally include water conservation programs, water recycling for non-potable uses, groundwater recovery (brackish water desalination) projects, seawater desalination, and groundwater management.

Water conservation programs could include rebate programs or other incentives for water saving devices, water use restrictions, and water conservation outreach campaigns to educate the public (e.g., direct mail newsletters or community events). Water conservation programs would likely be pursued by all four regions. Implementation of these types of conservation actions would not result in public health effects due to exposure to vector-borne diseases, exceedances of water quality criteria for constituents of concern in drinking water, increases in bioaccumulative pesticides or methylmercury in fish, or exposure to EMF or *Microcystis* and cyanotoxins. Because these water conservation actions are intended to reduce use and waste of water, they would not result in standing water (i.e., mosquito habitat), the mobilization or introduction of pollutants to surface or groundwater, require new power transmission lines, or result in changes in river flow (i.e., residence time), water temperature, nutrients or create other conditions conducive to CHABs.

Water recycling projects could be pursued in all four regions. Recycled water is wastewater treated to an acceptable water quality standard at a wastewater treatment plant (WWTP) and then distributed for use. Water recycling for non-potable use generally requires modifications to existing WWTPs and water distribution systems for treatment and conveyance, respectively. To the extent that ground-disturbing construction activities may be required to modify existing WWTPs, there may be temporary effects on water quality potentially related to runoff and erosion, but these would be localized and would not result in increases in concentrations of trace metals, pesticides or disinfection byproducts such that drinking water quality is compromised or cause a marked mobilization of or increase in bioaccumulative water quality constituents. Water ponding, including in unused containers and building wastes, as well as on the ground, at construction sites during construction could increase standing water after rain events and thereby create mosquito habitat, but these inundated areas would likely be relatively small, localized, and temporary and would not negatively affect public health due to vector-borne disease exposure. Because recycled water treatment is relatively energy intensive, upgrades to the electrical system of a WWTP may be required, but upgrades would likely occur within the existing WWTP footprint or right-of-way; therefore, increased public exposure to EMF would not occur. Furthermore, the utilities would implement EMF Design Guidelines for construction of new or upgraded electrical transmission lines and substations. These design guidelines include no-cost and low-cost methods for reducing magnetic fields. It is not anticipated that the recycled water facilities would discharge recycled water into receiving waters because the water would be distributed to users in the service area.

Accordingly, operation of these facilities would not result in changes in river flow, water temperature, nutrients or create other conditions conducive to CHABs.

The northern and southern coastal regions are most likely to explore implementing groundwater management projects. Construction of groundwater management projects could require excavation and other ground-disturbing activities, but there would be no effects on public health related to exposure to vector-borne diseases, increases in concentrations of trace metals, pesticides or disinfection byproducts such that drinking water quality is compromised, or cause a marked mobilization of or increase in bioaccumulative water quality constituents for the reasons discussed for construction of water recycling projects. Implementation of groundwater management projects may or may not require new power transmission lines to provide power to electric groundwater pumps. However, groundwater recharge projects are not typically located in densely populated areas and, therefore, if new transmission lines are required it is reasonable to assume that there would not be a notable increase in public exposure to EMF. Groundwater management projects would not affect drinking water quality because drinking water in public water supply systems would continue to be treated to drinking water standards prior to distribution into the drinking water system. Operation of groundwater recharge sites would likely create standing pools of water (e.g., recharge basins), which could create mosquito breeding habitat, an increase in mosquitoes and subsequent exposure of the public to vector-borne diseases. However, local mosquito and vector control districts (MVCDs) would exercise their authority to conduct surveillance for vectors, prevent the occurrence of vectors, and abate production of vectors and project proponents would also be responsible for mosquito abatement (California Health & Saf. Code §2060).

Water supply desalination involves diverting seawater or brackish water to a desalination facility and removing excess salts or minerals through membrane distillation treatment. Seawater desalination projects would most likely be pursued in the northern and southern coastal regions. The southern coastal regions would likely pursue larger and more desalination projects than the northern coastal region in order to replace the water yield that otherwise would have been received through the Delta Conveyance Project. Brackish water desalination could occur across the northern inland, southern coastal, southern inland regions and in both coastal and inland areas. There would be no adverse construction-related effects on public health related to exposure to vector-borne diseases, increases in concentrations of trace metals, pesticides or disinfection byproducts such that drinking water quality is compromised for the reasons discussed for construction of water recycling projects. Construction of water diversion intakes could mobilize existing bioaccumulative constituents within sediments (e.g., methylmercury), but this would be temporary and localized and would not result in a marked increase in bioaccumulation in fish and, therefore, would not affect public health. Construction effects would not be adverse because the mobilization would occur during a limited time and would be localized around the area of construction. Operation of desalination facilities, including distribution infrastructure, would not create habitat for mosquitoes because it would not create areas of standing water; therefore, there would be no increase in public exposure to vector-borne diseases. Public health would not be affected by adverse changes in drinking water quality because water intended for potable use would be treated to drinking water standards prior to distribution. Similarly, discharge of brine from either seawater or brackish water desalination facilities would be subject to waste discharge requirements of the Regional Water Board to avoid effects from increased salinity. Water desalination is an energy-intensive process, and it is likely that new transmission lines would be constructed and operated. New desalination facilities would require transmission lines for power and, although desalination facilities are not likely to be sited near sensitive receptors, transmission lines would traverse from the new desalination facility to existing electrical facilities providing power to the new lines. Accordingly, there could be an increase in exposure of sensitive receptors to EMF depending on proximity to new transmission lines. It is assumed that utilities would implement routine magnetic field reduction measures identified in the EMF Design Guidelines to reduce the potential for EMF exposure. It is not anticipated that the recycled water facilities would discharge recycled water into receiving waters because the water would be distributed to users in the service area. Accordingly, operation of these facilities would not result in changes in river flow, water temperature, nutrients or create other conditions conducive to CHABs.

New desalination facilities would require transmission lines for power and, although desalination facilities are not likely to be sited near sensitive receptors (e.g., adjacent to a hospital, school, or residential area), transmission lines would traverse from the new desalination facility to existing electrical facilities providing power.

3.17.2.4 Effects and Mitigation

Effects of the Action Alternatives on Socioeconomics

Impact ECON-1: Changes in Regional Employment and Income

No Action Alternative

Under the No Action Alternative, the economy of the Delta region is expected to be similar in structure to that described in Section 3.17.1, *Affected Environment.* Potential changes in expenditures related to recreation, municipal and industrial water uses, as well as potential changes in the value of agricultural production could result in changes to regional employment and income in the Delta region under the No Action Alternative. The scale of the economy would change with population growth; however, the structure of the economy (i.e., large proportion of employment in services, government, trade, and construction) would not.

All Action Alternatives

The regional economic effects on employment and labor income during construction and field investigations for the action alternatives in the Delta region were evaluated. Changes are shown relative to existing conditions and the No Action Alternative in Table 3.17-2.

1 **Table 3.17-2. Regional Economic Effects on Construction-Related Employment and Labor Income during Construction**

Regional Economic Effect [a]	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16
Alternative 1																
Employment (FTE)																
Direct	535	848	817	1,116	2,405	2,763	3,321	2,689	2,281	1,767	962	102	29	21	6	N/A
Total [b]	1,146	1,661	1,530	1,854	3,989	4,583	5,508	4,460	3,783	2,931	1,596	169	48	35	10	N/A
Labor Income (million $)																
Direct	62.6	89.3	81.6	96.4	207.3	238.2	286.3	231.8	196.6	152.3	82.9	8.8	2.5	1.8	0.5	N/A
Total [b]	114.5	153.4	135.2	142.0	305.0	350.4	421.1	341.0	289.2	224.1	122.0	12.9	3.7	2.7	0.8	N/A
Alternative 2b																
Employment (FTE)																
Direct	436	981	923	1,544	2,257	2,492	2,478	2,239	1,814	1,255	224	79	21	6	N/A	N/A
Total [b]	979	1,882	1,706	2,561	3,744	4,133	4,110	3,714	3,009	2,082	372	131	35	10	N/A	N/A
Labor Income (million $)																
Direct	53.9	100.8	90.7	133.1	194.6	214.8	213.6	193.0	156.4	108.2	19.3	6.8	1.8	0.5	N/A	N/A
Total [b]	101.4	170.3	148.7	195.8	286.2	316.0	314.2	283.9	230.0	159.1	28.4	10.0	2.7	0.8	N/A	N/A
Alternative 3																
Employment (FTE)																
Direct	436	772	758	1,016	2,209	2,515	2,861	2,228	1,786	1,304	773	59	33	22	17	N/A
Total [b]	979	1,535	1,433	1,685	3,664	4,171	4,171	3,695	2,962	2,163	1,282	98	55	36	28	N/A
Labor Income (million $)																
Direct	53.9	82.8	76.5	87.6	190.4	216.8	216.8	192.1	154.0	112.4	66.6	5.1	2.8	1.9	1.5	N/A
Total [b]	101.4	143.8	127.7	128.8	280.1	318.9	318.9	282.5	226.5	165.4	98.0	7.5	4.2	2.8	2.2	N/A
Alternative 4b																
Employment (FTE)																
Direct	436	908	770	1,272	1,889	1,990	1,922	1,693	1,259	821	83	44	21	6	N/A	N/A
Total [b]	979	1,760	1,452	2,110	3,133	3,301	3,188	2,808	2,088	1,362	138	73	35	10	N/A	N/A
Labor Income (million $)																
Direct	53.9	94.5	77.6	109.6	162.8	171.5	165.7	145.9	108.5	70.8	7.2	3.8	1.8	0.5	N/A	N/A
Total [b]	101.4	161.0	129.3	161.3	239.5	252.3	243.7	214.7	159.6	104.1	10.5	5.6	2.7	0.8	N/A	N/A

Regional Economic Effect [a]	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16
DWR's Preferred Alternative																
Employment (FTE)																
Direct	665	561	538	1,326	2,212	2,692	3,086	3,056	2,543	1,803	921	307	92	25	12	N/A
Total [b]	1,355	1,191	1,068	2,199	3,669	4,465	5,119	5,069	4,218	2,990	1,528	509	153	41	20	N/A
Labor Income (million $)																
Direct	73.4	64.9	57.6	114.3	190.7	232.1	266.0	263.4	219.2	155.4	79.4	26.5	7.9	2.2	1.0	N/A
Total [b]	129.7	118.0	99.8	168.1	280.5	341.4	391.3	387.5	322.5	228.6	116.8	38.9	11.7	3.2	1.5	N/A

Note: Labor income is based on IMPLAN sector data for this region and reported 2020 dollars (IMPLAN 2020).

FTE = full-time equivalent.

[a] IMPLAN results are changes relative to existing conditions.

[b] Sum of direct, indirect, and induced effects; numbers may not sum to the total due to rounding. Detailed estimates are presented in Delta Conveyance Project Draft EIR Appendix 17A, *Regional Economic Effects of Water Conveyance Facility Construction.*

None of the action alternatives are expected to have an adverse effect on natural gas wells in the study area. The topic of natural gas wells is discussed in Delta Conveyance Project Draft EIR Chapter 27, *Mineral Resources,* Impact MIN-1: *Loss of Availability of Locally Important Natural Gas Wells as a Result of the Project,* and Impact MIN-2: *Loss of Availability of Extraction Potential from Natural Gas Fields as a Result of the Project* (California Department of Water Resources 2022).

Each of the action alternatives could affect employment and labor income in the recreation sector; however, these changes are expected to be minimal. Impact ECON-5: *Changes in Recreational Economics in the Statutory Delta* discusses effects on recreational economics further.

In the Delta region, ongoing operation and maintenance of water-conveyance facilities would result in increased employment relative to the existing conditions and the No Action Alternative (regional economic conditions do not differ across existing conditions and the No Action Alternative). Table 3.17-3 shows the direct and total (i.e., sum of direct, indirect, and induced) changes that would result from expected operations and maintenance employment.

Table 3.17-3. Regional Economic Effects on Operations-Related Employment and Labor Income during Operations and Maintenance

Regional Economic Effect [a]	Alt 1	Alt 2b	Alt 3	Alt 4b	Alt 5
Employment (FTE)					
Direct	50	41	49	42	53
Total [b]	116	95	113	97	123
Labor Income (million $)					
Direct	5.9	4.9	5.8	5.0	6.3
Total [b]	10.2	8.4	10.0	8.6	10.8

Note: Labor income is reported 2020 dollars.
Alt = alternative; FTE = full-time equivalent.
[a] IMPLAN results are changes relative to the No Action Alternative.
[b] Sum of direct, indirect, and induced effects; numbers may not sum to the total due to rounding.

The construction footprint of conveyance facilities and related facilities such as roads and utilities would permanently or temporarily remove some existing agricultural land from production, so the effects of such removals on agricultural employment and income would be negative. Based on the crop production value changes described in Impact ECON-6: *Changes in Agricultural Economics in the Statutory Delta* during the construction phase, the direct agricultural job losses would more likely be concentrated in the orchards and vineyards sectors, which are relatively labor intensive, as well as in the forage crops sector, which is less labor intensive.

During the operations and maintenance phase of the action alternatives, the permanent effects of the construction footprint on agricultural land in production relative to the existing conditions and the No Action Alternative would continue. It is possible that agricultural land removed due to the temporary construction footprint would return to agriculture. However, the parcels that would be returned to agricultural use are not yet known. The analysis of project effects on agricultural employment and labor income conservatively assumes that all agricultural lands needed to support project construction and operation activities would be permanently converted to nonagricultural uses. The regional economic effects on employment and income in the Delta region from the change in agricultural production are reported in Table 3.17-4.

Table 3.17-4. Regional Economic Effects on Agricultural Employment and Labor Income due to the Project Construction Footprint

Regional Economic Effect [a]	Alt 1	Alt 2b	Alt 3	Alt 4b	Alt 5
Employment (FTE)					
Direct	-51	-41	-50	-39	-38
Total [b]	-68	-52	-68	-51	-55
Labor Income (million $)					
Direct	-1.2	-0.8	-1.2	-0.8	-1.2
Total [b]	-2.1	-1.4	-2.2	-1.5	-2.1

Note: Labor income is reported 2020 dollars.
[a] IMPLAN results are changes relative to the No Action Alternative.
[b] Sum of direct, indirect, and induced effects; numbers may not sum to the total due to rounding.
Alt = alternative; FTE = full-time equivalent.

Construction of the water-conveyance facilities would result in a temporary increase in related employment and labor income, which would be considered a beneficial effect. There would also be a permanent increase in operations-related employment, which would also be considered a beneficial effect. However, these activities would also be anticipated to result in a permanent decrease in agricultural-related employment and labor income, which would be considered an adverse effect.

Construction of the action alternatives would increase total employment and income in the Delta region, temporarily (during the construction period). Changes in recreational expenditures could also affect regional employment and income; however, these are not expected to be significant, as discussed in Impact ECON-5: *Changes in Recreational Economics in the Statutory Delta*. Changes in natural gas well operations are not expected to affect regional employment and income because there are no producing natural gas wells within the footprint of the action alternatives (Delta Conveyance Project Draft EIR Chapter 27, *Minerals Resources* [California Department of Water Resources 2022]).

Removal of agricultural land from production is discussed further in Delta Conveyance Project Draft EIR Chapter 15, *Agricultural Resources*, and changes in recreation-related activities are discussed further in Delta Conveyance Project Draft EIR Chapter 16, *Recreation* (California Department of Water Resources 2022).

The CMP for Bouldin Island and I-5 Ponds 6, 7, and 8 would require construction activities such as earth moving, access improvements, and construction of water control structures. Estimated equipment working days are used to estimate potential effects on employment and labor income, as summarized in Table 3.17-5. To estimate direct employment effects, this analysis assumes one construction employee per equipment working day, and 250 working days per employee per year. This estimate is conservative because more than one employee may be required to run some equipment, and other activities, such as weed control and planting, may not be included. Construction activities would be completed over a 2-year period on Bouldin Island and over a 3-year period for I-5 Ponds 6, 7, 8. The FTE estimates presented in Table 3.17-5 are based on annual averages over these periods. This increase in employment and labor income would be considered a beneficial effect.

Table 3.17-5. Temporary Regional Economic Effects on Construction-Related Employment and Labor Income Due to Compensatory Mitigation

Regional Economic Effect [a]	Bouldin Island (per year for 2 years)	I-5 Ponds 6, 7, & 8 (per year for 3 year)
Employment (FTE)		
Direct	4.3	12.9
Total [b]	7.2	21.4
Labor Income (million $)		
Direct	0.4	1.1
Total [b]	0.5	1.6

Note: Labor income is reported 2020 dollars.
[a] IMPLAN results are changes relative to existing conditions.
[b] Includes direct, indirect, and induced effects; numbers may not sum to the total due to rounding.
FTE = full-time equivalent.

The CMP, specifically the actions to be undertaken on Bouldin Island, are also expected to take additional farmland out of production, resulting in a reduction in agricultural jobs and labor income beyond those identified in Table 3.17-4. Section 3.2, *Agricultural Resources*, Impact AG-1: *Convert a Substantial Amount of Prime Farmland, Unique Farmland, Farmland of Local Importance, or Farmland of Statewide Importance as a Result of Construction of Water-Conveyance Facilities*, discusses effects of the compensatory mitigation on Delta agriculture further. Table 3.17-6 summarizes the changes in employment and labor income due to agricultural production lost at the Bouldin Island mitigation site. This loss in agricultural employment and income would be considered an adverse effect.

Table 3.17-6. Regional Economic Effects on Agricultural Employment and Labor Income due to Compensatory Mitigation

Regional Economic Effect [a]	Bouldin Island Compensatory Mitigation
Employment (FTE)	
Direct	-12
Total [b]	-14
Labor Income (million $)	
Direct	-0.2
Total [b]	-0.4

Note: Labor income is reported 2020 dollars.
[a] IMPLAN results are changes relative to the No Action Alternative.
[b] Sum of direct, indirect, and induced effects; numbers may not sum to the total due to rounding.
FTE = full-time equivalent.

No effects on recreation or natural gas well employment or labor income resulting from the CMP are anticipated.

Overall, construction of all action alternatives would result in a temporary increase in related employment and labor income, which would be considered a beneficial effect. However, construction of all action alternatives would also result in a permanent decrease in agricultural-related employment and labor income, particularly in the orchard and vineyard sectors, which would be considered an adverse effect. Therefore, the regional economic benefits on employment and labor income under all action alternatives would be offset by the adverse effects from the permanent conversion of agricultural lands to nonagricultural uses. In terms of changes in regional employment and income, there would be no effect.

Impact ECON-2: Changes in Population and Housing in the Delta Region

No Action Alternative

Under the No Action Alternative, it is anticipated that the population would follow the projections described in Section 3.17.1, *Affected Environment*, and trends in housing demand and supply would correspond to population trends. It is expected that the growth in housing would support the growth in population. Some county general plans, such as that for Sacramento, include growth management programs for unincorporated areas that could provide beneficial effects with respect to population and housing changes.

All Action Alternatives

Table 3.17-7 shows the estimated workforce during peak construction, as well as the year peak construction will take place for each action alternative.

Table 3.17-7. Estimated Workforce during Peak Construction

Action Alternative	Construction Workers	Year of Peak Construction
1	3,321	7
2b	2,492	6
3	2,861	7
4b	1,990	6
5	3,086	7

Construction of water-conveyance facilities would require an estimated peak of 3,321 workers in year 7 of the Alternative 1 construction period. Peak construction employment occurs in year 7 for Alternatives 1, 3, and DWR's Preferred Alternative and in year 6 for Alternatives 2b and 4b, as shown in Table 3.17-7. It is anticipated that the majority of these new jobs would be filled from within the existing labor force in the Delta region counties.

It is anticipated that some of the nonlocal workers would temporarily relocate to the Delta region, thus adding to the local population. This analysis estimates that 15% represents a reasonable percent of workers that would relocate into the region and would, therefore, affect long-term population and housing demand. Using the peak workforce of 3,321, the number of workers moving to the region would be approximately 498. Using the regional average household size of 2.89 persons (California Department of Finance 2020a), this would result in a potential population increase of 1,440 during peak construction.

This additional population would constitute a very small increase in the total 2019 Delta region population (not including Alameda County) of 4.1 million. It is also minor relative to the projected regional population growth of about 0.5 million between 2019 and 2035 (California Department of Finance 2020b).

There are about 79,000 vacant housing units available to accommodate any nonlocal workers who relocate to the Delta region (California Department of Finance 2020a). As a result, construction of the conveyance facilities is not expected to increase the demand for housing.

Changes in demand for public services resulting from any increase in population are addressed in Section 3.20, *Public Services, Utilities, and Energy.*

Operations and maintenance of conveyance facilities would require some permanent new workers. Given the nature of those operation and maintenance jobs, the existing water-conveyance facilities already in the Delta region, the large regional workforce, and the large water agencies with headquarters in the area, it is anticipated that all of these new jobs would be filled from within the labor force in the Delta region. Changes in demand for public services resulting from any increase in population are addressed in Section 3.20, *Public Services, Utilities, and Energy.*

It is anticipated that most of the operational workforce would be drawn from within the Delta region. Consequently, operation of the conveyance facilities would not result in effects on housing.

Within specific local communities, there could be localized effects on housing. However, given the availability of housing within the region, it would be speculative to predict where this effect would occur. In addition, new residents would likely be dispersed across the region, thereby not creating a burden on any one community.

These activities would not result in permanent concentrated, large increases in population or new housing.

Construction of the action alternatives could result in minor temporary population increases relative to existing population and relative to expected population growth in the Delta region. Physical environmental effects resulting from the minor increase in population are not anticipated. The Delta region has an adequate housing supply to accommodate the change in population.

Operation and maintenance of the action alternatives would likely not result in population increases in the Delta region.

Construction of compensatory mitigation may create employment in addition to the jobs created by the action alternatives and would remove jobs in agriculture as discussed under Impact ECON-1: *Changes in Regional Employment and Income*. However, this change in jobs would be small relative to the increase in employment during construction of conveyance facilities; therefore, it is not expected to create substantial effects on population or housing.

Based on the information presented above, the potential for the action alternatives to result in changes in population and housing in the Delta region does not appear to be significant.

Impact ECON-3: Changes in Community Character in the Statutory Delta

No Action Alternative

Under the No Action Alternative, community character, including community cohesion and the functionality of community gathering places, within the statutory Delta would be similar to that described under Section 3.17.1, *Affected Environment*. Projects and programs implemented under the No Action Alternative would not be anticipated to create adverse effects on the character of Delta communities. The exception could be the Sustainable Groundwater Management Act (SGMA), which could have effects on community character in conjunction with potential effects on agricultural economics in the Delta if Groundwater Sustainability Plans currently under development lead to reductions in agricultural production. However, at this time, implementation of these plans is not expected to have an adverse effect on Delta agriculture. The Delta Plan, as well as county general plans, include programs to protect the Delta as a unique and historical place, which should help to maintain the community character.

All Action Alternatives

Construction-related employment would expand as a result of the construction of the action alternatives, as discussed under Impact ECON-1: *Changes in Regional Employment and Income*. Agricultural contributions to the character and culture of the Delta would be likely to decline commensurate with the projected decline in agricultural-related acreage, employment, and production, discussed under Impacts ECON-1 and ECON-6: *Changes in Agricultural Economics in the Statutory Delta*.

To the extent that this anticipated economic shift away from agriculture and toward construction results in demographic changes in population, employment level, income, age, gender, or ethnic origin, the Delta region could be expected to see changes to its character.

In addition to potential changes in the demographic composition of Delta communities, construction of water-conveyance facilities under each action alternative could also affect the size of the communities. Based upon the projections provided under Impacts ECON-1 and ECON-2: *Changes in Population and Housing in the Delta Region*, the employment base of the Delta region would expand during water facility construction.

Legacy communities in the Delta, which are those identified as containing distinct historical and cultural character, include Locke, Bethel Island, Clarksburg, Courtland, Freeport, Hood, Isleton, Knightsen, Rio Vista, Ryde, and Walnut Grove. Construction activities associated with water-conveyance facilities could result in changes to the rural qualities of these communities during the construction period.

Effects associated with construction activities could also result in changes to community cohesion if they were to restrict mobility, reduce opportunities for maintaining face-to-face relationships, or disrupt the functions of community organizations or community gathering places (such as schools, libraries, places of worship, and recreational facilities). Additionally, access to historic sites and resources may be affected by construction activities. Implementation of environmental commitments related to noise, visual effects, and transportation would reduce adverse effects (Appendix C1, *Environmental Commitments and Best Management Practices*).

Throughout the Delta region, population and employment are not expected to markedly change as a result of continued operation and maintenance of the water-conveyance facilities. Agricultural contributions to the character and culture of communities within the statutory Delta may decline commensurate with the projected decline in agricultural-related employment and production. This could result in the continued closure of agriculture-dependent businesses or those catering to agricultural employees (although operations and maintenance activities specifically would not directly lead to any new closures).

While operations could result in beneficial effects relating to the economic welfare of a community, adverse social effects could linger in communities closest to potential character-changing effects and in those most heavily influenced by agricultural and recreational activities. However, these effects should be minimal.

Community character effects relating to changes in population and demographics are not anticipated to be notable during construction or operation of the action alternatives. There are some anticipated adverse effects on rural character, and access to community gathering places and historic sites during the construction phase, however the extent of these were not determined and would be speculative at this time. Both beneficial and adverse effects could arise from potential changes in economic welfare and stability to various communities during both the construction and operations phases of the action alternatives.

Construction and operation of water-conveyance facilities under each action alternative could affect community character in the Delta region during the construction work period.

Loss of agriculture would result from the CMP. This loss may also lead to adverse effects on communities linked to agriculture. However, these effects are not expected to be substantial.

Based on the information presented above, the potential for the action alternatives to cause changes in community character in the statutory Delta does not appear to be significant.

Impact ECON-4: Changes in Local Government Fiscal Conditions in the Delta Region

No Action Alternative

In consideration of the programs and adopted plans included in the No Action Alternative, local government fiscal conditions in the Delta region would be anticipated to be similar to those conditions described under Section 3.17.1, *Affected Environment*. Changes in land use, population, and other economic activity could affect property and sales tax revenue.

All Action Alternatives

Some of the land on which publicly owned water-conveyance facilities would be constructed is currently held by private owners. Any losses in property tax revenues as a result of state acquisition of private lands required to construct, operate, and maintain the action alternatives would be offset by the requirements of the Delta Reform Act of 2009. A commensurate increase in local sales tax revenue as a result of increased labor income during construction of the action alternatives is expected as well, which is considered a beneficial effect on local government fiscal conditions. The effect of sales tax revenue on local government fiscal conditions during the operations and maintenance phase would not be substantial.

No economic effect is expected to result from forgone tax revenue. As required by the Sacramento–San Joaquin Delta Reform Act, the action alternatives would compensate local governments for the loss of property tax or assessment revenue for land used for constructing, locating, operating, or mitigating for new Delta water-conveyance facilities. Additionally, as discussed under Impact ECON-1: *Changes in Regional Employment and Income*, construction of the action alternatives would be anticipated to result in a net temporary increase of income and employment in the Delta region. This would also create an indirect beneficial effect through increased sales tax revenue for local government entities that rely on sales taxes.

Under each action alternative, construction of water-conveyance facilities would result in the removal of a portion of the property tax base for various local government entities in the Delta region. However, the Delta Reform Act of 2009 requires the entities that contract to receive water from the SWP/CVP or a joint powers authority representing those entities have made arrangements or entered into contracts to pay to mitigate for lost property tax and assessment revenue associated with land needed for the construction of new conveyance facilities (Water Code Section 85089). Additionally, any losses of local government revenue could be offset, at least in part, by an anticipated increase in employment and sales tax revenue.

The CMP would not have a marked effect on local Delta government fiscal conditions. Effects on agricultural labor income would be minor relative to the workforce of the Delta region and, therefore, would have a minimal effect on local sales tax revenue. Effects on foregone property tax revenue would be offset per California law.

Based on the information presented above, the potential for the action alternatives to cause changes in local government fiscal conditions in the Delta region does not appear to be significant.

Impact ECON-5: Changes in Recreational Economics in the Statutory Delta

No Action Alternative

Recreational economics within the Delta region would be anticipated to be similar to that described under Section 3.17.1, *Affected Environment*. Projects anticipated to create potential benefits to wildlife observation opportunities may lead to increased economic activity associated with recreation in the Delta. While outside factors including changes to fisheries could alter the quality of recreational resources, consideration of measures to support recreation are ongoing.

All Action Alternatives

While facility construction would not physically displace any recreational facilities, some disruption of recreational activities considered temporary and permanent might occur in certain areas during the construction period, as described and defined in Impact REC-1: *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*, and Impact REC-2: *Include Recreational Facilities or Require the Construction or Expansion of Recreational Facilities That Might Have an Adverse Physical Effect on the Environment* (Section 3.18, *Recreation*). The quality of recreational activities including boating, fishing, waterfowl hunting, and hiking in the Delta could be affected by noise, lighting, traffic, and visual degradation near construction. If construction activities shift the relative popularity of different recreational sites, the action alternatives may carry localized effects.

As discussed in Impacts REC-1 and REC-2, operation and maintenance activities associated with the water-conveyance facilities under each action alternative are not anticipated to create adverse effects on recreational resources.

Overall, construction activities are only expected to have small effects on recreation in the Delta, implying that appreciable effects on recreational economics are not anticipated to result from construction of the facilities.

Potential physical changes to the environment relating to recreational resources are described and evaluated in Impacts REC-1 and REC-2.

Compensatory mitigation could create enhanced wildlife viewing opportunities. This could have a small beneficial effect on Delta recreational economics.

Based on the information presented above, the potential for the action alternatives to cause changes in recreational economics in the statutory Delta does not appear to be significant.

Impact ECON-6: Changes in Agricultural Economics in the Statutory Delta

No Action Alternative

Conditions under the No Action Alternative are based on summary crop acreages and value of production information presented in Section 3.17.1, *Affected Environment*. Crop acreage will adjust over time in response to market conditions, but at this time these changes are unknown, so current acreages are a reasonable prediction of 2040 acreages. Unlike some areas farther south in the San Joaquin Valley, the Delta is outside of critically overdrafted groundwater basins, and local draft Groundwater Sustainability Plans indicate that crop acreages in the Delta are not expected to be appreciably affected by SGMA implementation by 2040. County general plans include programs to protect Delta agriculture, which should help maintain favorable conditions for agricultural economics.

Irrigated crop acreage and value of agricultural production in the statutory Delta (and surrounding areas near project sites) under the No Action Alternative are expected to similar to those described in Section 3.17.1, *Affected Environment*. On average, $866 million in crop value would be generated on about 390,000 irrigated acres. Forage and field crops are the two largest categories by acreage, and account for about 55% of the total irrigated acreage. About 80% of the annual value of crop production is accounted for by two other crop categories: vegetable, truck, and specialty crops, and orchards and vineyards. Production costs and investments are similar to those described in Section 3.17.1, *Affected Environment*.

All Action Alternatives

Construction activities would convert land from existing agricultural uses to uses that include direct facility footprints, construction staging areas, borrow/spoils areas, reusable tunnel material storage, temporary and permanent roads, and utilities. These direct effects on agricultural land are described in Section 3.2, *Agricultural Resources*, Impacts AG-1: *Convert a Substantial Amount of Prime Farmland, Unique Farmland, Farmland of Local Importance, or Farmland of Statewide Importance as a Result of Construction of Water-Conveyance Facilities*, and AG-2: *Convert a Substantial Amount of Land Subject to Williamson Act Contract or under Contract in Farmland Security Zones to a Nonagricultural Use as a Result of Construction of Water-Conveyance Facilities*.

Table 3.17-8 summarizes the changes in acreage and value of agricultural production that would result during construction as a result of each action alternative.

Table 3.17-8. Crop Acres and Value of Agricultural Production in the Delta due to the Project Construction Footprint

	Alternative 1		Alternative 2b		Alternative 3		Alternative 4b		DWR's Preferred Alternative	
Analysis Metric	Total	Change	Total	Change	Total	Change	Total	Change	Total	Change
Total Crop Acreage (thousand acres)	**386.8**	**-2.9**	**387.2**	**-2.5**	**386.9**	**-2.9**	**387.3**	**-2.4**	**387.8**	**-2.0**
Grains	54.4	-0.3	54.4	-0.2	54.4	-0.2	54.4	-0.2	54.4	-0.2
Field crops	102.9	-0.7	103.0	-0.6	103.1	-0.5	103.1	-0.5	103.3	-0.3
Forage crops	107.5	-1.7	107.6	-1.6	107.5	-1.7	107.6	-1.6	108.4	-0.9
Vegetable, truck, and specialty crops	41.0	0.0	41.0	0.0	41.0	0.0	41.0	0.0	41.0	0.0
Orchards and vineyards	81.0	-0.3	81.2	-0.1	80.9	-0.3	81.1	-0.1	80.8	-0.5
Total Value of Production (million $)	**862.2**	**-3.8**	**863.7**	**-2.4**	**862.0**	**-4.0**	**863.4**	**-2.6**	**862.0**	**-4.0**
Grains	29.5	-0.1	29.5	-0.1	29.5	-0.1	29.5	-0.1	29.5	-0.1
Field crops	78.5	-0.5	78.5	-0.5	78.6	-0.4	78.6	-0.4	78.7	-0.2
Forage crops	71.9	-1.3	72.0	-1.3	71.9	-1.3	72.0	-1.2	72.6	-0.6
Vegetable, truck, and specialty crops	220.6	-0.1	220.6	-0.1	220.6	-0.1	220.6	-0.1	220.6	-0.1
Orchards and vineyards	461.7	-1.8	463.1	-0.5	461.5	-2.0	462.8	-0.7	460.6	-2.9

Depending on the action alternative, total value of irrigated crop production in the statutory Delta would decline by between $2.4 to $5.1 million per year during the construction period. Total irrigated crop acreage would decline by between 2,000 and 3,300 acres, depending on the action alternative. Both the declines in crop production and acreage are less than 1% relative to existing conditions under all action alternatives. These estimates are not dependent on water year type.

Construction of conveyance facilities could also affect production costs on lands even if gross revenues are largely unaffected; however, these costs are not anticipated to be large. Construction designs have provided for such costs in two ways. In most cases, affected lands would be within the facilities footprint, and are included in the agricultural acreage and value of production described elsewhere in this section and in Delta Conveyance Project Draft EIR Chapter 15, *Agricultural Resources*, Section 15.3.3.2, *Impacts of the Project Alternatives on Agricultural Resources* (California Department of Water Resources 2022). Travel associated with construction activities is required to stay on major freeways and away from local roads used by agricultural workers, as discussed in Delta Conveyance Project Draft EIR Chapter 20, *Transportation* (California Department of Water Resources 2022).

Loss of investments in production facilities and standing orchards and vineyards would occur as a result of construction. The negotiated acquisition of lands for the conveyance and associated facilities would compensate for most, but perhaps not all, of that value.

Only a minor change in the quality of agricultural water supply is expected during construction. Delta Conveyance Project Draft EIR Chapter 9, *Water Quality*, identifies temporary elevations in turbidity and TSS near construction sites. However, the direct effects of this on local agriculture would be minor.

During operation and maintenance of conveyance facilities, it is possible that agricultural land removed due to the temporary construction footprint would return to agriculture. However, the parcels that would be returned to agricultural use are not yet known. These direct effects on agricultural land are described in Section 3.2, *Agricultural Resources*, Impacts AG-1: *Convert a Substantial Amount of Prime Farmland, Unique Farmland, Farmland of Local Importance, or Farmland of Statewide Importance as a Result of Construction of Water-Conveyance Facilities*, and AG-2: *Convert a Substantial Amount of Land Subject to Williamson Act Contract or under Contract in Farmland Security Zones to a Nonagricultural Use as a Result of Construction of Water-Conveyance Facilities*. Delta Conveyance Project Draft EIR Chapter 17, *Socioeconomics* (California Department of Water Resources 2022) provides a discussion of changes in agricultural production as a result of operation and maintenance of the action alternatives. The analysis of project effects on agricultural economics conservatively assumes that the agricultural lands needed to support project construction and operation activities would be permanently converted to nonagricultural uses.

Construction of the conveyance facilities would lead to reductions in crop acreage and in the value of agricultural production during the construction period. Additionally, the footprint of conveyance facilities would result in lasting reductions in crop acreage and in the value of agricultural production during the operations and maintenance period.

The CMP would create adverse effects on Delta agricultural economics because farmland would come out of production for these mitigation areas, specifically on Bouldin Island. Effects of compensatory mitigation on Delta farmland are discussed further in Section 3.2, *Agricultural Resources,* Impact AG-1: *Convert a Substantial Amount of Prime Farmland, Unique Farmland, Farmland of Local Importance, or Farmland of Statewide Importance as a Result of Construction of Water-Conveyance Facilities*. Table 3.17-9 summarizes the changes in acreage and value of agricultural production that would result from the CMP on Bouldin Island. Changes are shown relative to the existing conditions and No Action Alternative by aggregate crop category.

While there would be some adverse effects on agricultural economics in the statutory Delta under all action alternatives, the impact does not appear to be significant.

Table 3.17-9. Crop Acres and Value of Agricultural Production in the Delta due to Compensatory Mitigation on Bouldin Island

Analysis Metric	Change
Total Crop Acreage (thousand acres)	**-0.8**
Grains	0.0
Field crops	-0.8
Forage crops	0.0
Vegetable, truck, and specialty crops	0.0
Orchards and vineyards	0.0
Total Value of Production (million $)	**-0.6**
Grains	0.0
Field crops	-0.6
Forage crops	0.0
Vegetable, truck, and specialty crops	0.0
Orchards and vineyards	0.0

Impact ECON-7: Socioeconomic Effects in the South-of-Delta SWP/ CVP Export Service Areas

No Action Alternative

Under the No Action Alternative, regions receiving water from the SWP and CVP south of the Delta are expected to see reductions in water-delivery reliability due to the ongoing effects of climate change and sea level rise. Less water reliability for agricultural uses would result in adverse effects on agricultural economics in these regions. The community character of rural regions receiving SWP and CVP water supply closely tied to agriculture would also experience adverse effects. Population and economic activity in urban areas rely on a consistent water supply, so reductions in delivery reliability from the Delta would result in the implementation of other costly projects and programs.

All Action Alternatives

As described in Delta Conveyance Project Draft EIR Chapter 31, *Growth Inducement*, Section 31.2.3, *Impacts and Mitigation Approaches*, construction and operation of the action alternatives could result in a number of effects in SWP export service areas receiving water deliveries by increasing the reliability of water deliveries. This can also reduce costs to water providers and users in these regions if they are able to use the SWP supply to avoid more costly supplies. According to the water supply changes summarized in Delta Conveyance Project Draft EIR Chapter 6, *Water Supply*, Table 6-2, south-of-Delta SWP contractors would receive the large majority of water supply–reliability improvements from the action alternatives (California Department of Water Resources 2022).

For further analysis of the effects of operations please see Delta Conveyance Project Draft EIR, Chapter 17, *Socioeconomics* (California Department of Water Resources 2022).

Effects of the Alternatives on Public Health

Impact PH-1: Increase in Vector-Borne Diseases

No Action Alternative

Water ponding during construction of habitat restoration projects and levee projects or of water supply–reliability projects such as desalination plants or water recycling facilities could increase standing water after rain events and thereby create mosquito habitat. However, these inundated areas would likely be relatively small, localized, and temporary and would not adversely affect public health due to vector-borne disease exposure.

Habitat restoration in the study area that may occur as part of implementation of projects such as Little Egbert Tract, the In-Delta Storage Project, or those included in California EcoRestore would generally be located in areas that are already potential sources of vectors, such as existing channels or agricultural areas. While these projects may increase habitat suitable to mosquitoes, habitat would be designed to maximize water exchange and flow, and thereby minimize stagnant water and mosquito production. In addition, all of the restoration activities would occur in consultation with local MVCDs given MVCDs would exercise their authority to conduct surveillance for vectors, prevent the occurrence of vectors, and abate production of vectors (California Health and Safety [Health & Saf.] Code § 2040) and project proponents would also be responsible for mosquito abatement (California Health & Saf. Code § 2060). Therefore, it is not expected that habitat restoration under the No Action Alternative would result in a marked increase in the public's risk of exposure to vector-borne diseases.

Operation of water supply–reliability projects would provide alternative sources of water to regional water agencies' constituents through desalination and water recycling. Operation of these facilities and distribution of this water would not create habitat suitable to mosquitoes and, therefore, would not result in an increase in the public's risk of exposure to vector-borne diseases. Operation of groundwater recharge sites would likely create standing pools of water (e.g., recharge basins), which could create mosquito breeding habitat, an increase in mosquitoes and subsequent exposure of the public to vector-borne diseases.

Climate change under the No Action Alternative would also be expected to affect the occurrence of vector-borne diseases relative to existing conditions. With increasing temperatures, it is expected that mosquito abundance, survival and feeding activity will increase because mosquitoes are ectotherms (i.e., "cold-blooded") and, as such, rely on external sources of heat for reproduction and survival. Further, the rate of development of the pathogen within the mosquito may also increase with increasing ambient temperatures. (Rocklöv and Dubrow 2020:479–480).

Local MVCDs would exercise their authority to conduct surveillance for vectors, prevent the occurrence of vectors, and abate production of vectors and project proponents would also be responsible for mosquito abatement.

All Action Alternatives

Under all action alternatives, temporary and permanent increases in surface water in the study area due to future preconstruction field investigations and construction of the water-conveyance facilities, as well as aquatic habitat as part of compensatory mitigation, could increase the public's exposure to vector-borne diseases in the study area by potentially increasing suitable mosquito breeding habitat and thus mosquito populations. Ponding on the ground, as well as any standing water (e.g., in unused containers and in or on construction and demolition debris), at construction and staging areas, as well as at sites where future preconstruction field investigations are performed, could develop after heavy precipitation events and temporarily create areas conducive to mosquito breeding. If this were to occur, this may temporarily increase the public's exposure to vector-borne diseases in the study area relative to the No Action Alternative. Stormwater runoff would be diverted to an on-site collection system to be captured, treated, and stored in enclosed trailers for on-site water supplies. Therefore, stormwater would not be allowed to accumulate in large open-shallow ponds at the construction site.

Potential changes in suitable mosquito breeding habitat in the study area due to operation of the action alternatives, including compensatory mitigation, would be as described in Delta Conveyance Project Draft EIR, Chapter 26, *Public Health*, Impact PH-1: *Increase in Vector-Borne Diseases* (California Department of Water Resources 2022). Relative to the No Action Alternative, where operation of the action alternatives in 2040 create areas of shallow, relatively still water, there may be an increase in suitable mosquito breeding habitat. This may increase the public's exposure to vector-borne diseases in the study area relative to the No Action Alternative. While there would be a net increase in aquatic habitat, not necessarily all of this habitat would be high-quality mosquito breeding habitat. For example, as described in Delta Conveyance Project Draft EIR, Chapter 26, *Public Health,* Section 26.1.1.5, *Vectors*, functional tidal marshes do not provide high-quality habitat for all mosquito species, and maintenance and restoration of natural tidal flushing in marshes is effective at limiting mosquito populations. Further, forested and scrub shrub wetlands are typically in areas that have saturated soils, but are not necessarily inundated such that pooling would occur, although the potential for pooling exists.

Implementation of Mitigation Measure PH-1a: *Avoid Creating Areas of Standing Water During Preconstruction Field Investigations and Project Construction*, would minimize the potential for an adverse public health effect related to increasing suitable mosquito breeding habitat within the study area during construction and preconstruction field investigations. Implementation of Mitigation Measure PH-1b: *Develop and Implement a Mosquito Management Plan for Compensatory Mitigation Sites on Bouldin Island and at I-5 Ponds*, would minimize the potential for an adverse public health effect related to increasing suitable mosquito breeding habitat in the study area as a result of implementing compensatory mitigation. See Appendix C2, *Mitigation Measures*, for details on these mitigation measures.

Based on the information presented above, and considering the proposed mitigation measures, the potential for the action alternatives to increase the occurrence of vector-borne diseases does not appear to be significant.

Impact PH-2: Exceedance(s) of Water Quality Criteria for Constituents of Concern Such That Drinking Water Quality May be Affected

No Action Alternative

Trace Metals

Trace metal concentrations under the No Action Alternative would not differ markedly from concentrations that occur under existing conditions. No mixing of Delta source waters could result in a concentration of trace metals of primarily human health and drinking water concern (i.e., aluminum, arsenic, iron, manganese) greater than the highest source water concentration, and given that the average water concentrations for these metals do not exceed water quality criteria, more frequent exceedances of drinking water criteria in the Delta would not occur under the No Action Alternative.

Pesticides

As described in Section 3.21, *Water Quality*, there would be no marked changes in Delta pesticide concentrations under the No Action Alternative relative to existing conditions. Current pesticide control programs, including total maximum daily loads (TMDLs) and the Central Valley RWQCB Water Quality Control Plan amendments for the control of diazinon, chlorpyrifos, and pyrethroids would continue to address pesticide-related impairments and prevent potential future impairments in surface waters.

Disinfection Byproducts

As described in Section 3.21, *Water Quality*, modeling results indicate that bromide concentrations would increase in the Sacramento River at Emmaton, San Joaquin River at Antioch, and Sacramento River at Mallard Island, particularly in the months of July through December. The San Joaquin River at Empire Tract, Contra Costa Water District Pumping Plant #1, Old River at SR 4, Victoria Canal, and Banks and Jones Pumping Plants also would experience higher monthly average bromide during some months, though to a lesser degree. There would be minimal changes in bromide concentrations in Barker Slough at North Bay Aqueduct and South Fork Mokelumne River at Terminous. These effects would be due to climate change and sea level rise, not changes in SWP/CVP facilities and operations. DOC concentrations under the No Action Alternative would differ minimally from the concentrations under existing conditions at most Delta assessment locations.

Due to potentially appreciable increase in bromide concentrations in the western Delta under the No Action Alternative, there could be potential increases in DBPs) produced during drinking water treatment, which could be an adverse effect on public health. To avoid potential increases in the formation of DBPs, drinking water treatment plants obtaining water from the western Delta may need to upgrade existing treatment systems in order to achieve U.S. Environmental Protection Agency Stage 1 Disinfectants and Disinfection Byproduct Rule action thresholds.

All Action Alternatives

Ground-disturbing construction activities could result in soil erosion and runoff, which may result in the transport of pesticides and trace metals of primarily human health and drinking water concern (i.e., arsenic, aluminum, iron, and manganese) potentially present in soil to nearby surface waters. However, this potential effect on water quality would be temporary and fairly localized to areas of construction, and implementation of site-specific Erosion and Sediment Control Plans and SWPPPs (Environmental Commitments EC-4a: *Develop and Implement Erosion and Sediment Control Plans*, and EC-4b: *Develop and Implement Stormwater Pollution Prevention Plans*, respectively) under all action alternatives would minimize the potential for this effect by controlling erosion and runoff to surface water. Sources of pesticides in the study area include direct input of surface runoff from agriculture and urbanized areas in the Delta as well as inputs from rivers upstream of the Delta. These sources would not be affected by operation and maintenance of the action alternatives. The applicant may use of both terrestrial and aquatic pesticides/herbicides during operation and maintenance of the water-conveyance facilities, and these would be used in accordance with the established DWR policy for pesticide use (Water Resources Engineering Memorandum No. 10b [WREM 10b]; California Department of Water Resources 2018) as well as per the requirements of the Statewide General National Discharge Pollutant Discharge Elimination System Permit for the Discharge of Aquatic Pesticides for Aquatic Weed Control in Waters of the United States for DWR's Aquatic Pesticides Application Plan for State Water Project facilities (Water Quality Order 2013-0002-DWQ; California Department of Water Resources 2016). The purpose of WREM 10b is to identify staff roles and responsibilities and to ensure that DWR is following safe procedures for all pesticide-related activities by meeting current regulatory requirements and using up-to-date best management practices.

All of the action alternatives would result in minor, if any, changes in trace metals concentrations in the Delta relative to the No Action Alternative. For more information on the effects on trace metals and pesticides, as a result of operations, refer to Delta Conveyance Project Draft EIR Appendix 9L, *Water Quality 2040 Analysis* (California Department of Water Resources 2022).

Modeling results indicate that there would be potentially higher bromide concentrations at some Delta locations relative to the No Action Alternative and this could result in a greater potential for the formation of DBPs in drinking water supplies that use Delta source waters. However, the degree to which this would occur is uncertain. Treatment plants that use the Delta as a source for drinking water already experience highly variable bromide concentrations and, thus, must implement appropriate treatment technologies to ensure compliance with drinking water regulations for DBPs. The incremental increases in annual average bromide concentrations that may occur under the action alternatives are not expected to be of sufficient magnitude to cause Delta diverters to exceed drinking water DBP maximum contaminant levels (MCLs) more often than under the No Action Alternative or cause exceedances of such MCLs where such exceedances would not occur for the No Action Alternative. Monthly average DOC concentrations at the Delta assessment locations modeled would change minimally relative to the No Action Alternative. At locations where model results indicate small increases in DOC, these increases would not be of the magnitude to require modifications to existing drinking water treatment plants in order to further reduce DOC concentrations. For more information on the effect on bromide at specific Delta locations as a result of operations, refer to Delta Conveyance Project Draft EIR Appendix 9L, *Water Quality 2040 Analysis* (California Department of Water Resources 2022).

Natural habitats proposed for compensatory mitigation in the Delta are not sources of bromide to receiving waters. The conversion of lands from agriculture to wetlands and other natural habitats could result in either a net decrease or increase in DOC loading for the Delta. However, compensatory mitigation is not expected to cause a long-term increase in DOC concentrations because the land area proposed for restoration would be relatively small compared to existing Delta land area and other external and internal sources of DOC. Therefore, compensatory mitigation would not result in increased potential for the formation of DBPs in Delta drinking water supplies.

Based on the information presented above, and considering the proposed mitigation measures and environmental commitments, the potential for the action alternatives to result in an exceedance(s) of water quality criteria for constituents of concern such that drinking water quality may be affected does not appear to be significant.

Impact PH-3: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate

No Action Alternative

Construction of habitat restoration projects would likely temporarily mobilize existing constituents within sediments known to bioaccumulate, such as methylmercury or legacy pesticides. This potential effect is expected in varying degrees depending on the location of restoration projects because the study area is generally known to be out of compliance with regard to mercury/methylmercury. Construction effects would not be adverse because the mobilization would occur during a limited time and would be localized around the area of construction. Once operational, habitat restoration projects that include aquatic habitat restoration such floodplain habitat could result in an increase of methylmercury as a result of biogeochemical processes and sediment conditions established in these habitat types. However, it is expected these projects either have evaluated, or would evaluate the potential for, methylmercury production and would implement measures to monitor and adaptively manage mercury methylation. For example, the Suisun Marsh Plan EIS/EIR evaluated the potential for methylmercury production due to tidal restoration and determined it would result in less-than-significant effects and that monitoring and other measures would be incorporated into the adaptive management plan to manage methylmercury concerns.

Modeled long-term average concentrations of methylmercury in largemouth bass would increase less than 0.1 milligram per kilogram (mg/kg) wet weight at all Delta assessment locations under the No Action Alternative relative to existing conditions. Increases would be due primarily to shifts in the relative Delta source water concentrations. Regulatory programs are being implemented in the study area to minimize mercury and methylmercury loading to the Delta; these programs include the Sacramento–San Joaquin Delta Estuary TMDL for methylmercury and the Cache Creek, Bear Creek, Sulphur Creek, Harley Gulch Mercury TMDL. Implementation of these regulatory programs is expected to reduce the transport of mercury and the production and transport methylmercury to the Delta over time.

All Action Alternatives

Bioaccumulative pesticides have low water solubility—they do not readily volatilize and tend to adsorb (bond) to particulates, settle out into the sediment, and not be transported far from the source. Similarly, mercury and methylmercury adsorb to suspended particulate matter and particulates in sediment. If legacy pesticides or mercury and methylmercury are present in sediment within in-water construction areas, these constituents would be temporarily disturbed and resuspended in the water column due to in-channel sediment-disturbing construction activities or field investigations. In addition, legacy pesticides and mercury that may be present in soil at construction sites adjacent to surface water in the study area could enter the water column via runoff and erosion. Increases in water column concentrations of bioaccumulative pesticides or methylmercury can ultimately be transferred to fish consumed by humans. Given the temporary nature of any sediment resuspension, potential changes in water column concentrations of legacy pesticides, mercury, or methylmercury during construction of the action alternatives would not increase long-term fish tissue concentrations in the study area relative to the No Action Alternative.

Given that legacy pesticides are no longer used, are infrequently detected in source waters of the Sacramento and San Joaquin rivers, and given lack of exceedances of water quality criteria or objectives, concentrations of legacy pesticides would not be affected measurably by operation of the water-conveyance facilities under all action alternatives. Maintenance dredging of sediment around the intake structures and pumping plant would result in the temporary resuspension of sediments, which could reintroduce legacy pesticides to the water column, but this would only occur periodically as needed, and sediment resuspension would be temporary and fairly localized.

Under all of the action alternatives, changes in long-term aqueous and fish tissue methylmercury concentrations in the study area due to operation of the proposed water-conveyance facilities would not be notably different from the No Action Alternative. Modeling results indicate that fish tissue methylmercury concentrations would increase by no more than 0.01 mg/kg wet weight as averages over the full simulation period at all Delta assessment locations relative to the No Action Alternative. For further analysis of effects of operations on mercury and methylmercury, please see Delta Conveyance Project Draft EIR Appendix 9L, *Water Quality 2040 Analysis* (California Department of Water Resources 2022).

Implementation of compensatory mitigation under the action alternatives, specifically the creation of new freshwater emergent perennial wetlands, seasonal wetlands, and tidal habitats, could result in new sources of methylmercury in adjacent Delta waters because conditions that are conducive to mercury methylation may occur within these types of habitats, as discussed in Section 3.21, *Water Quality*, which could adversely affect public health in the long term through fish consumption in these areas. The freshwater emergent perennial wetlands and seasonal wetlands would be located on Bouldin Island and would not be hydrodynamically connected with adjacent Delta waters. As part of management of the new wetlands, water may be discharged from the wetlands to adjacent Delta waterways through existing drains or outfalls. As part of adaptive management, monitoring of the discharge would be conducted and the discharges modified (e.g., to a detention basin) should monitoring results show the wetland discharges to be a net exporter of methylmercury to Delta waters. Thus, the wetlands to be created on Bouldin Island would not contribute to measurable increases in methylmercury concentrations in waters or fish of the Delta. The new tidal habitats would be hydrodynamically connected to the Delta and thus bioaccumulation of methylmercury in fish tissues may occur within and near the new tidal habitats, relative to comparable Delta habitats.

While not quantifiable on a local level, increases in methylmercury concentrations in waters and fish within and near the new tidal habitats could be measurable.

The California Office of Environmental Health Hazard Assessment (OEHHA) standards and fish consumption advisories would continue to be implemented for the consumption of study area fish, which would help protect people against the overconsumption of fish with increased body burdens of mercury. In addition, the applicant would implement Mitigation Measure WQ-6: *Develop and Implement a Mercury Management and Monitoring Plan* (Appendix C2, *Mitigation Measures*) with the goal to minimize generation of methylmercury within new tidal habitat, which would further reduce the potential for an increase in methylmercury in fish tissue of study area fish.

Based on the information presented above, and considering the proposed mitigation measure, the potential for the action alternatives to result in substantial mobilization of or increase in constituents known to bioaccumulate does not appear to be significant.

Impact PH-4: Adversely Affect Public Health Due to Exposing Sensitive Receptors to New Sources of EMF

No Action Alternative

Implementation of projects under the No Action Alternative that require the use of electrical energy such as desalination plants and water recycling facilities, may require the construction and operation of new transmission lines, which would introduce new sources of EMF. Although, it is unknown where new transmission lines would be located and, thus, whether they would be located close to sensitive receptors (e.g., hospitals, schools, parks), it is not unlikely that some of them may be. However, the utilities must implement the California Public Utilities Commission (CPUC) design criteria and guidelines regarding EMF (*EMF Design Guidelines for Electrical Facilities)*, which includes methods for reducing magnetic fields. CPUC reviews all proposals for transmission lines. Investor-owned utilities are required to obtain a permit from CPUC for construction of certain specified infrastructure (including transmission lines) listed under Public Utilities Code Section 1001 (California Public Utilities Commission 2011). Further, the current scientific evidence does not show conclusively that EMF exposure can increase health risks.

All Action Alternatives

The permanent aboveground and underground 69 kV transmission lines proposed for operation of the water-conveyance facilities under all action alternatives would be located in generally sparsely populated areas away from most existing potentially sensitive receptors. However, depending on the action alternative, 2 to 37 residences and up to 3 wildlife preserve areas would be within 300 feet of a proposed permanent underground 69 kV transmission line. Further, 23 residences total as well as the Cosumnes River Preserve would be within 300 feet of a proposed permanent aboveground 69 kV transmission line. Because visitors to wildlife preserve areas generally come for walks and other recreational activities, it is unlikely that large groups of people would be staying in the area within 300 feet of any proposed transmission line, so any EMF exposure would be limited. Up to 37 residences are located within 300 feet proposed permanent transmission lines for any action alternative. There are no state or federal standards (health-based or otherwise) to limit occupational or residential exposure to EMF and there is no medical or scientific consensus that EMF exposure poses a health risk. Furthermore, the location and design of proposed transmission lines and power facilities must be in accordance with CPUC's EMF guidance in *EMF Design Guidelines* *for Electrical Facilities* (California Public Utilities Commission 2006) to minimize potential exposure of sensitive receptors to EMF due to operation of the action alternatives. Methods identified in CPUC's EMF guidance document to reduce magnetic fields include increasing distance from electrical facilities by increasing structure height or trench depth and reducing conductor spacing.

Compensatory mitigation would not create a new source of EMF in the study area relative to the No Action Alternative because no new transmission lines would be constructed as part of that mitigation.

Based on the information presented above, the potential for the action alternatives to adversely affect public health due to exposing sensitive receptors to new sources of EMF does not appear to be significant.

Impact PH-5: Impact Public Health Due to an Increase in *Microcystis* Bloom Formation

No Action Alternative

As discussed in Section 3.21, *Water Quality*, CHABs would be expected to occur with similar or greater frequency throughout the study area for the No Action Alternative, relative to existing conditions. With climate change associated with the No Action Alternative in 2040, there would be the potential for earlier initiation of CHABs initiation into the Delta and the potential for more frequent large blooms. This would be driven by climate change that would increase water temperatures in the Lower Sacramento River, San Joaquin River, and Delta. Higher water temperatures earlier in the year could enable *Microcystis* and other cyanobacteria blooms to begin occurring more often in the Delta earlier in the year. To the extent that future climate change leads to lower inflows to the Delta from the Sacramento and San Joaquin rivers, such effects would be expected to result in longer residence times for various areas in the Delta, which also would further favor larger cyanobacteria blooms in areas of the Delta where residence times are longest (e.g., Discovery Bay, Franks Tract, Mildred Island, Stockton Deep Water Ship Channel). Implementation of projects in the study area that have the potential to affect the five key drivers of CHABs (i.e., water temperature, residence time, nutrients, water velocities and associated turbulence and mixing, and water clarity and associated irradiance) such that conditions become more conducive to CHAB formation could also contribute to CHABs and cyanotoxins in the study area.

All Action Alternatives

As described in detail in Delta Conveyance Project Draft EIR Appendix 9L, *Water Quality 2040 Analysis,* the frequency and magnitude of CHABs in the Delta would not increase under any of the action alternatives because operation of the water-conveyance facilities would not cause the key drivers of CHABs (i.e., temperature, residence time, nutrients, water velocities and associated turbulence/mixing, and water clarity and associated irradiance) to change markedly relative to the No Action Alternative. Accordingly, concentrations of cyanotoxins within the study area would not markedly increase due to operation of the water-conveyance facilities; therefore, there would be no increased potential for public health to be affected.

Implementation of compensatory mitigation, specifically the creation of tidal habitats that are hydrodynamically connected to Delta channels, could create some new areas where conditions are conducive to CHABs. Location(s) and size(s) of the new tidal habitat are currently undetermined and would be selected in accordance with the tidal habitat mitigation framework in Appendix C3, *Compensatory Mitigation Plan for Special-Status Species and Aquatic Resources*. The greatest potential for new CHAB formation would be at subsided sites where water temperatures and residence time could increase while allowing sufficient light penetration. Thus, certain tidal habitats could create new "seed" areas for CHABs. This could result in long-term increases in the frequency and size of CHABs within the Delta in the vicinity of new tidal habitats, relative to the No Action Alternative and, therefore, could potentially increase health risks to people recreating in the vicinity.

The other types of compensatory mitigation (i.e., valley/foothill riparian, freshwater emergent perennial wetland, seasonal wetland, lake/pond) would be located on Bouldin Island and would not be hydrodynamically connected with Delta channels. As such, these other types of new habitats would not affect CHAB formation within the Delta, relative to the No Action Alternative. Mitigation Measure WQ-14: *Develop and Implement a CHAB Management and Monitoring Plan* would help minimize increases in residence times and water temperatures through the siting, physical design, maintenance, and monitoring of the new tidal habitats (Appendix C2, *Mitigation Measures*). As described in Section 3.21, *Water Quality*, it is uncertain as to whether the siting or design and maintenance of the compensatory mitigation tidal habitat areas would be able to control and minimize the formation of CHABs in the tidal habitats.

Based on the information presented above, and considering the proposed mitigation measures and environmental commitments, the potential for the action alternatives to affect public health due to an increase in *Microcystis* bloom formation does not appear to be significant.

3.17.2.5 Cumulative Analysis

This cumulative effect analysis considers past, present, and reasonably foreseeable future projects in the study area that could affect the same resources and, where relevant, occur within the same timeframe as the action alternatives. It is expected that some changes related to socioeconomics and public health would take place, even though it is assumed that reasonably foreseeable future projects would include typical design and construction practices to avoid or minimize potential effects.

Socioeconomics

The cumulative effects analysis for socioeconomics considers past, present, and reasonably foreseeable future projects and programs in combination with the effects of the action alternatives. The cumulative socioeconomic effects of the plans, policies, and programs will vary, with many having potential beneficial effects on socioeconomic conditions, and a few which could have potential adverse effects. The plans, policies, and programs included in the cumulative analysis are summarized in Table 3.17-10, along with their anticipated effects regarding socioeconomics.

Table 3.17-10. Plans, Policies, and Programs Included in the Cumulative Analysis

Program / Project	Agency	Status	Description of Program/Project	Potential Effects on Socioeconomics
Delta Plan	DSC	Began in 2009, ongoing	The Delta Reform Act, created by SB X7-1, established the co-equal goals for the Delta of "providing a more reliable water supply for California and protecting, restoring, and enhancing the delta ecosystem." (Pub. Resources Code § 29702; Wat.	Beneficial effects on community character.

Program / Project	Agency	Status	Description of Program/Project	Potential Effects on Socioeconomics
			Code § 85054). These coequal goals are to be achieved "in a manner that protects and enhances the unique cultural, recreational, natural resources, and agricultural values of the Delta as an evolving place." (Wat. Code § 85054). The Delta Reform Act also established the DSC. The DSC is tasked with furthering the state's coequal goals for the Delta through development of the Delta Plan, a comprehensive, long-term, resource management plan for the Delta, containing both regulatory policies and recommendations aimed at furthering the coequal goals and promoting a healthy Delta ecosystem. The Delta Plan provides for a distinct regulatory process for activities that qualify as Covered Actions under Water Code Section 85057.5. State and local agencies proposing Covered Actions, prior to initiating implementation of that action, must prepare a written certification of consistency with detailed findings regarding consistency with applicable Delta Plan policies and submit that certification to the DSC.	
Sacramento County General Plan of 2005–2030	Sacramento County	Adopted in 2011	The updated plan provides a sustainable growth management program for the unincorporated territory through 2030.	Beneficial effects on population, housing, and community character.
San Joaquin County General Plan	San Joaquin County	Updated in 2015	This plan guides all future land use, development, preservation, and resource conservation decisions for the county through 2035.	Beneficial effects on community character. Could help avoid adverse effects on agricultural economics.
Solano County General Plan	Solano County	Adopted in 2008 (Housing and Public Health and Safety elements updated in 2015)	This policy document guides both land development and conservation of agricultural and natural resources in the unincorporated portions of the county through the year 2030.	Beneficial effects on population, housing, and community character. Could help avoid adverse effects on agricultural economics.
2030 Countywide General Plan	Yolo County	Adopted in 2009	Key purposes are to identify the county's land use, circulation, environmental, economic, and	Beneficial effects on community character.

Program / Project	Agency	Status	Description of Program/Project	Potential Effects on Socioeconomics
			social goals and policies as they relate to land use.	
Sustainable Groundwater Management Act	DWR	Passed in 2014. Plans ongoing	Requires groundwater basins in California to reach a sustainable yield by 2040.	Could create adverse effects on agricultural economics and regional employment.
Central Valley Vision	California State Parks	Draft Implementation Plan with 20-year outlook released in 2008	The plan provides a 20-year road map for State Park actions to focus on increasing service to Central Valley residents and visitors.	Beneficial effects on recreational economics and community character.
Water Supply Contract Extension Program	DWR	Most contracts expiring in 2035	The program mission is to extend the term and amend the State Water Project contracts by conducting negotiations between DWR contractors and public water agencies.	Would avoid adverse effects on agricultural economics.
Los Vaqueros Reservoir Expansion	Reclamation, DWR, and Contra Costa Water District	Final feasibility report released in August 2020	Project consists of enlarging the existing Los Vaqueros Reservoir and constructing related reservoir system facilities to develop water supplies for environmental water management that supports fish protection, habitat management, and other environmental needs, and Bay Area urban water users.	Beneficial effects on regional employment, and recreational economics. Also benefits the San Francisco Bay Area.
Irrigated Lands Regulatory Program	Central Valley WRQCB	Ongoing	This program regulates discharges from irrigated agricultural lands. Its purpose is to prevent agricultural discharges from impairing the waters that receive the discharges.	Beneficial effects on Delta water quality. Costs and restrictions on agricultural operations.
Delta Protection Commission Land Use and Resource Management Plan Update	DPC	Currently being updated (last update was in 2010)	The plan outlines the long-term land use requirements for the Sacramento-San Joaquin Delta and sets out findings, policies, and recommendations in the areas of environment, utilities and infrastructure, land use, agriculture, water, recreation and access, levees, and marine patrol/boater education/safety programs.	Beneficial effects on regional employment, population, housing, community character, agricultural economics, and recreational economics.
Recreation Proposal for the Sacramento-San Joaquin Delta and Suisun Marsh	DPR	Proposal developed in 2011	The proposal recommends that communities on the edge of the Delta or Suisun Marsh with access to major transportation routes be developed as “gateways” to provide supplies and information to visitors about	Beneficial effects on recreational economics and community character.

Program / Project	Agency	Status	Description of Program/Project	Potential Effects on Socioeconomics
			recreation opportunities available in an area.	
Sites Reservoir/ North of the Delta Offstream Storage	Sites Reservoir Authority	Under development	By operating in conjunction with other California reservoirs, Sites Reservoir increases water supply flexibility, reliability, and resiliency in drier years.	Beneficial effects on regional employment, agricultural economics, and recreational economics. Also benefits north-of-Delta and south-of-Delta regions.
Envision Stockton 2040 General Plan	City of Stockton	Adopted December 2018	The General Plan is the principal policy document that guides future conservation and development in Stockton.	Beneficial effects on regional employment, population, housing, and community character.
California Aquatic Invasive Species Management Plan	CDFW	Released January 2008	The plan's overall goal is to identify the steps that need to be taken to minimize the harmful ecological, economic, and human health effects of aquatic invasive species in California.	Beneficial effects on recreational economics and community character.
Yolo Bypass Wildlife Area Land Management Plan	CDFW	Ongoing	The Yolo Bypass Wildlife Area comprises approximately 16,770 acres of managed wildlife habitat and agricultural land within the Yolo Bypass. The bypass conveys seasonal high flows from the Sacramento River to help control river stage and protect the cities of Sacramento, West Sacramento, and Davis and other local communities, farms, and lands from flooding.	Beneficial effects on regional employment, community character, recreational economics, and agricultural economics.
FloodSAFE California	DWR	Ongoing (initiated in 2006)	The FloodSAFE vision is a sustainable integrated flood management and emergency response system throughout California that improves public safety, protects, and enhances environmental and cultural resources, and supports economic growth by reducing the probability of destructive floods.	Beneficial effects on regional employment, community character, recreational economics, and agricultural economics.

CDFW = California Department of Fish and Wildlife; Central Valley WRQCB = Central Valley Regional Water Quality Control Board; DPC = Delta Protection Commission; DPR = California Department of Parks and Recreation; DWR = California Department of Water Resources; DSC = Delta Stewardship Council; Reclamation = Bureau of Reclamation.

Public Health

This cumulative effect analysis considers past, present, and probable future projects in the study area that could affect the same resources and, where relevant, occur within the same timeframe as the action alternatives. The effects of the action alternatives, as they relate to public health, considered in connection with the potential effects of projects that may occur in the study area, could be cumulative. It is expected that some changes related to public health would take place, even though it is assumed that probable future projects would include typical design and construction practices to avoid or minimize potential effects.

Table 3.17-11 identifies the projects assumed to be included in the cumulative analysis for the purposes of the public health analysis.

Table 3.17-11. Plans, Policies, and Programs Included in the Cumulative Analysis

Program/ Project	Agency	Status	Description of Program/Project	Effects on Public Health
North Delta Flood Control and Ecosystem Restoration Project	DWR	Final EIR complete	Project implements flood control and ecosystem restoration benefits in the north Delta	Potential to increase the amount of breeding habitat for mosquitoes and, thus, increase the local populations of mosquitoes. Accordingly, within 10 miles of McCormack-Williamson Tract, there would be the potential to increase the public's exposure to mosquitoes and, therefore, potentially vector-borne disease.
Freeport Regional Water Project	Freeport Regional Water Authority and Reclamation	Completed late 2010	Project includes an intake/pumping plant near Freeport on the Sacramento River and a conveyance structure to transport water through Sacramento County to the Folsom South Canal	No effect on public health from vector-borne diseases and mobilization of constituents known to bioaccumulate during construction and operation.
Delta-Mendota Canal/ California Aqueduct Intertie	Reclamation	Completed in 2012	The purpose of the intertie is to better coordinate water delivery operations between the California Aqueduct (state) and the Delta-Mendota Canal (federal) and to provide better pumping capacity for the Jones Pumping Plant. New project facilities include a pipeline and pumping plant	No effect on public health from vector-borne diseases and mobilization of constituents known to bioaccumulate during construction and operation.
Suisun Marsh Habitat Management, Preservation, and Restoration Plan	CDFW, USFWS, Reclamation, DWR, Suisun Resource Conservation District	Final EIS/EIR 2011	The plan is intended to balance the benefits of tidal wetland restoration with other habitat uses in Suisun Marsh by evaluating alternatives that provide a politically acceptable change in marsh-wide land uses, such as salt marsh harvest mouse habitat, managed wetlands, public use, and upland habitat.	No effect on public health from vector-borne diseases or mobilization of constituents known to bioaccumulate during construction and operation.
Cache Slough Area Restoration	DWR and CDFW	Ongoing and future actions	Enhancement and restoration of existing and potential open water, marsh, floodplain and riparian habitat in northern Delta.	Potential incremental increase in methylmercury formation and contribution to Delta load

Program/ Project	Agency	Status	Description of Program/Project	Effects on Public Health
Dutch Slough Tidal Marsh Restoration Project (EcoRestore Project)	DWR	Planning phase	The Dutch Slough Tidal Marsh Restoration Project, located near Oakley in Eastern Contra Costa County, would restore wetland and uplands, and provide public access to the 1,166-acre Dutch Slough property owned DWR. The property is composed of three parcels separated by narrow man-made sloughs.	Reduce levels of mosquito production in areas where seasonal wetland areas and unmanaged nontidal freshwater marsh are reduced. Increase mosquito production as a result of non-tidal open water management options, which would increase exposure of humans to mosquitoes and potentially vector-borne diseases. Potential incremental increase in methylmercury formation and contribution to Delta load.
Franks Tract Project	DWR and Reclamation	Delayed	Operable gates would be installed to control the flow of water at Threemile Slough and/or West False River. Boat passage facilities would be included to allow for passing of watercraft when the gates are in operation.	No effect on public health would be expected from vector-borne diseases or mobilization of constituents known to bioaccumulate during construction and operation.
Delta Wetlands Project	Semitropic Water District	Final EIR 2011	The Delta Wetlands Project involves the construction of a new water diversion and storage system on two islands in the Delta: Bacon Island and Webb Tract (Reservoir Islands). The Reservoir Islands provide for a total estimated storage capacity of 215 thousand acre-feet. The Delta Wetlands Project would increase the availability of high-quality water in the Delta for export or outflow through the following: (1) diversion of water on to the Reservoir Islands during high-flow periods (i.e., December through March); (2) storage of water on the Reservoir Islands; (3) mitigation for wetland and wildlife effects of the water storage operations on the Reservoir Islands by implementing a habitat management plan on Bouldin Island and Holland Tract; (4) supplemental water storage in Semitropic Groundwater Storage Bank and the Antelope Valley Water Bank; (5) discharging water for export to	Implementation of this project would result in an increase in mosquito breeding habitat. Accordingly, there would be in increase in the public's exposure to mosquitoes and, therefore, potentially vector-borne disease.

Program/ Project	Agency	Status	Description of Program/Project	Effects on Public Health
			designated south-of-Delta users when excess CVP or SWP pumping capacity is available (i.e., typically July through November); and (6) releasing water for water quality and outflow enhancement in the Bay-Delta Estuary typically from September through November.	
Mayberry Farms Subsidence Reversal and Carbon Sequestration Project	DWR	Completed in 2010	Permanently flood 308-acre parcel of DWR-owned land (Hunting Club leased) and restore 274 acres of palustrine emergent wetlands within Sherman Island to create permanent wetlands and to monitor waterfowl, water quality, and greenhouse gases.	No effect on public health from vector-borne diseases and mobilization of constituents known to bioaccumulate during construction and operation.
American Basin Fish Screen and Habitat Improvement Project	Reclamation, CDFW, and Natomas Central Mutual Water Company	Ongoing	This project involves consolidation of diversion facilities; removal of decommissioned facilities; aquatic and riparian habitat restoration; and installing fish screens in the Sacramento River. Total project footprint encompasses about 124 acres east of the Yolo Bypass. Permanent conversion of 70 acres of farmland (including 60 acres of rice) during Phases I and II.	No effect on public health is expected from vector-borne diseases and mobilization of constituents known to bioaccumulate during or after conversion.
California Water Action Plan	CNRA, CalEPA, and DWR	Ongoing and future	Identifies key actions for the next 1 to 5 years that address urgent needs and provide the foundation for the sustainable management of California's water resources.	Actions implemented may affect seasonal and long-term water quality conditions in the Delta.
Bay-Delta Water Quality Control Plan Update	State Water Board	Ongoing and future	The State Water Board is updating the Bay-Delta Water Quality Control Plan in four phases: Phase I: Modifying water quality objectives (i.e., establishing minimum flows) on the Lower San Joaquin River and Stanislaus, Tuolumne, and Merced Rivers to protect the beneficial use of fish and wildlife and modifying the water quality objectives in the southern Delta to protect the beneficial use of agriculture; Phase II: Evaluating and potentially amending existing water quality objectives that	To the extent that modifications in surface water flow patterns, increase minimum instream flows, and increase minimum Delta outflows, this would benefit water quality in the Delta.

Program/ Project	Agency	Status	Description of Program/Project	Effects on Public Health
			protect beneficial uses and the program of implementation to achieve those objectives. Water quality objectives that could be amended include Delta outflow criteria; Phase III: Requires a water rights proceeding to determine changes to existing water rights to achieve the objectives identified in Phase I and Phase II. Phase III will likely not occur until after Phase IV is complete or close to complete; Phase IV: Evaluating and potentially establishing water quality criteria and flow objectives that protect beneficial uses on tributaries to the Sacramento River.	
Drought Contingency Plan (includes Emergency Drought Barriers project)	Reclamation, DWR, and State Water Board	Completed for 2015; reasonably foreseeable to occur in future years with drought	Modification of Bay-Delta Water Quality Objectives (e.g., Delta outflow and electrical conductivity requirements) and requirements from 2008/2009 SWP/CVP BiOps to balance supplying human needs, repelling saltwater in the Delta, and providing for coldwater needs of Chinook salmon.	Reduced Delta outflow may increase the potential for negative effects from flow-related stressors (e.g., *Microcystis*).
Middle River Intake and Pump Station (previously known as the Alternative Intake Project)	Contra Costa Water District, Reclamation, and DWR	Completed in 2011	Construction of a potable water intake and pump station, along Victoria Canal on Victoria Island, to improve drinking water quality for Contra Costa Water District customers.	No effect on public health.
Delta Smelt Permanent Refuge	University of California, Davis, DWR, CDFW, USFWS, and Reclamation	Program under development	Develop a permanent facility, possibly at the proposed U.S. Fish and Wildlife Science Center at Rio Vista.	No effect on public health.
San Joaquin River Restoration Program	Reclamation, USFWS, National Marine Fisheries Service, DWR, and CDFW	Final PEIS/EIR 2012	The program would restore and maintain fish populations in "good condition" in the main stem of the San Joaquin River below Friant Dam to the confluence of the Merced River, including naturally reproducing and self-sustaining populations of salmon and other fish.	There is the potential for vector-borne diseases to adversely affect public health as operation of this program could result in an increase in adult mosquito populations.
Central Valley Diuron TMDL	Central Valley RWQCB	Ongoing and future actions	Regulatory and implementation actions to	Goal is reduced source loading of diuron pesticide.

Program/ Project	Agency	Status	Description of Program/Project	Effects on Public Health
			achieve compliance with water quality objectives.	
Central Valley Diazinon and Chlorpyrifos TMDL	Central Valley RWQCB	Ongoing and future actions	Regulatory and implementation actions to achieve compliance with water quality objectives.	Goal is reduced source loading of diazinon and chlorpyrifos pesticides.
Sacramento and Feather Rivers Diazinon TMDL	Central Valley RWQCB	Ongoing and future actions	Regulatory and implementation actions to achieve compliance with water quality objectives.	Goal is reduced source loading of diazinon pesticides.
Sacramento-San Joaquin Delta Diazinon and Chlorpyrifos TMDL	Central Valley RWQCB	Ongoing and future actions	Regulatory and implementation actions to achieve compliance with water quality objectives.	Goal is reduced source loading of diazinon and chlorpyrifos pesticides.
Central Valley Pyrethroid Pesticide TMDL	Central Valley RWQCB	Ongoing and future actions	Regulatory and implementation actions to achieve compliance with water quality objectives.	Goal is reduced source loading of pesticides.
Central Valley Organochlorine Pesticide TMDL	Central Valley RWQCB	Ongoing and future actions	Regulatory and implementation actions to achieve compliance with water quality objectives.	Goal is reduced source loading of legacy organochlorine pesticides.
Cache Creek, Bear Creek, Sulphur Creek, and Harley Gulch Mercury TMDL	Central Valley RWQCB	Ongoing and future actions	Regulatory and implementation actions to achieve compliance with water quality objectives.	Goal is reduced source loading of mercury and methylmercury formation, and thus bioaccumulation in fish and consequent potential effects on public health.
Clear Lake Mercury TMDL	Central Valley RWQCB	Ongoing and future actions	Regulatory and implementation actions to achieve compliance with water quality objectives.	Goal is reduced source loading of mercury and methylmercury formation, and thus bioaccumulation in fish and consequent potential effects on public health.
Sacramento-San Joaquin Delta Methylmercury TMDL	Central Valley RWQCB	Ongoing and future actions	Regulatory and implementation actions to achieve compliance with water quality objectives.	Goal is reduced source loading of mercury and methylmercury formation, and thus bioaccumulation in fish and consequent potential effects on public health.

BiOp = Biological Opinion; CalEPA = California Environmental Protection Agency; Central Valley RWQCB = Central Valley Regional Water Quality Control Board; CNRA = California Natural Resources Agency; CVP = Central Valley Project; DWR = California Department of Water Resources; EIR = Environmental Impact Report; EIS = environmental impact statement; State Water Board = State Water Resources Control Board; SWP = State Water Project; HCP = Habitat Conservation Plan; TMDL = total maximum daily load; USFWS = U.S. Fish and Wildlife Service.

The specific plans, policies, programs, and projects are identified below for each effect category based on the potential to contribute to an effect due to implementation of the Delta Conveyance Project that could be deemed a cumulative effect. The potential for cumulative effects on public health is described for potential effects related to the construction and operation of the water-conveyance facilities and compensatory mitigation under the action alternatives.

Increase in Vector-Borne Diseases

Vector habitat is present throughout the study area, and the cumulative projects could result in an increase in potential mosquito habitat (e.g., more standing shallow water). Although programs to prevent mosquitoes from breeding and multiplying are in place throughout the study area, the incremental contribution of implementation of aquatic habitat restoration as part of compensatory mitigation to the cumulative effect on public health could be cumulative. Implementation of Mitigation Measure PH-1b: *Develop and Implement a Mosquito Management Plan for Compensatory Mitigation Sites on Bouldin Island and at I-5 Ponds* (Appendix C2, *Mitigation Measures*), which would help control mosquitoes and reduce the potential for an increase in mosquito breeding habitat due to compensatory mitigation related to aquatic habitat on Bouldin Island and at I-5 Ponds 6, 7, and 8, would reduce the magnitude of this effect.

Exceedance(s) of Water Quality Criteria for Constituents of Concern Such That Drinking Water Quality May be Affected

Trace Metals

As described in Delta Conveyance Project Draft EIR Chapter 26, *Public Health*, Section 26.1.1.1, *Drinking Water*, the primary sources of trace metals to the Delta include acid mine drainage from abandoned and inactive mines, agriculture, WWTP discharges, and urban runoff. Ongoing efforts to control acid mine drainage into the Sacramento River system and increasingly stringent regulations in the future are expected. Regulatory controls on and monitoring of agricultural runoff, WWTP discharges, and urban runoff are anticipated to prevent trace metal concentrations under the cumulative condition from becoming markedly worse than existing conditions. Ground-disturbing construction activities associated with construction of the action alternatives could result in soil erosion and runoff, which may result in the transport of existing trace metals potentially present in soil to nearby surface waters. However, this potential effect on water quality would be temporary and fairly localized to areas of construction. Implementation of site-specific Erosion and Sediment Control Plans and SWPPPs (Environmental Commitments EC-4a: *Develop and Implement Erosion and Sediment Control Plans*, and EC-4b: *Develop and Implement Stormwater Pollution Prevention Plans*, respectively) under all action alternatives would minimize the potential for this effect by controlling erosion and runoff to surface water. Construction of the action alternatives would not present new or appreciably changed sources of trace metals into the Delta. Implementation of the action alternatives, including compensatory mitigation, would not affect trace metal levels in the Delta and, therefore, would not contribute considerably to the cumulative condition for trace metals.

Pesticides

Pesticide use within and upstream of the Delta is changing continuously. While factors such as TMDLs and future development of more target-specific and less toxic pesticides would ultimately influence the cumulative condition for pesticides, forecasting whether these various efforts would ultimately be successful at resolving current pesticide-related impairments requires considerable speculation. Construction of the action alternatives would not contribute considerably to the cumulative condition for pesticides in the study area. Although ground-disturbing construction activities could result in soil erosion and runoff, which may result in the transport of pesticides potentially present in soil to nearby surface waters, this potential effect on water quality would be temporary and fairly localized to areas of construction. Implementation of site-specific Erosion and Sediment Control Plans and SWPPPs (Environmental Commitments EC-4a: *Develop and Implement Erosion and Sediment Control Plans*, and EC-4b: *Develop and Implement Stormwater Pollution Prevention Plans*, respectively) under all action alternatives would minimize the potential for this effect by controlling erosion and runoff to surface water. Similarly, implementation of compensatory mitigation would not markedly affect pesticide concentrations in the Delta and, therefore, would not contribute considerably to any cumulative effect on water quality in the Delta due to pesticides.

Disinfection Byproducts

The cumulative condition for bromide and DOC in the Delta is considered considerable relative to existing conditions due to anticipated future increases in these constituents in the Delta. For bromide, the primary driver of these increases would be seawater intrusion associated with climate change and sea level rise. Future nonpoint and point source loadings of organic carbon from growing urbanized areas of the watershed are expected to increase in the future.

Any potential effects of construction of the action alternatives on bromide and organic carbon in surface water would be due to ground-disturbing activities and would not contribute considerably to any cumulative condition related to these water quality constituents and formation of DBPs during water treatment. Potential construction-related effects would be temporary. Further, implementation of site-specific Erosion and Sediment Control Plans and SWPPPs (Environmental Commitments EC-4a: *Develop and Implement Erosion and Sediment Control Plans* and EC-4b: *Develop and Implement Stormwater Pollution Prevention Plans*, respectively) under all action alternatives would minimize the potential for introduction of bromide or DOC to surface water by controlling erosion and runoff to surface water. The compensatory mitigation would not appreciably affect, or affect at all, bromide or DOC levels in the Delta for the reasons discussed in Section 3.17.2.4, for Impact PH-2: *Exceedance(s) of Water Quality Criteria for Constituents of Concern Such That Drinking Water Quality May be Affected*. Thus, the action alternatives, including compensatory mitigation, would not contribute considerably to any cumulative effect related to the formation of DBPs in Delta-diverted drinking water supplies.

Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate

Numerous regulatory efforts have been implemented to control and reduce mercury loading to the Delta, which include a Delta mercury TMDL and its implementation strategies, increased restrictions on point-source discharges such as from WWTPs, greater restrictions on suction dredging in Delta tributary watersheds, and continued clean-up actions on mine drainage in the upper watersheds. The Sacramento–San Joaquin Delta Estuary TMDL for methylmercury is intended to reduce agricultural drainage, tributary inputs, and point and nonpoint source discharges of mercury and methylmercury in the Delta to meet fish tissue objectives and is supported by the Central Valley RWQCB Delta Mercury Exposure Reduction Program. The State Water Resources Control Board is also developing a state-wide mercury control program for reservoirs and a Central Valley mercury control program for rivers. Despite these regulatory programs, a key challenge surrounds the pool of mercury deposited in the sediments of the Delta, which cannot be readily or rapidly reduced despite efforts to reduce loads in Delta tributaries, and which serves as a source for continued methylation and bioaccumulation of methylmercury by Delta biota.

Other projects shown in Table 3.17-11 could affect constituents known to bioaccumulate, such as methylmercury. These projects are not anticipated to markedly increase methylmercury concentrations in the study area because they are not anticipated to have actions that would mobilize such a constituent. Once operational, the habitat restoration projects could result in an increase of methylmercury in the study area as a result of biogeochemical processes and sediment conditions established in restored aquatic habitat types conducive to mercury methylation. However, it is expected that these projects either have evaluated or would evaluate the potential for methylmercury production and would implement measures to monitor and adaptively manage methylmercury production.

As indicated in Section 3.21, *Water Quality*, construction of the action alternatives would not contribute considerably to any cumulative water quality condition in the Delta, including mercury and methylmercury. Modeling results (Delta Conveyance Project Draft EIR, Appendix 9H, *Mercury*) indicate that long-term average mercury concentrations with implementation of the action alternatives would be similar to existing conditions at most Delta locations (California Department of Water Resources 2022). Any changes in Delta fish tissue methylmercury concentrations from facility operations would likely not be measurable. Accordingly, implementation of facility operations under the action alternatives would not markedly alter the cumulative condition for mercury/methylmercury and the impairment in the Delta. However, wetlands habitats to be constructed in the Delta are known to methylate mercury at higher rates than most other aquatic habitats. Hence, the creation of the compensatory mitigation wetlands, including tidal habitats, would be expected to contribute to additional mercury methylation and bioaccumulation of mercury in the wetlands themselves and adjacent Delta waters. However, OEHHA standards and fish consumption advisories would continue to be implemented for the consumption of study area fish, which would help protect people from the overconsumption of fish with increased body burdens of mercury. In addition, Mitigation Measure WQ-6: *Develop and Implement a Mercury Management and Monitoring Plan* would be implemented with the goal to minimize generation of methylmercury within compensatory mitigation sites.

Adversely Affect Public Health Due to Exposing Sensitive Receptors to New Sources of EMF

Past, present, and reasonably foreseeable future projects have resulted in the development and operation of power transmission lines in the study area that expose existing populations and sensitive receptors to EMF. Although existing populations and sensitive receptors are exposed to EMF, medical and scientific research has not shown conclusively that EMF exposure can increase health risks. However, although medical and scientific communities generally agree that evidence from available research has not demonstrated that EMF exposure creates a health risk, they have not fully dismissed the possibility of such a risk, and research is ongoing. There would be up to 37 residences (depending on the action alternative) within 300 feet of a proposed permanent transmission line. The siting and design of proposed transmission lines and substations for all of the action alternatives would be done in accordance with the EMF Design Guidelines (California Public Utilities Commission 2006b), to minimize potential exposure of sensitive receptors to EMF due to operation of the action alternatives.

Effect Public Health Due to an Increase in Microcystis Bloom Formation

The cumulative condition for *Microcystis* (and thus microcystin concentrations) and other CHABs is considered considerable in the Delta primarily because climate change will increase temperatures and change precipitation patterns and associated flows. The primary reason for this is that climate change will increase temperatures in the rivers that flow into the Delta, as well as temperatures in Delta waters. High water temperatures, particularly those above 25°C (77°F) give cyanobacteria a competitive advantage over other algae. As such, *Microcystis* and other cyanobacteria typically produce more biovolume and cell abundance at elevated water temperatures. Climate change is expected to cause an increase in average Delta water temperatures during the summer and early fall months, which could lead to earlier attainment of the water temperature threshold of 19°C (66°F) required to initiate *Microcystis* blooms in the Delta, and thus, earlier occurrences of blooms, relative to existing conditions. Warmer water temperatures could also increase bloom duration and magnitude, relative to existing conditions. Other key environmental factors that affect *Microcystis* and other cyanobacteria production are residence time, nutrients, channel velocities and associated turbulence and mixing, and water clarity and associated irradiance. Although nutrients and water clarity and associated irradiance are not expected to change notably in the future in a manner that would favor cyanobacteria blooms in Delta waters, climate change could lead to reduced reservoir storage levels more often, thereby leading to lower flows into the Delta and higher residence times. Residence times could increase further due to sea level rise.

The compensatory tidal habitats to be constructed in the Delta would be expected to have long residence times, a relatively calm water column, and higher water temperatures than surrounding Delta channels. These conditions within the tidal habitat are likely to be highly suitable for CHABs. Cyanobacteria populations have historically been lower in the Sacramento River compared to the San Joaquin River. This is due to the different environmental conditions that typically exist in each river and, thus, this trend is expected to continue in the future. Mitigation Measure WQ-14: *Develop and Implement a CHAB Management and Monitoring Plan* would be implemented with the goal to mitigate the potential for increases in CHAB formation and, thus, human exposure to cyanotoxins, within compensatory mitigation sites.

3.18 Surface Water

The large-scale operation of the SWP, including the facilities proposed for all alternatives, is outside USACE authority under Section 408, Section 404, and Section 10. Therefore, while the effects of operations of the action alternatives are discussed briefly and qualitatively in this Draft EIS, a more in-depth analysis of operations and associated effects on the environment is provided in the Delta Conveyance Project Draft EIR Chapter 5, *Surface Water* (California Department of Water Resources 2022). This Draft EIS focuses only on those actions under USACE authority.

3.18.1 Affected Environment

The surface water study area comprises the Delta—located at the confluence of the Sacramento and San Joaquin Rivers. Specifically, this section examines the Trinity, Sacramento, Feather, and American Rivers (and relevant associated reservoirs) in the Sacramento River Basin. These surface waters represent the geographic areas where potential changes could occur to surface waters as a result of new diversion and conveyance facilities for the SWP identified in the action alternatives. Surface water resources associated with the San Joaquin River are not expected to be affected by the action alternatives and are, therefore, not included in this analysis.

3.18.2 Environmental Consequences

3.18.2.1 Methods for Analysis

Modeling tools were used to identify potential changes to flows in the Trinity, Sacramento, Feather, and American Rivers and SWP or CVP reservoir storage levels resulting from implementation of the action alternatives. While no changes are being proposed in operational rules and water supply–allocation procedures for the SWP/CVP system, operation of the proposed north Delta intakes (as part of a dynamic system) could result in changes in river flows and reservoir storage levels.

CalSim 3 was used to simulate SWP/CVP operations—providing information about the surface water flows and reservoir storage associated with each action alternative. CalSim 3 results are not indicative of daily real-time operations decisions, especially for extreme conditions. Instead, model results and potential changes are an approximation of operational conditions on a monthly average basis and should always be evaluated in a comparative manner.

Changes to Sacramento River Basin flows at several key locations that can depict the SWP/CVP system operation were examined, including the Trinity River downstream of Lewiston Dam, Sacramento River downstream of Keswick Reservoir, Sacramento River at Bend Bridge, Yolo Bypass at Fremont Weir, Sacramento River at Freeport (i.e., upstream of the proposed north Delta intakes), Sacramento River south of Hood (i.e., near the proposed north Delta intakes), Feather River downstream of Thermalito Afterbay, and American River at Watt Avenue Bridge.

For comparative analyses, the simulated monthly flows from CalSim 3 are summarized on a long-term average basis and are also averaged by water year type (i.e., wet, above normal, below normal, dry, critical, and dry/critical years) for existing conditions and all of the action alternatives. The action alternatives are not expected to affect San Joaquin River flows; therefore, locations on the San Joaquin River were not evaluated further. The Delta Conveyance Project Draft EIR Appendix 5A, *Modeling Technical Appendix*, includes surface flows for additional locations in the study area (that are not relevant to the discussion in this section) (California Department of Water Resources 2022).

To evaluate changes to reservoir storage, end-of-month storages from CalSim 3 were analyzed for Trinity Lake, Shasta Lake, Folsom Lake, and Lake Oroville, for all years and for dry/critical years only. Storage in major SWP/CVP reservoirs usually increases in early spring because of snowmelt and often peaks in May. End-of-month storages were analyzed for May, June, and August since these periods correspond with operational rules that support recreational uses (for Memorial Day, Independence Day, and Labor Day, respectively). End-of-month storages were also analyzed for September, which is the water supply reserve for the coming water year. These storages were calculated for existing conditions and all of the action alternatives, and then compared.

The action alternatives are not expected to affect the operations of reservoirs south of the Delta on the tributaries of the San Joaquin River (e.g., Millerton Lake on the San Joaquin River and the New Melones Reservoir on the Stanislaus River); therefore, these reservoirs were not evaluated further. The Delta Conveyance Project Draft EIR Appendix 5A, *Modeling Technical Appendix*, includes storage for additional reservoirs in the study area (that are not relevant to the discussion in this section) (California Department of Water Resources 2022).

3.18.2.2 Effects and Mitigation

No Action Alternative

Under the No Action Alternative, the SWP/CVP operations are assumed to continue in a manner similar to their operations under existing conditions. The applicant and Reclamation would continue to operate the SWP and CVP to divert, store, and convey water consistent with applicable laws and contractual obligations.

Action Alternatives

All of the action alternatives would produce similar changes to surface water resources and are discussed together.

Changes to Sacramento River Basin Flows

Generally, long-term average monthly flows for the action alternatives would be similar to existing conditions, with some minor differences described below. The differences would vary by water year type, and changes are sometimes more extreme and/or more concentrated in certain month and water year type combinations.

The modeling results showed consistent decreases in long-term average flows for all months on the Sacramento River north of Courtland (i.e. downstream of the proposed north Delta intakes). These decreases occur in most water year type and month combinations, although the decreases are smaller or nonexistent in the summer of drier years. During the winter and spring in most years, and in wetter years when the Delta is in excess, these decreases are due to diversions of excess flows at the proposed north Delta intakes.

In the summer and early fall, the decreases on the Sacramento River just south of Hood (near the proposed north Delta intakes) are due to two reasons. First, releases for exports from upstream reservoirs can be lower in these months because San Luis Reservoir is fuller entering the summer; this is due to the diversions of excess water at the proposed north Delta intakes previously discussed. Second, in months when carriage water—the additional water needed for Delta outflow to assure compliance with the water quality requirements of the SWP and CVP—requirements are lower because of the use of the proposed north Delta intakes (and this carriage water savings cannot be exported), reservoir releases are reduced, which decreases downstream flows. While the flow decreases on the upstream tributaries are minor when measured on an annual average basis, they can be larger for certain water year types. Because carriage water savings are split between the SWP and CVP according to the Coordinated Operations Agreement, flows downstream of both SWP and CVP reservoirs exhibit these decreases. These conditions also cause reduced flows on the Sacramento River downstream of Keswick Reservoir, the Sacramento River at Bend Bridge, the Feather River downstream of Thermalito Afterbay, and the American River at Watt Avenue.

In addition to the direct effects of the proposed north Delta intakes on flows previously discussed, there are additional flow changes that occur for certain month and water year type combinations. While these changes make sense in terms of the simplified operational rules that are used in CalSim 3, in many cases, they may be exaggerations of the differences that would occur in a real-time operation. This is because of the tendency of CalSim 3 to adjust the operations in a single month, despite the changes in real-time operation occurring gradually.

There are changes in flows during the winter and spring in certain month and water year type combinations on the tributaries mentioned above, as well as on the Trinity River downstream of Lewiston Dam. These changes typically include increases in flows, although decreases in flows occur as well. Such changes are commonly due to operational shifts in a small number of years that are large enough to affect the water year type averages. These operational shifts happen because of a variety of factors, which include the following.

- Changes in reservoir spills when entering the month with storage that is a different distance from the flood curve.
- Shifts in reservoir balancing for the CVP (i.e., similar overall releases would be split differently between Trinity Lake, Shasta Lake, and Folsom Lake depending on the scenario).
- Changes in releases for exports due to different conditions in San Luis Reservoir when entering the month.
- Differences in reservoir releases for meeting salinity standards in the Delta.
- Differences in releases for wheeling.[30] All of these differences can occur when operations for the previous month were different and can generally be traced back to a prior month(s) when diversions at the proposed north Delta intakes caused changes in other components of the operation.

Flows in the Feather River downstream of Thermalito Afterbay show a consistent, minor increase in flows in October. This is because of increased releases for exports to increase storage in the SWP share of San Luis Reservoir, allowing for additional Article 56 deliveries in the following year. Article 56 carryover demands are higher due to higher Table A allocations in the action alternatives, as a result of additional exports at the proposed north Delta intakes. Flows on the American River at Watt Avenue show a consistent, minor decrease in flows in October. This is due to rebalancing with Shasta Lake since it often has higher storage in September.

[30] The term *wheeling* means the transmission of water owned by one entity through the facilities owned by another entity, in this case CVP water wheeled through the SWP north Delta intakes.

Changes to State Water Project or Central Valley Project Reservoir Storages

Storages at SWP and CVP north-of-Delta reservoirs averaged for all years and for dry/critical years under all of the action alternatives would be similar to existing conditions for all time periods examined (i.e., end of May, end of June, end of August, and end of September). For Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake, storage changes would be minimal. However, in some cases, there would be very minor increases in end-of-September storage because of lower releases for exports (because of diversions at the proposed north Delta intakes) and carriage water savings.

The modeling results showed that there are larger changes in storage at San Luis Reservoir as long-term averages show increases for all of the action alternatives when compared to existing conditions for all time periods examined (i.e., end of May, end of June, end of August, and end of September). These increases are due to diversions at the proposed north Delta intakes, which augment storage in San Luis Reservoir during the winter and spring. Some of this increased storage is used to support deliveries during the summer, although some carries over into September and is used for Article 56 carryover. A similar pattern is present for most of the dry/critical year averages, although there are decreases in the end-of-September storages, mainly because of decreases in the SWP share of San Luis Reservoir. This decrease in end-of-September storage is due to increased SWP allocations in the prior spring, which is caused by increased exports and higher storages in SWP San Luis Reservoir at that time. These lead to greater deliveries in the summer, which can decrease San Luis Reservoir storage in September.

3.19 Transportation

This section describes the affected environment for transportation and analyzes effects that could occur in the study area from construction, operation, and maintenance of the action alternatives, as well as the No Action Alternative. Mitigation and minimization measures that would avoid, minimize, rectify, reduce, or compensate potentially adverse effects are included as part of each action alternative. Additional information on the affected environment, methods of analysis, and the anticipated effects of the action alternatives can be found in the Delta Conveyance Project Draft EIR Chapter 20, *Transportation*, and Appendix 20C, *Delta Conveyance 2040 Traffic Analysis* (California Department of Water Resources 2022).

The large-scale operation of the SWP, including effects associated with operation of facilities constructed under the action alternatives, are outside USACE authority under Section 10 and Section 408 of the RHA and Section 404 of the CWA. Therefore, while the effects of project operations are discussed briefly and qualitatively in this Draft EIS, a more in-depth analysis of project operations and associated effects on the environment is provided in the Delta Conveyance Project Draft EIR (California Department of Water Resources 2022). This Draft EIS focuses primarily on those actions under USACE authority.

3.19.1 Affected Environment

This section describes the affected environment for transportation in the study area. The transportation study area includes facility construction areas, the regional Caltrans freeway and highway facilities, and local roadways that provide access to the proposed action features. Based on construction schedule for each of the action alternatives, employee traffic activity was used to determine that the study area would include parts of Sacramento, San Joaquin, Yolo, Contra Costa, Solano, and Alameda Counties, as shown in Figure 3.19-1.

Delta Conveyance Project Draft EIR Chapter 20, *Transportation,* Section 20.1, *Environmental Setting*, presents a detailed description of the traffic and transportation conditions that exist in the study area (California Department of Water Resources 2022). Existing marine facilities in the study area are described in Section 3.14.1.1, *Marine Facilities*.

3.19.1.1 Existing Transportation Facilities in the Study Area

Roadways

Based on the regional and local travel routes of construction workers and truck traffic delivering project materials and a threshold of 50 or more vehicles during peak hours during the construction, 120 roadway segments were analyzed in the study area. Key roadways in the project study area include I-5, I-205, SR 160, SR 84, SR 12, SR 4, and other two-and four-lane roadways within the Delta (Figure 3.19-1).

The 120 study roadway segments are as follows.

- Alameda County—1 roadway segment
- City of Brentwood—2 roadway segments

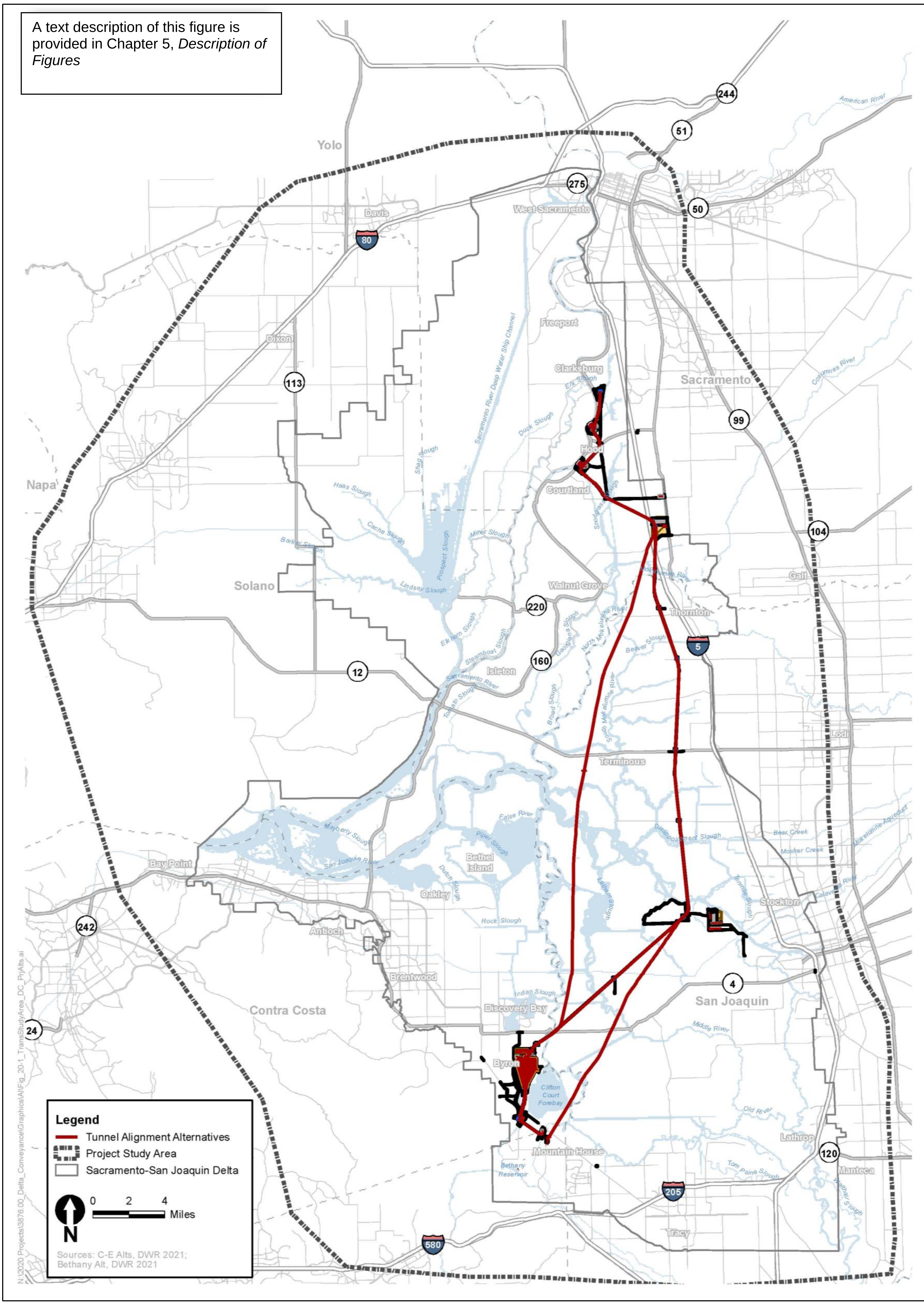


Figure 3.19-1. Transportation Study Area

- Contra Costa County—4 roadway segments
- Caltrans—66 freeway/highway/roadway segments
- City of Oakley—2 roadway segments
- City of Sacramento—3 roadway segments
- Sacramento County—18 roadway segments
- San Joaquin County—7 roadway segments
- City of Stockton—7 roadway segments
- City of Tracy—1 roadway segment
- City of West Sacramento—4 roadway segments
- Yolo County—5 roadway segments

The complete list of roadway segments within the study area is presented in Table 20A-1 and shown in Figure 20A-1 in Appendix 20A, *Delta Conveyance 2020 Traffic Analysis*, of the Delta Conveyance Project Draft EIR.

Intersections

Based on the regional and local travel routes of construction workers and truck traffic delivering project materials during the construction, 44 key intersections were identified in the study area and included in the transportation analysis. These include freeway on-ramp and off-ramp intersections and intersections in Sacramento, San Joaquin, Contra Costa, and Yolo Counties. The complete list of the study area intersections is presented in Table 20A-2 and shown in Figure 20A-2 in the Delta Conveyance Project Draft EIR.

Rail Facilities

Northern California has a rail network that provides freight and passenger services to various points within the region and connections with the continental United States. California is served by two private, transcontinental railroad companies: UPRR and BNSF Railway Company. These two railroads own right-of-way and operate freight services over their own systems of main lines, branch lines, railyards, and terminals. While the two railroads compete with each other for freight business, they also share routes and use each other's tracks under operating agreements.

In addition to providing freight services, with more than 50 trains per day in pre-COVID 2019 and a reduction to approximately 40 trains per day in 2020 traveling over their respective routes, both railroads host extensive intercity and long-haul passenger services that operate on their lines under agreement. The Amtrak Capital Corridor passenger service between San Jose and Sacramento and the Amtrak long-distance interstate service are among these passenger operators. Railroads in the transportation study area are shown in Figure 3.19-2.

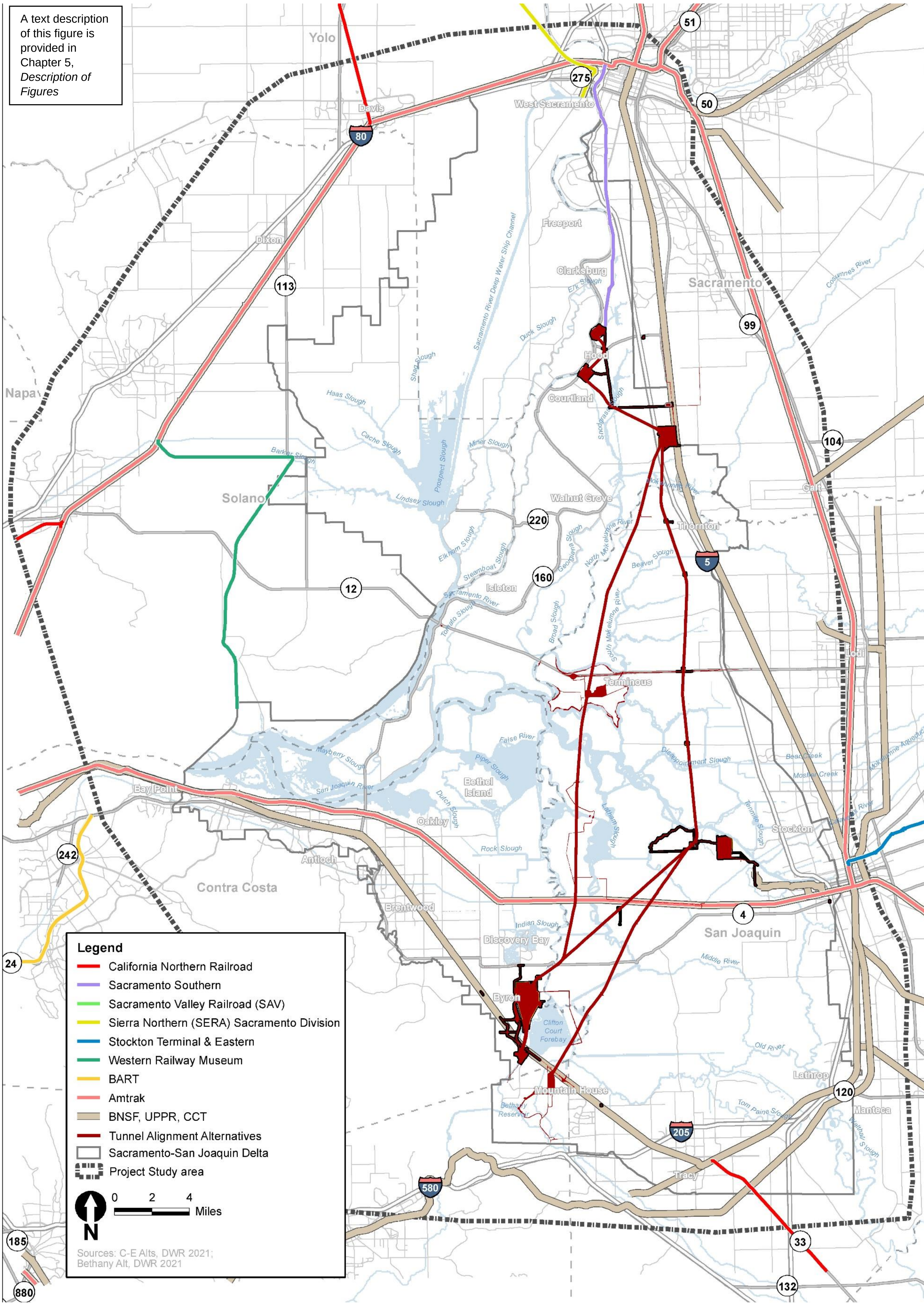


Figure 3.19-2. Railroad Facilities

3.19.2 Environmental Consequences

This section describes the affected environment for transportation and analyzes effects that could occur in the study area from construction, operation, and maintenance of the proposed action, as well as the No Action Alternative. Mitigation and minimization measures that would avoid, minimize, rectify, reduce, or compensate potentially adverse effects are included as part of each action alternative. Additional information on the affected environment, methods, and the anticipated effects of the proposed action can be found in Delta Conveyance Project Draft EIR Chapter 20, *Transportation*, and Appendix 20C, *Delta Conveyance 2040 Traffic Analysis* (California Department of Water Resources 2022). Potential disruptions to marine traffic and effects on navigation are discussed in Section 3.14.2.2, *Effects and Mitigation*.

3.19.2.1 Methods of Analysis—Roadways

This analysis provides an estimate of study area roadway segment congestion using level of service (LOS) performance measures. LOS is a qualitative measure of traffic operating conditions using a letter grade to represent the level of comfort and convenience associated with driving. In general, LOS A represents free-flow conditions with no congestion, and LOS F represents severe congestion and delay under stop-and-go conditions.

Traffic operations of roadway segments were analyzed using procedures and methodologies described in the *Highway Capacity Manual: A Guide for Multimodal Mobility Analysis* (Transportation Research Board 2016).

Roadway segment traffic data for the No Action Alternative conditions were developed using the following organizations' regional travel demand models.

- Sacramento Council of Governments (SACOG)
- San Joaquin Council of Governments (SJCOG)
- Alameda County Transportation Commission (ACTC)
- Contra Costa Transportation Authority (CCTA)

Traffic operations analysis was conducted to determine the weekday hourly LOS for the No Action Alternative conditions for the hours between 6:00 a.m. and 7:00 p.m. in the study area. Traffic volume estimates for the No Action Alternative conditions were developed by increasing existing 2020 condition traffic volumes to reflect projected traffic volumes on the 120 selected roadway segments for the No Action Alternative conditions.

For this assessment, the No Action Alternative condition LOS analysis results were compared to public agency LOS thresholds identified in traffic impact study guidelines, general plans, or equivalent plans. For Caltrans facilities, the LOS threshold used for analysis was consistent with the "concept facility LOS" described in Caltrans Transportation Concept Reports and Corridor System Management Plans. Caltrans' *Guide for the Preparation of Traffic Impact Studies* (California Department of Transportation 2002) states that, when a state facility currently operates at an unacceptable LOS (e.g., LOS F), the existing measure of effectiveness should be maintained.

For each of these study segments, the highest traffic volume that would occur during the construction period was analyzed for each action alternative compared to future 2040 conditions to determine if the maximum project-related traffic on each roadway would exceed adopted LOS transportation policies. Exceeding the LOS policy for the single construction day when the highest traffic volumes on a specific roadway does not equate to having the maximum project-related traffic using the affected roadway over the entire construction period.

3.19.2.2 Methods of Analysis—Intersections

Study area intersections were analyzed using procedures and methodologies contained in the *Highway Capacity Manual* (Transportation Research Board 2016). These methodologies were applied using traffic analysis software that considers traffic volumes, lane configurations, intersection control, and other parameters of intersection operations. Study area intersections were analyzed using the LOS methodology described above for roadways. For signalized intersections, roundabouts, and all-way stop control intersections, LOS is based on the average delay experienced by all vehicles passing through the intersection. For side street stop-controlled intersections, the delay and LOS for the overall intersection is reported along with the delay for the worst-case movement.

Intersection turning movement data for the No Action Alternative conditions were developed using SACOG, SJCOG, ACTC, and CCTA regional travel demand models. Traffic operations analysis was conducted for the No Action Alternative weekday morning and afternoon peak-hour conditions. Traffic volume estimates for the No Action Alternative conditions were developed by adjusting 2020 volumes based on projected growth at the 44 study intersections during weekday morning and afternoon peak-hour conditions.

Baseline condition LOS results were compared to public agency LOS thresholds identified in traffic impact study guidelines, general plans, or equivalent plans. For Caltrans facilities, the LOS threshold used for analysis was consistent with the "concept facility LOS" described in relevant Transportation Concept Reports and Corridor System Management Plans.

Caltrans' *Guide for the Preparation of Traffic Impact Studies* (California Department of Transportation 2002) states that, when a state facility currently operates at an unacceptable LOS (e.g., LOS F), the existing measure of effectiveness should be maintained.

3.19.2.3 Analysis Criteria

The construction traffic effect LOS criteria outlined below are based on applicable policies of the public agencies whose roadways are likely to be affected by construction traffic in the study area. The criteria address potential effects on traffic operations on roadways and intersections.

- Alameda County roadways
  - Cause traffic operations to deteriorate roadways from LOS D (or better) to LOS E (or worse) or exacerbate LOS E (or worse) conditions.
- City of Brentwood roadways
  - Cause traffic operations to deteriorate roadways from LOS D (or better) to LOS E (or worse) or exacerbate LOS E (or worse) conditions.
- Contra Costa County roadways and intersections
  - Cause traffic operations to deteriorate roadways or intersections from LOS D (or better) to LOS E (or worse) or exacerbate LOS E (or worse) conditions

- Caltrans roadways and intersections
  - Cause traffic operations to deteriorate freeways or highways from LOS B to LOS C (or worse) along State Route (SR) 84 between the West Sacramento city limits and Courtland Road.
  - Cause traffic operations to deteriorate freeways or highways from LOS C (or better) to LOS D (or worse) or exacerbate a LOS condition worse than LOS C (on I-5 between Twin Cities Road and Eight Mile Road, I-205 between I-580 and 11th Street, SR 4 between Discovery Bay Boulevard and Tracy Boulevard, SR 84 between Courtland Road and Cache Slough Ferry, SR 12 between Walters Road/Lawler Ranch Parkway and I-5, SR 113 between SR 12 and I-80, SR 12 between I-80 and Walters Road/Lawler Ranch Parkway, I-80 between Suisun Valley Road and SR 12, I-80 between SR 113 and Pedrick Road, I-5 between Eight Mile Road and 8th Street).
  - Cause traffic operations to deteriorate freeways or highways from LOS D (or better) to LOS E (or worse) or exacerbate a LOS condition worse than LOS D (I-205 between Grant Line Road and MacArthur Drive, SR 4 between SR 160 and Discovery Bay Boulevard, SR 4 between Tracy Boulevard and I-5).
  - Cause traffic operations to deteriorate freeways or highways from LOS E (or better) to LOS F (or worse) or exacerbate a LOS condition worse than LOS F (SR 160 between Sacramento City limits and SR 12).
  - Cause traffic operations to exacerbate a freeways or highways condition of LOS F (I-5 between Florin Road and Twin Cities Road, SR 160 between Brannan Island Road and SR 12).
  - Cause traffic operations to deteriorate intersections from LOS D (or better) to LOS E (or worse) or exacerbate LOS E (or worse) conditions.
- City of Oakley roadways
  - Cause traffic operations to deteriorate roadways from LOS D (or better) to LOS E (or worse) or exacerbate LOS E (or worse) conditions.
- City of Sacramento roadways and intersections
  - Cause traffic operations to deteriorate roadways or intersections from LOS D (or better) to LOS E (or worse) or exacerbate LOS E (or worse) conditions.
- Sacramento County roadways
  - Cause traffic operations to deteriorate roadways from LOS D (or better) to LOS E (or worse) or exacerbate LOS E (or worse) conditions.
  - Cause traffic operations to deteriorate on an urban roadway segment from LOS E (or better) to LOS F or exacerbate LOS F conditions.
- San Joaquin County roadways and intersections
  - Cause traffic operations to deteriorate roadways or intersections from LOS C (or better) to LOS D (or worse) or exacerbate LOS D (or worse) conditions.
- City of Stockton roadways and intersections

- Cause traffic operations to deteriorate roadways from LOS E (or better) to LOS F or exacerbate LOS F conditions.
- Cause traffic operations to deteriorate intersections from LOS D (or better) to LOS E or F or exacerbate LOS E or F conditions.

- City of Tracy roadways
  - Cause traffic operations to deteriorate roadways from LOS D (or better) to LOS E (or worse) or exacerbate LOS E (or worse) conditions.
- City of West Sacramento roadways
  - Cause traffic operations to deteriorate roadways from LOS C (or better) to LOS D (or worse) or exacerbate LOS D (or worse) conditions (Jefferson Boulevard and Industrial Boulevard/Lake Washington Boulevard).
  - Cause traffic operations to deteriorate roadways from LOS D (or better) to LOS E (or worse) or exacerbate LOS E (or worse) conditions (Harbor Boulevard).
- Yolo County roadways and intersections
  - Cause traffic operations to deteriorate roadways or intersections from LOS C (or better) to LOS D (or worse) or exacerbate LOS D (or worse) conditions.

3.19.2.4 No Action Alternative

Table 3.19-1 summarizes the 2040 No Action Alternative LOS for the 120 selected study roadway segments. A total of 40 roadway segments (i.e., 33.3% of the 120 segments) exceed the applicable LOS threshold for at least 1 hour during the 6:00 a.m. to 7:00 p.m. analysis period.

1 **Table 3.19-1. 2040 No Action Alternative Roadway Level of Service**

ID[a]	Segment	From	To	LOS Threshold	LOS Hourly Volume Threshold	Cumulative 2040 No Action Alternative Conditions: Hourly Volume Range (6 a.m. to 7 p.m.)	Cumulative 2040 No Action Alternative Conditions: Hours Operating Worse Than LOS Threshold
ALA 01	Byron Highway	Contra Costa Co/ Alameda Co Line	Alameda Co/ San Joaquin Co Line	D	1,600	470–820	–
BRE 01	Brentwood Blvd (old SR 4)[a]	Delta Road (Oakley City Limits)	Balfour Road	D	1,760	720–1,900	**2 (7 a.m.–8 a.m.) (5 p.m.–6 p.m.)**
BRE 02	Brentwood Blvd (old SR 4)[a]	Balfour Road	Brentwood City Limits (South)	C	1,920	460–1,250	–
CC 01	Old SR 4[a]	Brentwood City Limits (South)	Marsh Creek Road	D	1,600	1,380–2,060	**4 (6 a.m.–8 a.m.) (4 p.m.–6 p.m.)**
CC 02	Byron Highway	Delta Road	Camino Diablo	D	1,600	950–1,430	–
CC 03	Byron Highway	Camino Diablo	Clifton Court Road	D	1,600	980–1,470	–
CC 04	Byron Highway	Clifton Court Road	Contra Costa Co/ Alameda Co Line (Herdlyn Road)	D	1,600	1,120–1,680	**2 (4 p.m.–6 p.m.)**
CT 01	I-5 Northbound	Florin Road	Pocket Road	F	6,060	3,280–6,790	**2 (6 a.m.–8 a.m.)**
CT 02	I-5 Southbound	Florin Road	Pocket Road	F	6,060	2,070–6,790	**2 (4 p.m.–6 p.m.)**
CT 03	I-5 Northbound	Pocket Road	Laguna Blvd	F	6,060	2,880–6,210	**2 (6 a.m.–8 a.m.)**
CT 04	I-5 Southbound	Pocket Road	Laguna Blvd	F	6,060	2,070–6,790	**2 (4 p.m.–6 p.m.)**
CT 05	I-5 Northbound	Cosumnes River Blvd	Laguna Blvd	F	6,060	2,760–6,100	**2 (6 a.m.–8 a.m.)**
CT 06	I-5 Southbound	Cosumnes River Blvd	Laguna Blvd	F	6,060	1,960–6,100	**2 (4 p.m.–6 p.m.)**
CT 07	I-5 Northbound	Laguna Blvd	Elk Grove Blvd	F	4,010	2,300–4,030	**1 (7 a.m.–8 a.m.)**

ID[a]	Segment	From	To	LOS Threshold	LOS Hourly Volume Threshold	Cumulative 2040 No Action Alternative Conditions: Hourly Volume Range (6 a.m. to 7 p.m.)	Cumulative 2040 No Action Alternative Conditions: Hours Operating Worse Than LOS Threshold
CT 08	I-5 Southbound	Laguna Blvd	Elk Grove Blvd	F	4,010	1,610–4,030	**1 (5 p.m.–6 p.m.)**
CT 09	I-5 Northbound	Elk Grove Blvd	Hood Franklin Road	F	4,010	1,960–2,880	–
CT 10	I-5 Southbound	Elk Grove Blvd	Hood Franklin Road	F	4,010	1,840–2,760	–
CT 11	I-5 Northbound	Hood Franklin Road	Twin Cities Road	F	4,010	1,730–2,300	–
CT 12	I-5 Southbound	Hood Franklin Road	Twin Cities Road	F	4,010	1,610–2,300	–
CT 13	I-5 Northbound	Twin Cities Road	Walnut Grove Road	C	2,880	1,610–2,190	–
CT 14	I-5 Southbound	Twin Cities Road	Walnut Grove Road	C	2,880	1,500–2,190	–
CT 15	SR 160 (Freeport Blvd)	Sacramento City Limits	Cosumnes River Blvd	E	1,740	270–660	–
CT 16	SR 160 (Freeport Blvd)	Cosumnes River Blvd	Freeport Bridge	E	1,740	240–790	–
CT 17	SR 160 (Freeport Blvd/ River Road)	Freeport Bridge	Scribner Road	E	1,740	200–290	–
CT 18	SR 160 (River Road)	Scribner Road	Hood Franklin Road	E	1,740	70–200	–
CT 19	SR 160 (River Road)	Hood Franklin Road	Lambert Road	E	1,740	160–270	–
CT 20	SR 160 (River Road)	Lambert Road	Paintersville Bridge	E	1,740	110–200	–
CT 21	SR 160 (River Road)	Paintersville Bridge	Twin Cities Road	E	1,740	80–160	–
CT 22	SR 160 (River Road)	Twin Cities Road	Walnut Grove-Thornton Road	E	1,740	70–150	–
CT 23	SR 160 (Paintersville Bridge)	Sutter Slough Bridge Road	SR 160 (River Road)	E	1,740	110–200	–
CT 24	SR 160	Paintersville Bridge	Walnut Grove Bridge	E	1,740	110–200	–
CT 25	SR 160 (River Road)	Walnut Grove Bridge	A Street (Isleton)	E	1,740	240–730	–

ID[a]	Segment	From	To	LOS Threshold	LOS Hourly Volume Threshold	Cumulative 2040 No Action Alternative Conditions	
						Hourly Volume Range (6 a.m. to 7 p.m.)	Hours Operating Worse Than LOS Threshold
CT 26	SR 160	A Street (Isleton)	SR 12	E	1,740	290–590	–
CT 27	SR 160	SR 12	Brannan Island Road	F	1,740	670–1,110	–
CT 28	SR 160	Brannan Island Road	Three Mile Slough Bridge	F	1,740	690–1,140	–
CT 29	SR 160	Three Mile Slough Bridge	Antioch Bridge	F	1,740	740–1,230	–
CT 30	SR 160	Antioch Bridge	SR 4	F	1,740	1,110–1,600	–
CT 31	SR 84 (Jefferson Blvd)	West Sacramento City Limits	Gregory Avenue (South River Road)	D	1,410	870–1,450	**1 (5 p.m.–6 p.m.)**
CT 32	SR 84 (Jefferson Blvd)	Gregory Avenue (South River Road)	Clarksburg Road	D	1,410	1.110–1,600	**2 (7 a.m.–8 a.m.) (5 p.m.–6 p.m.)**
CT 33	SR 84 (Jefferson Blvd)	Clarksburg Road	Courtland Road	D	1,410	130–500	–
CT 34	SR 84 (Courtland Road/Ryer Avenue)	Courtland Road	Minor Slough	C	680	50–190	–
CT 35	SR 84 (Courtland Road/Ryer Avenue)	Minor Slough	Cache Slough Ferry	C	680	40–150	–
CT 36	SR 84 (Courtland Road/Ryer Avenue)	Cache Slough Ferry	Ryer Island Ferry	C	680	30–140	–
CT 37	SR 84 (Courtland Road/Ryer Avenue)	Ryer Island Ferry	SR 12	C	680	30–190	–
CT 38	I-80 Eastbound	Suisun Valley Road	SR 12	D	10,160	3,680–10,580	**2 (6 a.m.–8 a.m.)**
CT 39	I-80 Westbound	Suisun Valley Road	SR 12	D	10,160	3,680–10,580	**2 (4 p.m.–6 p.m.)**
CT 40	SR 12	Sunset Avenue/ Grizzly Island Road	Walters Road/ Lawler Ranch Parkway	C	5,060	1,840–3,340	–
CT 41	SR 12	Walters Road/Lawler Ranch Parkway	SR 113	C	790	1,270–2,070	**13 (6 a.m.–7 p.m.)**
CT 42	SR 12	SR 113	SR 84 (River Road)	C	790	1,380–1,960	**13 (6 a.m.–7 p.m.)**

IDa	Segment	From	To	LOS Threshold	LOS Hourly Volume Threshold	Cumulative 2040 No Action Alternative Conditions	
						Hourly Volume Range (6 a.m. to 7 p.m.)	Hours Operating Worse Than LOS Threshold
CT 43	SR 12 (Rio Vista Bridge)	SR 84 (River Road)	SR 160 (River Road)	C	970	1,380–1,960	**13 (6 a.m.–7 p.m.)**
CT 44	SR 12	SR 160 (River Road)	Sacramento Co/ San Joaquin Co Line	C	790	800–1,270	**13 (6 a.m.–7 p.m.)**
CT 45	SR 12	Sacramento Co/ San Joaquin Co Line	Terminous Drive	C	790	810–1330	**13 (6 a.m.–7 p.m.)**
CT 46	SR 12	Terminous Drive	I-5	C	790	920–1,380	**13 (6 a.m.–7 p.m.)**
CT 47	I-80 Eastbound	SR 113	Pedrick Road	C	4,400	2,890–5,330	**3 (3 p.m.–7 p.m.)**
CT 48	I-80 Westbound	SR 113	Pedrick Road	C	4,400	3,570–4,600	**2 (6 a.m.–8 a.m.)**
CT 49	SR 113	I-80	Dixon City Limits	C	1,920	740–1,590	–
CT 50	SR 113	Dixon City Limits	SR 12	C	680	230–460	–
CT 51	SR 4 (Marsh Creek Road)	Vasco Road	Byron Highway (Old SR 4)	D	1,600	580–920	–
CT 52	SR 4	Marsh Creek Road	Discovery Bay Blvd	D	1,600	640–1,410	–
CT 53	SR 4	Discovery Bay Blvd	Tracy Blvd	C	790	580–1,150	**4 (6 a.m.–8 a.m.) (4 p.m.–6 p.m.)**
CT 54	SR 4 (Charter Way)	Tracy Blvd	Middle River Bridge	C	790	460–1,130	**4 (6 a.m.–8 a.m.) (4 p.m.–6 p.m.)**
CT 55	SR 4 (Charter Way)	Middle River Bridge	Roberts Road	C	790	410–1,100	**4 (6 a.m.–8 a.m.) (4 p.m.–6 p.m.)**
CT 56	SR 4 (Charter Way)	Roberts Road	I-5	D	1,410	1,150–2,070	**4 (6 a.m.–8 a.m.) (4 p.m.–6 p.m.)**
CT 57	I-5 Northbound	SR 4 (Freeway)	SR 4 (Charter Way)	D	7,280	3,220–5,750	–
CT 58	I-5 Southbound	SR 4 (Freeway)	SR 4 (Charter Way)	D	7,280	5,520–6,900	–

ID[a]	Segment	From	To	LOS Threshold	LOS Hourly Volume Threshold	Cumulative 2040 No Action Alternative Conditions: Hourly Volume Range (6 a.m. to 7 p.m.)	Cumulative 2040 No Action Alternative Conditions: Hours Operating Worse Than LOS Threshold
CT 59	I-5 Northbound	SR 4 (Charter Way)	8th Street	D	5,410	3,220–6,670	**6 (6 a.m.–9 a.m.) (4 p.m.–9 p.m.)**
CT 60	I-5 Southbound	SR 4 (Charter Way)	8th Street	D	5,410	5,180–7,020	**6 (6 a.m.–9 a.m.) (4 p.m.–9 p.m.)**
CT 61	I-205 Eastbound	I-580	Mountain House Parkway	C	4,400	2,300–6,330	**5 (2 p.m.–7 p.m.)**
CT 62	I-205 Westbound	I-580	Mountain House Parkway	C	4,400	2,300–5,980	**5 (5 a.m.–10 a.m.)**
CT 63	I-205 Eastbound	Mountain House Parkway	11th Street	C	4,400	2,070–5,980	**5 (2 p.m.–7 p.m.)**
CT 64	I-205 Westbound	Mountain House Parkway	11th Street	C	4,400	2,300–5,980	**5 (5 a.m.–10 a.m.)**
CT 65	I-205 Eastbound	Grant Line Road	Tracy Blvd	C	4,400	2,070–5,980	**5 (2 p.m.–7 p.m.)**
CT 66	I-205 Westbound	Grant Line Road	Tracy Blvd	C	4,400	2,300–5,980	**5 (5 a.m.–10 a.m.)**
OAK 01	Main Street (old SR 4)[a]	SR 160	Cypress Road	C	1,920	990–2,100	**1 (5 p.m.–6 p.m.)**
OAK 02	Main Street (old SR 4)[a]	Cypress Road	Delta Road (Oakley City Limits)	D	1,760	1,050–1,840	**1 (5 p.m.–6 p.m.)**
SAC 01	Pocket Road	I-5	Freeport Blvd (Old SR 160)	D	3,540	1,230–2,710	–
SAC 02	Freeport Blvd (old SR 160)	Pocket Road	Sacramento City Limits	D	1,760	370–740	–
SAC 03	Cosumnes River Blvd	Freeport Blvd	I-5	D	1,760	250–620	–
SC 01	Freeport Bridge	River Road	SR 160 (Freeport Blvd)	D	1,410	130-460	–
SC 02	Hood Franklin Road	SR 160 (River Road)	6th Street	D	1,410	110–180	–
SC 03	Hood Franklin Road	6th Street	Stone Lakes	D	1,410	110–180	–
SC 04	Hood Franklin Road	Stone Lakes	I-5	D	1,410	110–180	–

IDa	Segment	From	To	LOS Threshold	LOS Hourly Volume Threshold	Cumulative 2040 No Action Alternative Conditions: Hourly Volume Range (6 a.m. to 7 p.m.)	Cumulative 2040 No Action Alternative Conditions: Hours Operating Worse Than LOS Threshold
SC 05	Lambert Road	SR 160 (River Road)	Herzog Road	D	1,410	20–40	–
SC 06	Lambert Road	Herzog Road	Franklin Blvd	D	1,410	30–50	–
SC 07	Franklin Blvd	Lambert Road	Twin Cities Road	D	1,410	60–100	–
SC 08	Twin Cities Road	River Road	I-5	D	1,410	180–330	–
SC 09	Twin Cities Road	I-5	Franklin Blvd	D	1,410	190–420	–
SC 10	Sutter Slough Bridge Road	Sacramento Co/Yolo Co Line	Paintersville Bridge	D	1,410	70–150	–
SC 11	River Road (Sacramento Co)	Paintersville Bridge	Twin Cities Road	D	1,410	120–180	–
SC 12	River Road (Sacramento Co)	Twin Cities Road	Walnut Grove Bridge	D	1,600	300–480	–
SC 13	Walnut Grove Road/ River Road	Walnut Grove Bridge	Sacramento Co/ San Joaquin Co Line	D	1,410	230–440	–
SC 14	Isleton Road	River Road (Walnut Grove)/Isleton Road Bridge	1.5 miles west of Isleton Road Bridge	D	1,410	80–380	–
SC 15	Race Track Road/ Tyler Island Road	Walnut Grove Road	Southern End of Tyler Island	D	1,410	30–50	–
SC 16	Tyler Island Road	Southern End of Tyler Island	SR 160 (River Road)	D	1,410	20–60	–
SC 17	Jackson Slough Road	Isleton City Limits	SR 12	D	1,410	10–70	–
SC 18	Jackson Slough Road	Brannan Island Road	SR 12	D	1,410	30–70	–
SJ 01	Walnut Grove Road	Sacramento Co/San Joaquin Co Line	I-5	C	790	190–310	–
SJ 02	Peltier Road	Blossom Road	I-5	C	680	20–40	–
SJ 03	Tracy Blvd	SR 4	Clifton Court Road	C	790	150–280	–
SJ 04	Tracy Blvd	Clifton Court Road	Tracy City Limits	C	790	100–230	–
SJ 05	Byron Hwy	Alameda Co/ San Joaquin Co Line	Mountain House Parkway	D	1,600	690–1,080	–
SJ 06	Mountain House Parkway	Byron Highway	Arnaudo Blvd	D	1,410	250–400	–

ID[a]	Segment	From	To	LOS Threshold	LOS Hourly Volume Threshold	Cumulative 2040 No Action Alternative Conditions: Hourly Volume Range (6 a.m. to 7 p.m.)	Cumulative 2040 No Action Alternative Conditions: Hours Operating Worse Than LOS Threshold
SJ 07	Mountain House Parkway	Arnaudo Blvd	I-205	D	3,540	550–1,010	–
ST 01	Port of Stockton Expressway	SR 4	Navy Drive	E	1,870	410–1,010	–
ST 02	Fresno Avenue	SR 4	Navy Drive	D	1,760	270–790	–
ST 03	Navy Drive	SR 4	Navy Drive	D	1,760	400–790	–
ST 04	Stockton Street	SR 4	8th Street	D	1,760	270–920	–
ST 05	8th Street	Fresno Avenue	Stockton Street	D	1,760	400–1,050	–
ST 06	8th Street	Stockton Street	I-5	D	1,760	400–1,180	–
ST 07	Roberts Road	SR 4	Howard Road	D	1,760	270–530	–
TRA 01	Tracy Blvd	Tracy City Limits	I-205	D	1,760	400–1,050	–
WS 01	Harbor Blvd	Industrial Blvd	US 50	D	3,540	1,680–3,500	**2 (4 p.m.–6 p.m.)**
WS 02	Industrial Blvd/Lake Washington Blvd	Harbor Blvd	Jefferson Blvd (Old SR 84)	C	1,920	1,180–2,700	**4 (7 a.m.–9 a.m.) (4 p.m.–6 p.m.)**
WS 03	Jefferson Blvd (old SR 84)	Lake Washington Blvd	Southport Parkway	C	1,920	790–2,490	**4 (7 a.m.–9 a.m.) (4 p.m.–6 p.m.)**
WS 04	Jefferson Blvd (old SR 84)	Southport Parkway	West Sacramento City Limits	C	680	70–280	–
YOL 01	River Road (Yolo Co)	Freeport Bridge	Courtland Road	C	680	120–420	–
YOL 02	River Road (Yolo Co)	Courtland Road	Sacramento Co/ Yolo Co Line	C	680	50–140	–
YOL 03	Courtland Road	SR 84 (Jefferson Blvd)	River Road	C	680	50–130	–

Source: Transportation Research Board 2016.
Blvd. = Boulevard; Co. = county; EB = eastbound; I- = Interstate; LOS = level of service; NB = northbound; SB = southbound; SR = State Route; WB = westbound.
[a] Segment IDs correspond to the segment IDs mapped on Figure 20A-1 of the Delta Conveyance Project EIR.

Table 3.19-2 summarizes the No Action Alternative LOS for the 44 selected study intersections. Eight intersections (i.e., 18% of the 44 intersections) exceed the applicable LOS threshold for at least 1 hour during the morning or afternoon peak hours.

Table 3.19-2. 2040 No Action Alternative Intersection Level of Service

Intersection ID[a]	North/South Roadway	East/West Roadway	Intersection Control	AM Peak-Hour Delay (Seconds)/ LOS[b]	PM Peak-Hour Delay (Seconds)/LOS[b]
AC 01	Grant Line Road	Eastbound I-205 On/Off-Ramps	Side-Street Stop Control	9/A	19/C
AC 02	Grant Line Road	Westbound I-205 On/Off-Ramps	Side-Street Stop Control	**45/E**	14/B
CC 01	Byron Highway	SR 4	Signal	45/D	**60/E**
CC 02	Discovery Bay Blvd	SR 4	Signal	43/D	**70/E**
CC 03	Byron Highway	Clifton Court Road	Side-Street Stop Control	18/C	28/D
CC 04	Byron Highway	Camino Diablo	Signal	32/C	37/D
CT 01	Southbound I-5 On/Off-Ramps	Hood Franklin Road	Side-Street Stop Control	10/B	10/B
CT 02	Northbound I-5 On/Off-Ramps	Hood Franklin Road	Side-Street Stop Control	10/B	10/B
CT 03	Southbound I-5 On/Off-Ramps	Twin Cities Road	Side-Street Stop Control	8/A	7/A
CT 04	Northbound I-5 On/Off-Ramps	Twin Cities Road	Side-Street Stop Control	8/A	7/A
CT 05	SR 160 (River Road)	Freeport Bridge (East)	Side-Street Stop Control	17/C	18/C
CT 06	SR 160 (River Road)	Hood Franklin Road	Side-Street Stop Control	18/C	22/C
CT 07	SR 160 (River Road)	Paintersville Bridge (East)	All-Way Stop Control	21/C	27/D
CT 08	SR 160 (River Road)	Walnut Grove Bridge (East)	All-Way Stop Control	22/C	26/D
CT 09	SR 160 (River Road)	Isleton Bridge (East)	Side-Street Stop Control	16/C	18/C
CT10	Eastbound I-205 On/Off-Ramps	Mountain House Parkway	Signal	51/D	17/B
CT11	Westbound I-205 On/Off-Ramps	Mountain House Parkway	Signal	**100/F**	15/B
SAC 01	Freeport Blvd	Cosumnes River Blvd	Signal	37/D	**59/E**
SAC 02	Franklin Boulevard	Lambert Road	All-Way Stop Control	25/D	28/D
SAC 03	Point Pleasant Road	Lambert Road	Side-Street Stop Control	9/A	10/B
SAC 04	Franklin Boulevard	Dierssen Road	Side-Street Stop Control	8/A	10/B
SAC 05	Franklin Boulevard	Twin Cities Road	All-Way Stop Control	18/C	22/C

Intersection ID[a]	North/South Roadway	East/West Roadway	Intersection Control	AM Peak-Hour Delay (Seconds)/ LOS[b]	PM Peak-Hour Delay (Seconds)/LOS[b]
SAC 06	Stone Lakes Reserve Driveway	Hood Franklin Road	Side-Street Stop Control	7/A	9/A
SAC 07	Stone Lakes Reserve Driveway	Lambert Road	Side-Street Stop Control	6/A	8/A
SAC 08[c]	Intake Haul Road	Hood-Franklin Road	Future Side Street Stop Control	N/A	N/A
SAC 09	SR 160 (River Road)	Walnut Grove Bridge (West)	All-Way Stop Control	21/B	26/D
SAC 10	SR 160 (River Road)	Isleton Bridge (West)	Side-Street Stop Control	15/B	12/B
SAC 11	River Road	Twin Cities Road	All-Way Stop Control	20/C	22/C
SJ 01	SR 12	Tower Park/Glasscock	Side-Street Stop Control	22/C	24/C
SJ 02	SR 12	Terminous Shaft Access Road	Side-Street Stop Control	6/A	5/A
SJ 03	SR 12	SR 160 – Rio Vista	Signal	28/C	29/C
SJ 04	SR 4	Tracy Blvd	Side-Street Stop Control	16/C	17/C
SJ 05	Mountain House Parkway	Byron Road	Signal	43/ D	**70/E**
SJ 06	Great Valley Parkway	Byron Road	Signal	32/D	50/D
SJ 07	Great Valley Parkway	Grantline Road	All-Way Stop Control	30/D	28/D
ST 01	Port of Stockton Expressway	SR 4	Signal	32/C	41/D
ST 02	Roberts Road	SR 4	Side-Street Stop Control	16/C	18/C
ST 03	Fresno Avenue	SR 4	Signal	36/D	**57/E**
ST 04	Navy Drive/ South Stockton Street	SR 4	Signal	38/D	**56/ E**
YOL 01	SR 84 (Jefferson Blvd)	Clarksburg Road	Side-Street Stop Control	22/C	24/C
YOL 02	South River Road	Clarksburg Road	Side-Street Stop Control	18/C	21/C
YOL 03	SR 84 (Jefferson Blvd)	Courtland Road	Side-Street Stop Control	20/C	20/C
YOL 04	South River Road	Courtland Road	Side-Street Stop Control	17/C	20/C
YOL 05	South River Road	Freeport Bridge	All-Way Stop Control	21/C	27/D

Source: Transportation Research Board 2016.

Blvd = Boulevard; Co. = county; LOS = level of service; SR = State Route.

[a] Intersection IDs correspond to the intersection IDs mapped on Figure 20A-2 of the Delta Conveyance Project EIR.

[b] LOS at signalized and unsignalized intersections is based on average delay for all vehicles.

[c] Intersection SAC 08 (Intake Haul Road/Hood-Franklin Road) does not currently exist. However, by 2040 the intersection would be constructed as part of the proposed action. The 2040 AM and PM Peak-Hour Delays (Seconds)/LOS for intersection SAC 08 are projected to be 22/C and 24/C, respectively (i.e., below applicable LOS thresholds).

Additionally, the No Action Alternative takes into account projects, plans, and programs that would be reasonably expected to occur in the foreseeable future if none of the action alternatives were approved and the proposed action's purpose and need were not met. Many of these projects, such as construction of desalination plants or water recycling facilities, would involve construction of facilities that would require ground-disturbing activities by individual public water agencies to ensure local water supply reliability for its constituents.

Desalination plants, water recycling facilities, groundwater management facilities and water efficiency projects would be constructed to supply water to the coastal and inland regions that would have received water through the Delta Conveyance Project. Multiple facilities would be built and would require the use of heavy equipment for construction of elements, such as pipelines, structures, access roads, and other related infrastructure.

The increase in vehicles on local roadways in the vicinity of water supply projects could have temporary effects on the local circulation system including roadways, transit, emergency access routes, and pedestrian facilities. The magnitude of a change would depend on the size and location of the water-supply facility being constructed. Most likely, facilities such as desalination plants or large-scale water recycling/treatment facilities would have the greatest effect because of their size and time required to complete construction compared to other water-supply actions such as groundwater recharge or conservation. Effects could be reduced or avoided by developing construction traffic management and travel demand management plans to reduce the reliance on single occupancy vehicles and increase employee carpooling and alternative travel modes (transit, bicycling and walking).

Operation and maintenance of new facilities would not create notable changes in the number of vehicles miles traveled or roadway conditions because of the limited personnel normally required to operate water facility infrastructure.

3.19.2.5 Effects and Mitigation

This section analyzes the LOS changes estimated for the action alternatives compared to the No Action Alternative. The following is a summary of the total vehicle trips estimated (employees and trucks delivering project materials) for each action alternative based on detailed schedule information provided by the applicant (Delta Conveyance Design and Construction Authority 2022a, 2022b).

- **Alternative 1.** Central alignment with a total of 8,579,254 vehicle trips generated over 3,935 days of construction, a median vehicle trip generation of 849 vehicle trips, and a maximum vehicle trip generation of 6,893 vehicle trips occurring on January 22, year 6 of construction.
- **Alternative 2b.** Central alignment with a total of 6,477,599 vehicle trips generated over 3,913 days of construction, a median vehicle trip generation of 691 vehicle trips, and a maximum vehicle trip generation of 5,010 vehicle trips occurring on January 29, year 4 of construction.
- **Alternative 3.** Eastern alignment with a total of 8,689,326 vehicle trips generated over 4,221 days of construction, a median vehicle trip generation of 837 vehicle trips, and a maximum vehicle trip generation of 7,013 vehicle trips occurring on January 22, year 6 of construction.

- **Alternative 4b.** Eastern alignment with a total of 6,471,689 vehicle trips generated over 3,856 days of construction, a median vehicle trip generation of 698 vehicle trips, and a maximum vehicle trip generation of 4,864 vehicle trips occurring on January 29, year 4 of construction.
- **DWR's Preferred Alternative**. Bethany alignment with a total of 8,339,654 vehicle trips generated over 3,903 days of construction, a median vehicle trip generation of 535 vehicle trips, and a maximum vehicle trip generation of 6,623 vehicle trips occurring on February 4, year 6 of construction.

This LOS analysis estimates the potential traffic effects associated with construction-related activities, employees, and equipment and recommends conditions of approval to avoid or reduce potential effects.

One of the key objectives of this evaluation is to provide sufficient information about the study area's traffic operations such that significant construction effects that exceed the LOS threshold can either be minimized or avoided. For the purposes of analyzing the potential effect of the action alternatives, the maximum project-related traffic volumes for each location were used in the roadway and intersection analyses.

The action alternatives would add varying amounts of traffic to roadway segments and intersections based on the location of the project feature and schedule developed by the Delta Conveyance Design and Construction Authority. In addition, the assessment is based on project construction not being completed by 2040.

Therefore, the assessment of conditions with the action alternatives analysis is an extremely conservative analysis approach because it evaluated the construction day when the highest construction generated traffic would use the roadway segment or intersection.

Roadway Segments

For each of the 120 roadway study segments, the maximum vehicle trips generated by each of the action alternatives were added to the 2040 No Action Alternative traffic volumes. The maximum construction traffic volume would occur on a different date (i.e., different days, months, and years) for each of the action alternatives. Similarly, traffic volumes would also vary on roadway segments over the entire construction period with the maximum volume occurring on a specific date or for a very short time period (1–2 weeks) when compared to the entire construction period for each of the action alternatives. The primary results are the following.

- Under No Action Alternative conditions, 40 of the 120 (i.e., 33%) roadway segments are projected to exceed LOS standards during at least one hour during the morning and evening commute periods (between 6:00 a.m. and 7:00 p.m.).
- Alternatives 2b and 4b would result in 42 of the 120 roadway segments exceeding LOS standards, an increase of 2 roadway segments when compared to the No Action Alternative.
- Alternative 1 and DWR's Preferred Alternative would result in 43 of the 120 roadway segments exceeding LOS standards, an increase of 3 roadway segments when compared to the No Action Alternative.
- Alternative 3 would result in 44 of the 120 roadway segments exceeding LOS standards, an increase of 4 roadway segments when compared to the No Action Alternative.

Intersections

For each of the 44 study intersections identified during the scoping and public information process, the maximum vehicle trips generated by each of the action alternatives was added to the 2040 No Action Alternative morning and afternoon peak-hour LOS analysis results. For reference, there are over 300 signalized and unsignalized intersections in the study area. The 44 study intersections were identified as those most likely to be affected by project-generated traffic (vehicles and material delivery trucks) during the construction of the project. Similar to the roadway analysis, the maximum construction traffic volume would occur on different dates (i.e., different days, months, and years) for different study intersections over the entire construction period.

Under the No Action Alternative and all action alternative conditions, eight of the 44 study intersections (i.e., 18%) are projected to exceed LOS standards during morning and/or afternoon peak hours. These include the following intersections.

- Grant Line Road/Westbound I-205 On-/Off-Ramps (AC 01)
- Byron Highway/SR 4 (CC 01)
- Discovery Bay Boulevard/SR 4 (CC 02)
- Westbound I-205 On-/Off-Ramps/Mountain House Parkway (CT 11)
- Freeport Boulevard/Cosumnes River Boulevard (SAC 01)
- Mountain House Parkway/Byron Road (SJ 05)
- Fresno Avenue/SR 4 (ST 03)
- Navy Drive-South Stockton Street/SR 4 (ST 04)

Impact TRANS-1: Increased Construction Vehicle Trips Resulting in Unacceptable Roadway Level of Service Conditions

No Action Alternative

Under No Action Alternative conditions, 40 roadway segments would exceed the acceptable LOS standards during at least one hour during the morning and evening commute periods (between 6:00 a.m. and 7:00 p.m.).

In general, traffic volumes on selected roadway segments are anticipated to increase over the construction period due to population increases in the region. Under the No Action Alternative, any currently underway or planned project in the study area that involves construction, operation, and maintenance activities may result in potential effects on transportation facilities from movement of personnel, delivery of construction equipment, and delivery of goods and services. The effects could include increased delays on already congested roadways.

Roadways currently experiencing congestion and delays would continue to experience LOS effects unless capacity enhancements are undertaken.

Activities associated with operations and maintenance of the existing SWP and CVP systems and facilities upstream of the Delta would continue, but there would be no changes attributable to the action alternatives that could affect transportation systems in these areas. Construction of wildlife habitat in Suisun Marsh or elsewhere would potentially create localized transportation effects and could affect access to farmland.

All Action Alternatives

Construction associated with the action alternatives would cause LOS thresholds to be exceeded for at least 1 hour during the 6:00 a.m. to 7:00 p.m. analysis period on a total of 43 (Alternative 1 and DWR's Preferred Alternative), 42 (Alternatives 2b and 4b), and 44 (Alternative 3) roadway segments. This is an increase of three, two, and four roadway segments, respectively, over that which is anticipated to occur under the No Action Alternative. Mitigation Measure TRANS-1: *Implement Site-Specific Construction Transportation Demand Management and Transportation Management Plan* would mitigate this effect.

This mitigation measure would reduce the severity of increased construction-related vehicle trips through development of TDM plans and TMPs that would minimize traffic, limit construction activities during commute hours, and would require consultation with affected state, regional, or local agencies to alleviate transportation-related issues.

Prior to construction, the applicant will require that provisions be included in contracts that construction contractors' crews and truck delivery schedules are coordinated to reduce total employee and truck trips during commute time periods through the use of park-and-ride lots and carpooling and vanpooling, and that the plans and specifications are being followed. Construction contractors would be responsible for developing the TDM plans and TMPs in consultation with the applicable transportation entities, including the following.

- Caltrans for state and federal roadway facilities.
- Local agencies for local roadway and intersection facilities (vehicles, pedestrians, and bicyclists).
- Transit providers.
- Commuter and freight rail operators.

The applicant would be responsible for verifying that the TDM plans and TMPs are implemented prior to beginning construction at each project feature. If necessary, to minimize unexpected operational and safety-related effects or delays during construction, the applicant would also be responsible for modifying the TDM plans and/or the TMPs to reduce potential effects identified by the applicable transportation entities identified above throughout the duration of the contract.

Because only two to four additional roadway segments (depending on alternative) would exceed LOS thresholds compared to the No Action Alternative, and because the applicant would require construction contractors to develop TDM plans and TMPs in consultation with the applicable transportation entities prior to beginning construction at each project feature, substantial LOS effects on the 120 study area roadway segments during construction are not anticipated.

Based on the information presented above, including the proposed mitigation measure, the potential for the action alternatives to increase construction vehicle trips resulting in unacceptable roadway LOS conditions does not appear to be significant.

Impact TRANS-2: Increased Construction Vehicle Trips Exacerbating Unacceptable Intersection Level of Service Conditions

No Action Alternative

Under No Action Alternative conditions, eight of the 44 study intersections, or 18% are projected to exceed LOS standards during morning and/or afternoon peak hours. The No Action Alternative condition and potential for effects on LOS conditions of intersections in the study area would be similar to that described under TRANS-1.

All Action Alternatives

Construction associated with the action alternatives would cause LOS thresholds to be exceeded during morning and afternoon peak hours at 8 of the 44 study intersections, or 18%, under all of the action alternatives. These are the same eight intersections expected to exceed LOS thresholds under the No Action Alternative. No additional intersections would exceed LOS thresholds under the action alternatives. Mitigation Measure TRANS-1: *Implement Site-Specific Construction Transportation Demand Management and Traffic Management Plan*, is recommended to reduce this effect.

The applicant would require that provisions be included in contracts that construction contractors' crews and schedules are coordinated to reduce employee and truck trips during commute time periods. The proposed action and action alternatives would also require development of site-specific TDM plans and TMPs that address the specific steps to be taken before, during, and after construction to minimize LOS-related effects as a result of construction employees driving single occupancy vehicles between the park-and-ride lots and construction sites.

Construction contractors would be responsible for developing the TDM plans and TMPs in consultation with the applicable transportation entities, including the following.

- Caltrans for state and federal roadway facilities.
- Local agencies for local roadway and intersection facilities (vehicles, pedestrians, and bicyclists).
- Commuter and freight rail operators.

The applicant would be responsible for verifying that the TDM plans and TMPs are implemented prior to beginning construction at each project feature. If necessary, to minimize unexpected operational and safety-related effects or delays during construction, the applicant would also be responsible for modifying the TDM plans and/or the TMPs to reduce potential effects identified by the applicable transportation entities identified above throughout the duration of the contract.

Because the eight intersections expected to exceed LOS thresholds under the No Action Alternative would also exceed LOS thresholds under the action alternatives, and because the applicant would require construction contractors to develop TDM plans and TMPs in consultation with the applicable transportation entities prior to beginning construction at each project feature, substantial additional LOS effects at the 44 study area intersections during construction are not anticipated.

Based on the information presented above, including the proposed mitigation measure, the potential for the action alternatives to result in unacceptable intersection LOS conditions from increased construction vehicle trips does not appear to be significant.

Impact TRANS-3: Conflict with a Program, Plan, Ordinance or Policy Addressing the Circulation System

No Action Alternative

Foreseeable transportation changes associated with the No Action Alternative in the study area could be incompatible with applicable transportation programs, plans, ordinances, or policies. Construction of large-scale projects could result in an increase in an exceedance of LOS on roadways and at intersections which would violate local programs, plans, ordinances, or policies. Depending on the project's location and other characteristics, habitat restoration, construction of facilities in the Delta, and urban development projects may result in incompatibilities.

All Action Alternatives

The action alternatives would result in effects on traffic and transportation systems as a result of the potential to add additional transit riders, construction traffic disrupting bicycle and pedestrian routes and adding additional vehicle miles traveled on delta roadways. Over the course of construction project generated employee traffic could disrupt existing services affecting existing vehicle, transit, bicycle and pedestrian routes. Mitigation Measure TRANS-1: *Implement Site-Specific Construction Transportation Demand Management and Traffic Management Plans*, would mitigate these effects by reducing additional vehicle miles traveled on delta roadways and intersections to the extent practicable. Potential effects on rail lines and service and marine traffic would be minimal because project construction would not markedly disrupt existing rail service or marine traffic based on estimates of construction changes that would occur under the alternatives.

Based on the information presented above, including the proposed mitigation measure, the potential for the action alternatives to conflict with a program, plan, ordinance, or policy addressing the circulation system does not appear to be significant.

Impact TRANS-4: Substantially Increase Hazards from a Geometric Design Feature (e.g., Sharp Curves or Dangerous Intersections) or Incompatible Uses (e.g., Farm Equipment)

No Action Alternative

Under the No Action Alternative, no construction-related effects would occur and existing operation and maintenance practices would continue. Projects and programs implemented under the No Action Alternative are not anticipated to involve geometric design features or incompatible uses which would substantially increase hazards.

All Action Alternatives

Constructing the action alternatives would not introduce new circulation system design features that would increase hazards from geometric design features. The major road improvements described would be designed to meet *2014 California Manual on Uniform Traffic Control Devices, Revision 6* (California Department of Transportation 2021a) and California Highway Design Manual (California Department of Transportation 2021b) uniform standards and specifications for the local and regional transportation systems. Geometric Approval Drawings (GADs) would be developed by the applicant for review, comment, refinement, and approval in consultation with the applicable transportation entities, including Caltrans for state and federal roadway and intersection (vehicles, pedestrians, and bicyclists) facilities; and local agencies for local roadway and intersection (vehicles, pedestrians, and bicyclists) facilities.

Project-related heavy construction traffic on local roadways during the construction period would increase the potential for safety hazards such as conflicts with commuter traffic, recreational vehicles, and seasonal farming operations. These effects would primarily occur on regional Caltrans freeways, Caltrans interchanges, local roadways, and local intersections serving the study area. The action alternatives incorporate considerable roadway, access road, and intersection improvements to reduce the potential for construction traffic safety hazards on haul routes and project feature site access roads. These improvements are expected to reduce, but not eliminate, some of the circulation system safety issues on haul roads and at construction sites by minimizing conflicts with commuter traffic, recreational vehicles, and seasonal farming operations.

Mitigation Measure TRANS-1: *Implement Site-Specific Construction Transportation Demand Management and Traffic Management Plans,* would mitigate this effect if the applicant implements all of the improvements prior to construction of the action alternatives.

Some mitigation measures would involve the use of heavy equipment such as graders, excavators, dozers, and haul trucks that would have the potential to increase the number of construction related vehicles on the road and traffic safety hazards. The mitigation measures with potential to result in increased hazards are: Mitigation Measures BIO-2c: *Electrical Power Line Support Placement*; AG-2: *Replacement or Relocation of Affected Infrastructure Supporting Agricultural Properties*; AES-1c: *Implement Best Management Practices to Implement Project Landscaping Plan;* CUL-1: *Prepare and Implement a Built-Environment Treatment Plan in Consultation with Interested Parties*; and AQ-9: *Develop and Implement a GHG Reduction Plan to Reduce Construction and Net CVP Operational Pumping Emissions to Net Zero*.

Temporary increased transportation hazards resulting from implementation of mitigation measures would be similar to construction effects of the action alternatives in certain construction areas and would contribute to increased transportation hazard effects of the action alternatives. An increase of construction workers and construction materials delivery traffic could create the potential for traffic hazards related to increasing the number of trucks and construction equipment operating with commuters, farming operations, and recreational users in areas adjacent to construction sites. Mitigation Measure TRANS-1: *Implement Site-Specific Construction Transportation Demand Management and Traffic Management Plans* would reduce roadway hazards.

Based on the information presented above, including the proposed mitigation measure, the potential for the action alternatives to substantially increase hazards from a geometric design feature or incompatible uses does not appear to be significant.

Impact TRANS-5: Result in Inadequate Emergency Access

No Action Alternative

Under the No Action Alternative, no construction-related effects would occur and existing operation and maintenance practices would continue. Construction of large-scale projects would potentially impede emergency access if roadways and intersections are overwhelmed with additional vehicles, slowing down emergency vehicle response time. However, the access to and egress from the future project construction sites are anticipated to be designed to meet local and regional emergency access requirements.

All Action Alternatives

Access to and egress from the action alternatives' construction sites would be designed to meet local and regional emergency access requirements. This would include procedures for construction area evacuation in the case of an emergency declared by county or other local authorities. In addition, provisions for providing a secondary access point for emergency response vehicles through agreements prior to construction would be included in the construction traffic management plan.

Per the Project Emergency Response Plan, on-site emergency response facilities/services would be provided at primary work sites during construction.

Based on the unique nature of many of the construction activities under the action alternatives, the construction contractor would provide the primary emergency response services. Therefore, temporary emergency response facilities, equipment, and trained personnel have been included in the plans for the main construction sites (the intakes, tunnel launch shaft sites, and the Bethany Complex), including helipads to evacuate injured persons at the tunnel launch shaft sites and intake sites. In addition to the primary response services provided by the contractor, it is planned that nearby local emergency response agencies provide this secondary backup emergency response services. Therefore, the action alternatives would not result in inadequate emergency access.

Emergency Vehicle Access Geometric Approval Drawings will be developed by the applicant for review, comment, refinement, and approval in consultation with the applicable city or county fire department.

Based on the information presented above, the potential for the action alternatives to result in inadequate emergency access does not appear to be significant.

3.19.2.6 Cumulative Analysis

The cumulative effects analysis for transportation addresses the potential for the alternatives to act in combination with future state and local projects or programs to create a cumulative effect on the regional and local transportation system. Table 3.19-3 lists a selection of the plans, policies, and programs included in the cumulative analysis that could result in effects on transportation.

Table 3.19-3. Plans, Policies, and Programs Included in the Cumulative Analysis

Program/ Project	Agency	Status	Description of Program/Project	Effects on Transportation
San Joaquin Council of Governments Regional Transportation Plan/Sustainable Communities Strategy	San Joaquin Council of Governments	Ongoing	Mainline Highway Improvement Projects Interchange Improvement Projects Regional Roadway improvement Projects Railroad Crossing Safety Improvement Projects Bus Transit Improvement Projects Rail Corridor Projects Public Airport- Aviation Projects Active Transportation and Community Enhancement Projects	Regional multimodal improvements to reduce congestion, improve travel time reliability, and reduce greenhouse gas emissions.
Sacramento Area Council of Governments Regional Transportation Plan/Sustainable Communities Strategy	Sacramento Area Council of Governments	Ongoing	Active Transportation Initiatives Smart Mobility Climate Adaptation Planning Regional Technology Plan Public Transportation Plan Airport Plan Sacramento Regional Blueprint	Implementation of a wide array of projects and programs to improve regional air quality, transportation, and land use planning.

Program/ Project	Agency	Status	Description of Program/Project	Effects on Transportation
Plan Bay Area 2040	Metropolitan Transportation Commission	Ongoing	Street, Roads and Arterials Program Freeway Improvement Program Transit Hubs Program Forward Commute Initiatives Traveler Services Active Transportation Program	A regional multimodal program that would support a growing economy, provide more transportation choices, and reduce pollution caused by transportation.

Construction of planned projects throughout the study area would have temporary, discrete effects such as traffic disruption resulting in delays to travelers and users of the transportation system, although these effects would not necessarily be significant from a regional perspective.

Construction of these projects could result in temporary effects on LOS because of increases in vehicle trips associated with movement of personnel, goods, and materials. Heavy construction equipment on local roadways could contribute to existing pavement deterioration. Conflicts with other users of the transportation roadway network, such as cyclists, transit services, or emergency service providers could occur. Temporary effects from construction include reducing LOS on some roadway segments, deteriorating the condition of roadway pavement, and increasing safety hazards. Mitigation Measure TRANS-1: *Implement Site-Specific Construction Transportation Demand Management and Traffic Management Plans,* would be available to reduce these effects, but the effect would remain.

Although it is difficult to determine when major infrastructure projects would be constructed, the cumulative effect may be significant if these projects occurred during the same time frame and location as the Delta Conveyance project because the magnitude of effects would be greater. If these projects occurred sequentially, the construction-related effects could be drawn out for an extended period. If one local area experiences several large construction projects simultaneously, there could be significant localized effects. The effects are relatively similar between the action alternatives and vary in location according to the type of conveyance.

Operations and maintenance would occur at locations of permanent facilities that are in the study area. Operations and maintenance of the action alternatives would require a small percentage of employees compared to project construction. Under all of the action alternatives, operations and maintenance of the project would not result in an exceedance of LOS and would only contribute incrementally to cumulative future conditions.

None of the alternatives would construct new public transportation facilities, demolish existing public transportation facilities, or add substantial traffic to transportation facilities during routine operation and maintenance. Operation and maintenance of the project would not result in the construction of new transportation systems or increases in capacity in existing transportation systems.

3.20 Public Services, Utilities, and Energy

This section describes the affected environment for public services, utilities, energy and analyzes the effects that could occur in the study area from construction, operation, and maintenance of the action alternatives, as well as the No Action Alternative. Mitigation measures that would avoid, minimize, rectify, reduce, or compensate potentially adverse effects are included as part of each action alternative. Additional information on the affected environment, methods, and the anticipated effects of the action alternatives can be found in Delta Conveyance Project Draft EIR Chapter 21, *Public Services and Utilities*, and Chapter 22, *Energy* (California Department of Water Resources 2022).

3.20.1 Affected Environment

This section describes public services and utilities in the study area (i.e., the area in which effects may occur) that could be affected by construction, operations, and maintenance of the action alternatives. This section also describes the existing energy resources available in the study area and analyzes the potential effects on these energy resources from construction and operation of the action alternatives.

Public services include law enforcement, fire protection, hospitals and medical services facilities, public schools, and libraries. Emergency response services are subsumed within the individual fire protection agencies. Utilities include solid waste management, water supply and treatment, wastewater treatment, energy (electricity and natural gas), and communications. Public services and utilities are provided throughout the study area by various entities including counties, cities, community services/special districts, and private companies. The study area evaluated for potential effects on public services and utilities includes the construction footprint and a 1-mile buffer zone around the construction footprint for most public service and utilities categories. The additional 1-mile buffer was included in the study area because services and utilities within 1 mile of the construction footprint could be affected by construction-related access within the respective service areas or experience a potential increase in service demand from construction activities or ongoing operation and maintenance of the action alternatives. Two exceptions to the 1-mile buffer were used for hospitals and solid waste facilities. A 5-mile buffer zone around the study area boundary was used for hospitals. Solid waste facilities were identified based on proximity to the study area because it is not known which solid waste facilities would be used for disposal. Energy includes diesel, gasoline, and electrical power supplies that would be needed during construction of the action alternatives and during long-term operations. The study area for the energy analysis includes construction areas of the action alternatives where energy would be consumed and regional energy sources that could be affected by the action alternatives' energy demand.

Delta Conveyance Project Draft EIR Chapter 21, *Public Services and Utilities,* Section 21.1, *Environmental Setting* (California Department of Water Resources 2022), includes a detailed description of the public services and utilities provided by local governments, community services/special districts, and private companies in the study area and the additional buffer zones described above. Delta Conveyance Project Draft EIR Chapter 22, *Energy,* Section 22.1, *Environmental Setting*, describes the existing energy resources available in the study area, including energy generated at the SWP and CVP hydropower facilities and energy supplied by other utilities and energy marketers under short-term purchase agreements.

3.20.2 Environmental Consequences

This section describes the assessment methods used to analyze potential environmental effects and identifies the direct, indirect, and cumulative effects on public services, utilities, and energy that would result from construction, operation, and maintenance of the action alternatives.

3.20.2.1 Methods for Analysis

Effects on public services and utilities would occur if construction, operation, and maintenance activities negatively affect the ability of service agencies to provide adequate services within the study area or require expansions or upgrades to public facilities or utility infrastructure that could result in adverse effects.

Analysts used the following methods to gather information for the study area and additional buffer zones.

- Collected and reviewed relevant GIS data to locate law enforcement and fire protection facilities, emergency services, hospitals, public school districts and schools, and libraries in the study area. GIS data were also used to identify solid waste facilities (e.g., landfills), water, wastewater, electric, and natural gas systems.
- Reviewed conveyance facility construction footprints and compensatory mitigation footprints against GIS information and the Project Emergency Response Plan Technical Memoranda from the C-E EPR and the Bethany EPR for police/sheriff stations, fire stations, hospitals, public schools and libraries, landfills, and water and wastewater facilities to identify potential direct and indirect conflicts with individual facilities.
- Determined utility crossings for each action alternative by selecting utility features in or partially within the alignment (aboveground and belowground footprints depending on utility type), construction footprint, and compensatory mitigation footprint. Utility features were identified from existing sets of utility data in ArcGIS or by visual inspection of aerial photography of the footprint areas. Utility datasets came from the California Energy Commission (2020), California Office of Emergency Services (2019), U.S. Energy Information Administration (2019), and U.S. Environmental Protection Agency (2019). C-E EPR Attachment G, *Summary of Utility Crossings Technical Memorandum,* and the Bethany EPR Summary of Utility Crossings Technical Memorandum were also reviewed for information on utility crossings and conflicts.
- Analyzed the alternatives, GIS data, and technical memoranda to determine if public services and utilities in the study area would permanently be affected by operation of the action alternatives, including conveyance-related activities and operations, facilities, and the compensatory mitigation through an increase in population demand or through effects on the circulation network or existing infrastructure.

Operations and maintenance activities associated with the action alternatives would be unlikely to create any notable effects on law enforcement services, fire protection services, hospitals and medical facilities, schools, or libraries. Operations and maintenance activities would also be unlikely to create any notable effects on solid waste facilities, water services, wastewater services, telecommunications, or natural gas supplies. The Delta Conveyance Project Draft EIR Chapter 22, *Energy*, Section 22.3.1, *Methods for Analysis* (California Department of Water Resources 2022), provides additional details on the assessment methods used to analyze potential environmental effects associated with public services and utilities during construction, operation, and maintenance of the action alternatives.

Electrical energy needs for construction were evaluated based on the estimated annual energy required for each action alternative. The construction-related energy demand is considered temporary (i.e., will cease once construction is complete). Construction of the water-conveyance facility would require use of electricity for lighting, tunnel ventilation, tunnel boring, earth removal from the tunnels, and other construction machinery.

Construction of the action alternatives would also consume gasoline and diesel fuels through operation of heavy-duty construction equipment and vehicles. Materials manufacturing would also consume energy, although information about the intensity and quantity of fuel used during manufacturing is currently unknown and is considered qualitatively. Accordingly, this analysis focuses on energy associated with physical construction of the water-conveyance facilities (i.e., fuels consumed by heavy-duty equipment and vehicles).

DCA developed project-specific construction assumptions (e.g., equipment operating hours) for each of the physical project components. Gasoline and diesel fuel consumption by onsite equipment vehicles was calculated by converting GHG emissions that were calculated during the air quality analysis (Delta Conveyance Project Draft EIR Chapter 23, *Air Quality and Greenhouse Gases* [California Department of Water Resources 2022]) using the rate of carbon dioxide (CO_2) emitted per gallon of combusted diesel fuel. Gasoline and diesel fuel consumption by offsite vehicles (e.g., employee commute vehicles) was calculated using the California Air Resources Board's (CARB's) EMFAC2017 model and available traffic data (i.e., annual miles traveled) (Delta Conveyance Project Draft EIR Chapter 20, *Transportation*).

Energy requirements during operations were analyzed for each action alternative using a variety of computer models and post-processing tools. Details about the model and processing tool computational methods are in Delta Conveyance Project Draft EIR Appendix 5A, *Modeling Technical Appendix* (California Department of Water Resources 2022).

No Action Alternative

Under the No Action Alternative, public services and utilities would generally continue to operate similarly to existing conditions. The applicant would continue to operate the SWP to divert, store, and convey SWP water consistent with applicable laws and contractual obligations. The CVP would also continue to operate. The No Action Alternative considers projects, plans, and programs that would be reasonably expected to occur in the foreseeable future if the action alternatives were not approved and the purpose and need were not met.

Water agencies participating in the Delta Conveyance Project have been grouped into four geographic areas: northern coastal, northern inland, southern coastal, southern inland. The water agencies within each geographic area would likely pursue a similar suite of water supply projects under the No Action Alternative. Public services (police and fire protection, schools, and libraries) and utilities (water and natural gas lines, electrical and fiber optic lines, solid waste facilities, etc.) are located throughout each of these four regions. Consequently, effects on public services and utilities would be similar within the four regions and they are discussed collectively.

As discussed in Chapter 4, *Other Statutory Requirements*, none of the action alternatives are expected to foster growth within the service areas of the participating water agencies. Because the water supply generated under the No Action Alternative would be no greater than the action alternatives, it also would not foster growth and not result in a change in the demand for local or regional public services. In general, water supply projects that have large footprints or require a long construction period may be more likely to disrupt public services. However, when being constructed, these projects are typically required to ensure construction activities do not affect the level of public services provided prior to construction commencing. The extent and complexity of meeting these requirements is typically commensurate with the size of the facility and the time needed to complete construction. Of the types of water supply projects considered in the No Action Alternative, the more likely projects such as desalination and water recycling would have a greater potential to temporarily disrupt the provision of public services than actions such implementing water conservation measures.

Construction of desalination projects, groundwater management projects, water recycling projects, and water use efficiency projects to meet water suppliers' needs would result in the short-term consumption of energy from construction of the facilities and would vary depending on the nature and duration of construction. With the possible exception of water use efficiency projects, long-term operational energy consumption from operations and maintenance of these facilities would be expected to increase; although, not to the extent that regional supplies would be notably affected. Most of the existing programs and projects comprising the No Action Alternative would require no or minor operations and maintenance activities or the use of mechanical equipment in the same manner as the proposed facilities and would, therefore, not result in wasteful or unnecessary consumption of energy resources or result in a marked net increase of energy consumption. Additionally, key programs such as the 2017 Climate Change Scoping Plan and California's Renewables Portfolio Standard includes goals and strategies to power the state with renewable energy sources, further increasing energy resiliency for these projects. Under the No Action Alternative if additional desalination plants are required to meet regional and local water supply demand, the energy requirements for water supply production could increase compared to existing conditions because of the relatively high energy demand required for these types of facilities.

3.20.2.2 Effects and Mitigation

Effects of the Alternatives on Public Services and Utilities

Impact UT-1: Result in Substantial Physical Impacts Associated with the Provision of, or the Need for, New or Physically Altered Governmental Facilities, the Construction of Which Could Cause Significant Environmental Impacts on Public Services Including Police Protection, Fire Protection, Public Schools, and Other Public Facilities (e.g., Libraries, Hospitals)

No Action Alternative

The projects considered under the No Action Alternative are not expected to foster growth; therefore, they would not result in a change in the demand for local or regional public services or result in the need for new or physically altered governmental facilities. Construction activities could result in additional traffic from equipment and hauling; however, minimization measures are available, such as a implementing a traffic management plan, that could reduce conflicts with emergency services.

All Action Alternatives

Construction of the water-conveyance facilities under all action alternatives could increase the demand for public services and utilities due to new construction workers populating the study area. Depending on the action alternative, an estimated 1,922 to 3,321 workers would be required during peak construction activity. While some construction workers could relocate to the study area, most are anticipated to already reside within the study area, are part of the existing labor force, and would not require relocation. Because there would be minimal, if any, increase in population that would require workers from elsewhere relocating to the study area, it is assumed that the construction workers and operations and maintenance workers associated with the action alternatives are already served by existing public services. Therefore, long-term effects on public services would be negligible, and there would be no need for additional police and fire protection services, hospitals, schools, or libraries.

Temporary effects on police and fire protection services are unlikely to occur as a result of increased demand associated with construction work areas and activities, such as protecting construction property or responding to potential construction-related accidents associated with hazardous materials spills, contamination, or fires. Most of the tunnel shafts would be located within 30 minutes travel time (without consideration of local traffic congestion) to an existing fire station. Based on the unique nature of much of the construction activities under the action alternatives, the primary emergency response services would be provided by the construction contractors. Therefore, temporary emergency response facilities, equipment, and trained personnel have been included in the plans for the main construction sites, including intakes, tunnel launch shaft sites, and the Southern Complex. Emergency response for the action alternatives includes emergency service buildings at major components that are equipped with an ambulance, rescue boat, full-time staff, a fire truck and accommodations for a full-time crew, and helipads for emergency evacuations. Fire water supplies would be stored on-site at each major water-conveyance feature. Having on-site emergency response throughout the alignments would reduce the need for existing police and fire protection to have to respond to incidents resulting from construction of the action alternatives.

Public services such as law enforcement, fire departments, and emergency response services may be affected by construction traffic, although there would be new roads constructed for accessibility purposes. Mitigation Measure TRANS-1a: *Implement Site-Specific Construction Transportation Demand Management Plan*, would reduce this effect by requiring specific transportation management actions at construction sites and actions to reduce traffic congestion.

Compensatory mitigation (on Bouldin Island and three ponds along I-5) and creation of tidal wetland and channel margin habitat in the North Delta Arc (Appendix C3, *Compensatory Mitigation Plan for Special-Status Species and Aquatic Resources)* would provide construction jobs for site preparation, material deliveries, earth moving, access improvements, and vegetation. These jobs would primarily be filled by local residents living in the five-county study area. Some population increase could occur, but it would constitute a very small increase in the total Delta region population. Any project-related effects on population are anticipated to be distributed throughout the five-county Delta region.

Based on the information presented above, including the proposed mitigation measure, the potential for the action alternatives to result in substantial physical effects associated with new or physically altered governmental facilities—the construction of which could cause significant environmental effects on public services— does not appear to be significant.

Impact UT-2: Require or Result in the Relocation or Construction of New or Expanded Service System Infrastructure, the Construction or Relocation of Which Could Cause Significant Environmental Impacts for Any Service Systems such as Water, Wastewater Treatment, Stormwater Drainage, Electric Power Facilities, Natural Gas Facilities, and Telecommunications Facilities

No Action Alternative

Projects under consideration in the study area could have effects on service systems. Construction of new infrastructure would involve grading, tunneling, boring, and other groundwork. These types of activities could result in the interruption or relocation of an existing utility such as water pipelines, overhead and underground electric, natural gas, and fiber optic lines. It is assumed that each of the projects implemented under the No Action Alternative would be required to undergo an environmental compliance process (i.e., pursuant to NEPA and/or CEQA), and it is assumed that these projects would comply with applicable laws and regulations related to utilities and would also coordinate with agencies during the design phase. These measures would reduce the potential to interrupt our relocate utility service systems.

All Action Alternatives

Construction of all action alternatives would involve using water for dust control, restrooms, tunneling operations, concrete mixing, emergency firefighting, and other uses. The action alternatives would minimize the use of groundwater and surface water to the extent feasible by maximizing the use of on-site water supplies, limiting surface water and groundwater use, and if possible, using recycled water to the maximum extent feasible based on legal and institutional constraints. Wastewater would not overload existing systems because the action alternatives entail construction of septic systems to handle wastewater. To reduce stormwater runoff effects, stormwater runoff on the construction sites at the intakes, tunnel shafts (under all action alternatives), Bethany Reservoir (DWR's Preferred Alternative), or the Southern Complex would be collected, treated, and stored on-site to reduce the need for off-site water sources. These facilities would also reduce peak stormwater runoff flows from the construction sites. During wet weather periods when the storage facilities are full, water would be discharged to adjacent drainages. Capacity analyses would be conducted to determine if the discharged flows would adversely affect use of adjacent drainage facilities by existing users. Because the action alternatives would construct their own stormwater collection and treatment facilities, and because the action alternatives would reuse stormwater to the extent feasible, it is not anticipated that any action alternative would result in effects on existing facilities. Environmental Commitment EC-4b: *Develop and Implement Stormwater Pollution Prevention Plans*, is included to ensure erosion and sediment control measures are in place during construction, as well as waste management measures and inspection and monitoring measures.

Construction sites under all action alternatives would require electric power for construction of the intakes and tunnel shafts, and the central and eastern alignments would require electric power for the Southern Complex. Power for construction would use existing power lines to the extent feasible, but some facilities would require new aboveground power poles with lines or underground conduits. New electrical power service would be required for the operation of all action alternatives. New aboveground transmission lines on existing poles would be needed from the Franklin Substation along Franklin Boulevard to Lambert Road and new underground transmission lines would be extended underground to the intakes and the Twin Cities Complex. Additional new aboveground high-voltage transmission lines would be needed to serve the Southern Complex. While existing power lines would be used to the extent feasible, some of the project components, such as widening roads, would require relocation of existing poles used for overhead power lines.

Construction of the action alternatives could also conflict with existing electric power lines, natural gas lines, and telecommunications lines if relocation or temporary service interruptions of existing facilities are required. The action alternatives could also result in environmental effects in and around areas temporarily or permanently affected by relocation activities. During the design phase, coordination with the appropriate owners and operators would occur to avoid interference or interruption of service.

Compensatory mitigation implemented on Bouldin Island, and at the sites of the I-5 Ponds 6, 7, and 8, and tidal wetland and channel margin habitat creation in the North Delta Arc (Appendix C3), would entail site preparation and staging areas, which could include construction trailers. On-site utilities would be either protected or relocated as needed in coordination with the affected utility.

Temporary irrigation would be installed for select plantings for the first several years of plant establishment. Improvements such as temporary pumps and piping may be installed. Some compensatory mitigation would be supplemented by surface water. Ongoing water management would be necessary to maintain habitat for certain species.

Various infrastructure modifications, such as protection, removal and/or relocation of existing utilities, pumping systems and other water management structures, would occur as needed, and stormwater would be detained on-site.

Based on the information presented above, the potential for the action alternatives to result in the relocation or construction of new or expanded service system infrastructure, which could cause significant environmental effects for any service systems, does not appear to be significant.

Impact UT-3: Exceed the Capacity of the Wastewater Treatment Provider(s) that Would Serve the Action Alternatives' Anticipated Demand in Addition to the Provider's Existing Commitments

No Action Alternative

The projects that are anticipated to occur under the No Action Alternative are unlikely to result in additional population growth that could require existing wastewater infrastructure or services. Construction of such projects would require wastewater services during the construction period; however, many projects would use portable restrooms or construct wastewater treatment systems on-site, or otherwise not affect existing wastewater treatment providers. Furthermore, new projects would undergo environmental review and be required to identify and assess any demand associated with wastewater generation and treatment. These projects would also be expected to comply with applicable laws and regulations related to wastewater treatment.

All Action Alternatives

Each action alternative would involve construction of wastewater treatment facilities (e.g., septic systems and leach fields) to treat wastewater during construction and plant operations. Because no wastewater would be generated by the action alternatives this impact does not appear to be significant.

Impact UT-4: Generate Solid Waste in Excess of Federal, State, or Local Standards, or Be in Excess of the Capacity of Local Infrastructure, or Otherwise Impair the Attainment of Solid Waste Reduction Goals

No Action Alternative

The projects under consideration in the study area (i.e., levee construction, improvements, and maintenance, and habitat restoration projects) could generate solid waste during construction. Waste would be transported to a local landfill, of which there are many throughout the region with sufficient capacity to accept such waste. These ongoing projects including construction and operations would also adhere to state and local waste-reduction goals related to recycling and waste diversion. Therefore, the No Action Alternative is not anticipated to generate solid waste in excess of federal, state, or local standards or exceed the capacity of an existing landfill.

All Action Alternatives

Construction of any one of the action alternatives would generate construction debris that could require disposal at a landfill. All excavated soil from intake sites would be reused on-site. Excavated soil from the construction of tunnel shafts, Southern Complex, or Bethany Complex would either be reused or stored on-site. Construction debris would be diverted from landfills to the maximum extent feasible at the time of demolition. Landfills that serve the study area have the capacity to handle the remaining waste generated by construction activities. Although it is not known specifically which landfills would be used during construction of the action alternatives, disposal of demolition and excavated material would be expected to occur at several different locations depending on the type of material and its origin.

Overall, the construction waste that could be generated by the action alternatives would not exceed the capacity of available landfills. The construction debris and excavated material that would require disposal at a landfill could be accommodated by the remaining permitted capacity of the landfills that serve the study area. Operations and maintenance under all action alternatives would require sediment removal from intake sites. This material would require disposal at a landfill could be accommodated by the remaining permitted capacity of the landfills that serve the study area.

Solid waste generated by the compensatory mitigation on Bouldin Island, in three ponds along I-5, and the creation of tidal wetland and channel margin habitat in the North Delta Arc (Appendix C3), are not anticipated to contribute to landfills to the extent of exceeding their capacity or in excess of state or local standards. The compensatory mitigation generally entails habitat creation on existing agricultural lands and would not entail substantial demolition that would require disposal at a landfill in the study area. Earthmoving would not require additional waste facility use because the removed material would remain on-site.

Based on the information presented above, the potential for the action alternatives to generate solid waste in excess of federal, state, or local standards, or be in excess of the capacity of local infrastructure or impair the attainment of solid waste reduction goals does not appear to be significant.

Effects of the Alternatives on Energy

Impact ENG-1: Result in Substantial Environmental Impacts due to Wasteful, Inefficient, or Unnecessary Consumption of Energy Resources, during Construction or Operation

No Action Alternative

There would be no substantial changes in SWP/CVP energy production or consumption under the No Action Alternative because there would not be substantial changes in operation of the existing SWP or CVP hydroelectric generation facilities or pumping facilities. Furthermore, the applicant's commitment to GHG reductions in the Climate Action Plan (CAP) Phase 1: Greenhouse Gas Emissions Reduction Plan Update 2020 (Update 2020) will result in increases in energy efficiency from implementation of operational efficiencies combined with the increased use of renewable energy.

Construction of projects under consideration in the study area would result in the short-term consumption of energy from the use of construction equipment to build the facilities and would vary depending on the nature and duration of construction. Increases in long-term operational energy consumption from operation and maintenance of facilities would be expected, however not to the extent that regional supplies would be significantly affected. Most of the existing programs and projects comprising the No Action Alternative would not require substantial operation and maintenance activities or the use of mechanical equipment in the same manner as the proposed facilities and would, therefore, not result in wasteful or unnecessary consumption of energy resources or result in a substantial net increases of energy consumption. Additionally, it is assumed that each project has or will undergo an environmental compliance process (i.e., pursuant to NEPA and/or CEQA) and that that these projects would comply with applicable programs, laws and regulations related to energy efficiency and consumption.

All Action Alternatives

Diesel, gasoline, and electrical power supplies would be needed at construction sites during the construction period. Diesel and gasoline would be used to power heavy-duty construction equipment, construction worker vehicles, haul trucks, locomotives, and marine vessels. Diesel and gasoline consumption associated with off-road and on-road equipment over the entire construction period would be 32 million gallons for Alternative 2b, 33 million gallons for Alternative 4b, 39 million gallons for Alternatives 1 and 3, to 48 million gallons for DWR's Preferred Alternative. Given the extensive footprint of the action alternatives, transportation efficiencies have been incorporated into each alternative to reduce the daily effect of truck trips on local roadways and to provide for the flow of construction materials to each site in an efficient manner. Site access and logistics would be largely focused on identifying appropriate transportation modes and routes to ensure that manpower, goods, and services would be transported in effective ways to minimize effects on the environment and residents of the Delta. This would be accomplished by sequencing of water-conveyance facilities and incorporating construction material hauling by rail, limited use of barges (at intakes only for placement of riprap near the end of construction and during limited field investigations), and establishing park-and-ride facilities for employee trips.

Electrical power would be needed to support large construction equipment such as cranes and ground improvement machines, small tools, and construction-support facilities, including construction trailers, temporary lighting, and electric vehicle charging stations. Depending on the action alternative, total electrical energy consumption during construction would be 1,019,633 megawatt hours (MWh) for Alternative 2b; 1,103,480 MWh for Alternative 4b; 1,166,491 MWh for DWR's Preferred Alternative; 2,093,421 MWh for Alternative 1; and 2,291,614 MWh for Alternative 3. The peak annual consumption would occur under Alternative 1 in construction year 8, with an estimated use of 464,060 MWh. Maximum usage for each action alternative would occur during tunnel boring activity. Electrical energy consumption for construction of the action alternatives is minimal when compared to the total amount of available energy sources.

Construction activities would include implementation of Environmental Commitments EC-7: *Off-Road Heavy-Duty Engines,* EC-8: *On-Road Haul Trucks,* EC-9: *On-Site Locomotives,* EC-10: *Marine Vessels,* and EC-13: *DWR Best Management Practices to Reduce GHG Emissions* (Delta Conveyance Project Draft EIR Appendix 3B, *Environmental Commitments and Best Management Practices* [California Department of Water Resources 2022]), which include construction best management practices such as minimizing idling times, maintaining all construction equipment in proper working condition, using renewable diesel, and implementing other measures to reduce pollutants. Other renewable features have also been incorporated into project construction including the installation of solar panels at the park-and-ride lots to power electric vans to move employees to construction sites and requiring the use of commercially available electric or hybrid vehicles. These measures would help to improve equipment efficiency and reduce energy use. Furthermore, due to the high cost of fuel and with standard federal, state, and local policies and regulations pertaining to construction equipment, effects related to wasteful, inefficient, and unnecessary use of energy resources would be further reduced because construction contractors would purchase fuel from local suppliers and would conserve the use of their fuel supplies to minimize costs. These measures would help to improve equipment efficiency and reduce energy use.

During operations electrical power would be needed to operate the intakes, the Southern Complex control structures, the South Delta Pumping Plant, and the Bethany Reservoir alignment pumping facilities (for DWR's Preferred Alternative only). Operations would also result in an increase in the consumption of fuel (gasoline and diesel) due to an increase of maintenance activities that would be needed. Based on current information, it is projected that, during operations of the action alternatives, the consumption of fuel for equipment and vehicle operation would be lower than it would be under current conditions. This decrease is attributable to improvements in engine technology and regulations to reduce combustion emissions and more efficient vehicles and electric-powered vehicles being added to the fleet.

Power would also be required for mechanical equipment (e.g., operable gates, screen cleaners, pumps), supervisory control and data acquisition systems, and for on-site buildings and lights. The applicant's commitment to energy efficiencies, as established in Update 2020, includes measures to increase operational efficiencies such as Measure OP2—Unit Efficiency Improvements and Measure OP-3 Renewable Energy Procurement Plan and, therefore, would not result in wasteful or inefficient consumption of energy.

Based on the information presented above, including the proposed environmental commitments, the potential for the action alternatives to result in substantial environmental effects due to wasteful, inefficient, or unnecessary consumption of energy resources, during construction or operations does not appear to be significant.

Impact ENG-2: Conflict with or Obstruct any State/Local Plan, Goal, Objective or Policy for Renewable Energy or Energy Efficiency

No Action Alternative

Under the No Action Alternative, the energy requirements for new and existing projects could increase, however key programs such as the 2017 Climate Change Scoping Plan and California's Renewables Portfolio Standard; as well as legislation such as the Warren-Alquist State Energy Resources Conservation and Development Act includes renewable energy goals and strategies to power the state with renewable energy sources, further increasing energy resiliency. Therefore, the No Action Alternative would not conflict or obstruct a state/local plan, goal, objective or policy for renewable energy or energy efficiency.

All Action Alternatives

As described in Impact ENG-1, construction activities would incorporate efficiencies into each alternative to reduce the daily effect of truck trips on local roadways and to provide for the flow of construction materials to each site in an efficient manner. Additionally, electricity would be used during construction to the extent possible and once construction is complete, the need for additional electricity services for boring operations and other construction-related appurtenances would cease, and any new facilities that were temporarily expanded to accommodate construction would be removed as appropriate. Environmental Commitment EC-13: *DWR Best Management Practices to Reduce GHG Emissions* includes best management practices that would reduce pollutants and will also improve construction equipment efficiency, reducing energy use. These best management practices are consistent with Construction Emissions Reduction Measures to reduce project-level emissions as established in DWR's Update 2020, Measure CO-1, *Construction BMPs and Regulations*.

Operation of all action alternatives would be supplied with the same energy sources as existing SWP operations. The increase in power needed to move water through the new water-conveyance facilities would be procured by the applicant, and the energy requirements would be directly linked to the SWP/CVP exports. For further analysis of effects of operations please see Delta Conveyance Project Draft EIR, Chapter 22, *Energy* (California Department of Water Resources 2022).

Based on the information presented above, the action alternatives would not result in a conflict with a state or local plan, goal, objective, or policy for renewable energy or energy efficiency; therefore, no impact is anticipated.

3.20.2.3 Cumulative Analysis

Table 3.20-1 lists a selection of the plans, policies, and programs included in the cumulative analysis that could result in effects on public services and utilities. In general, programs, plans, and projects that would result in additional population could result in effects on public services; programs, plans, and projects that would involve ground disturbance or construction could result in conflicts with utilities.

Table 3.20-1. Plans, Policies, and Programs Included in the Cumulative Analysis

Program/Project	Agency	Status	Description of Program/ Project	Effects on Public Services and Utilities
Bay Area stormwater management programs	BASMAA member agencies	Ongoing	Implementing stormwater regulations across stormwater management programs within the San Francisco Bay Area.	Could result in direct effects on stormwater facilities.
Sacramento County general plan	Sacramento County	Ongoing	Comprehensive document that guides planning in the unincorporated county.	The plan guides population growth in the unincorporated county. Increases in population would result in increased needs for public services and utilities infrastructure.
SRWTP facility upgrade project (EchoWater)	Regional San	Planning phase	Regional San is updating its existing facilities to meet new NPDES permit requirements.	Upgrades to existing secondary treatment facilities would occur. The project would not involve an increase in wastewater treatment capacity.
San Joaquin County general plan update	San Joaquin County	Ongoing	Provides guidance for future growth.	Increases in population would result in increased needs for public services and utilities infrastructure. Future growth is generally directed to existing urban communities.
San Joaquin County, Stockton, and Tracy stormwater management programs	San Joaquin County (Department of Public Works), Stockton (Municipal Utilities Department), Tracy (Water Resources Department), and State Water Resources Control Board	Ongoing	Each of these SWMPs regulates stormwater runoff, discharge, and conveyance. Implements stormwater management programs and permits.	Each of these SWMPs limits the discharge of pollutants from storm sewer systems in certain permit areas; includes BMPs to be implemented and assessed during the permit terms; and addresses construction site stormwater runoff.
Grassland Bypass Project	Reclamation and San Luis & Delta Mendota Water Authority	Ongoing	Prevents discharge of agricultural drainage water into wildlife refuges and wetlands through water conveyance.	New features could result in expansion of San Joaquin River Water Quality Improvement Project facility.
Delta Dredged Sediment Long-Term Management Strategy/Pinole Shoal	USACE	Ongoing	Maintaining and improving channel function, levee rehabilitation, and ecosystem restoration.	Potential for effects on public services and utilities from construction of restoration actions.

Program/Project	Agency	Status	Description of Program/ Project	Effects on Public Services and Utilities
Management Study				
Dutch Slough Tidal Marsh Restoration Project	DWR	Ongoing, Phase 3 scheduled for 2022	Restoration 1,178-acre site in the south Delta to tidal marsh habitat.	The project's potential effect on police protection, fire protection, water supply, wastewater, storm drainage, and electrical and gas transmission would be less than significant or mitigated to less-than-significant levels.
Cache Slough Area Restoration	DWR	Final EIR certified, construction in 2021–2023	Restoration of lands within the Cache Slough Complex in the Delta. Could include roughly 45,000 acres of existing and potential open-water, marsh, floodplain, and riparian habitat.	Potential for effects on public services and utilities from construction of restoration actions.
California EcoRestore	Delta Conservancy	Launched in 2015, ongoing	Entails implementation of a suite of Delta restoration actions for up to 30,000 acres of fish and wildlife habitat. Construction projects are ongoing through 2021, and habitat operations and maintenance will continue long term.	Potential for effects on public services and utilities from construction of restoration actions.
City of Antioch Brackish Water Desalination Project	City of Antioch	Planning	The Antioch Brackish Water Desalination Project, which utilizes existing infrastructure to the extent possible, includes the construction of new desalination facilities and associated infrastructure to improve the City's water supply reliability and operational flexibility.	Potential short-term effects from temporary increase in energy consumption from implementation, may require additional energy for operation
Carlsbad Seawater Desalination Plant	City of Carlsbad	Ongoing	The Carlsbad Seawater Desalination Plant is at the site of the former Encina Power Station. Poseidon Water finalized a 30-year water agreement with San Diego County Water Authority for the purchase of 50 million gallons per day of desalinated seawater and secured financing for the project. The desalination plant began delivering water to San Diego in December 2015.	Long-term energy consumption from operation.
Seawater Desalination Plant	City of Huntington Beach	Planning	The Seawater Desalination Project at Huntington Beach is proposed for the site of the existing Huntington Beach Generating Station. A subsequent EIR was prepared and was certified in September 2010. As of	Potential short-term effects from temporary increase in energy consumption from implementation, may require additional energy for operation

Program/Project	Agency	Status	Description of Program/ Project	Effects on Public Services and Utilities
			2020, the coastal development permit is on appeal at the California Coastal Commission and the NPDES permit renewal public hearing with the Santa Ana Regional Water Quality Control Board is postponed.	
Water Supply Management Program 2040	East Bay Municipal Utility District	Ongoing	East Bay Municipal Utility District's current Water Supply Management Program (WSMP 2020), adopted in 1993, serves as the basis for water conservation and recycling programs and for development of supplemental supply initiatives such as the Freeport Regional Water Project. The WSMP 2040 updates the current plan and extends the planning horizon another 20 years. It identifies and recommends a Preferred Portfolio of solutions to meet dry-year water needs through 2040, including desalination, enlargement of Mokelumne River reservoirs.	Potential short-term effects from temporary increase in energy consumption from implementation, may require additional energy for operation
Eastern San Joaquin Integrated Conjunctive Use Program	NSJCGBA	Ongoing	The Eastern San Joaquin Integrated Regional Water Management Plan defines and integrates key water management strategies to establish protocols and courses of action to implement the Eastern San Joaquin Integrated Conjunctive Use Program. The program will develop approximately 140,000 to 160,000 AF/yr of new surface water supply for the basin that will be used to directly and indirectly to support conjunctive use by the NSJCGBA member agencies. This amount of water would support groundwater recharge at a level consistent with the NSJCGBA's objectives for conjunctive use and the underlying groundwater basin. Within this framework, the program would implement the following categories of	Potential short-term effects from temporary increase in energy consumption from implementation, may require additional energy for operation

Program/Project	Agency	Status	Description of Program/ Project	Effects on Public Services and Utilities
			conjunctive use projects and actions: • Water conservation measures • Water recycling • Groundwater banking • Water transfers • Development of surface storage facilities • Groundwater recharge • River withdrawals Construction of pipelines and other facilities	
Phase 1: Greenhouse Gas Emissions Reduction Plan	DWR	Ongoing	In 2012, DWR developed the Greenhouse Gas Emissions Reduction Plan as the first phase of its Climate Action Plan to guide decision making related to energy use and GHG emissions.	Indirect effect from implementation of measures intended to reduce GHG emission rate for SWP energy generation. Improved efficiencies and procurement of additional renewable energy are expected to result in energy savings.
South Fork Feather Project	South Fork Feather Project	Ongoing	The South Fork Feather Project (FERC Project No. 2088) is a water supply/power project composed of four hydroelectric developments: Sly Creek, Woodleaf, Forbestown, and Kelly Ridge. Final Water Quality Certification was issued on November 30, 2018.	Direct effects from continued operation of SWP energy generation facility.
Bucks Creek Hydroelectric Project	FERC, PG&E, and the City of Santa Clara	Ongoing	The Bucks Creek Hydroelectric Project (FERC Project No. 619) is an 84.8-megawatt project located in Plumas County, California. Final Water Quality Certification was issued on October 22, 2010.	Direct effects from continued operation of SWP energy generation facility.
Yuba River Watershed Hydroelectric Projects	FERC, Nevada Irrigation District, PG&E	Ongoing	The Nevada Irrigation District is applying for a new license for the Yuba-Bear Project (FERC Project No. 2266), and PG&E is applying for the Drum-Spaulding Project (FERC Project No. 2310). Final Water Quality Certification was issued on February 3, 2021.	Direct effects from continued operation of SWP energy generation facility.
Yuba River Development Project Relicensing	FERC, Yuba County Water Agency	Ongoing	The Yuba County Water Agency is seeking to renew its 50-year FERC license for the Yuba River Development Project (FERC Project No. 2246). FERC issued the Final EIS in January 2019.	Direct effects from continued operation of energy generation facility.

Program/Project	Agency	Status	Description of Program/ Project	Effects on Public Services and Utilities
Upper North Fork Feather River Hydroelectric Project	FERC, PG&E	Ongoing	The Upper North Fork Feather River Hydroelectric Project (FERC Project No. 2105) is located on the North Fork Feather River in Plumas County. The project includes eight hydroelectric generating units with a total nameplate capacity of 362.3 megawatts.	Direct effects from continued operation of energy generation facility.
DeSabla-Centerville Hydroelectric Project	FERC, PG&E	Ongoing	The DeSabla-Centerville Hydroelectric Project (FERC Project No. 803) is located on Butte Creek and the West Branch Feather River. Final Water Quality Certification was issued on April 8, 2015.	Direct effects from continued operation of energy generation facility.
Don Pedro Hydroelectric Project	Tulare Irrigation District, Modesto Irrigation District, FERC	Ongoing	Turlock Irrigation District and Modesto Irrigation District are the co-licensees of the 168-megawatt Don Pedro Hydroelectric Project (FERC Project No. 2299) located on the Tuolumne River in western Tuolumne County. Final Water Quality Certification was issued on January 15, 2021.	Direct effects from continued operation of energy generation facility.
Incidental Take Permit for Long-Term Operation of the State Water Project in the Sacramento-San Joaquin	CDFW	Ongoing	CDFW issued an ITP to DWR for long-term operations of the SWP.	Indirect effects from facility operational requirements in ITP.
2019 NMFS Biological Opinion on the Long-term Operations of the Central Valley Project and State Water Project	2019 NMFS BiOp on the Long-term Operations of the Central Valley Project and State Water Project	Ongoing	On October 21, 2019, NMFS issued a final BiOp finding that continued operations of the CVP/SWP is not likely jeopardize several listed species, including Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley steelhead, Southern Distinct Population Segment of North American green sturgeon, and Southern Resident killer whales.	Indirect effects from facility operational requirements in BiOp.

Program/Project	Agency	Status	Description of Program/ Project	Effects on Public Services and Utilities
2019 USFWS Biological Opinion on the Long-Term Operations of the Central Valley Project and State Water Project (Delta smelt)	Reclamation, USFWS, and DWR	Ongoing	On October 21, 2019, USFWS delivered its BiOp to the U.S. Bureau of Reclamation on the effects of the continued operation of the CVP/SWP on the delta smelt and its designated critical habitat.	Indirect effects from facility operational requirements in BiOp.

BASMAA = Bay Area Stormwater Management Agencies Association; SRWTP = Sacramento Regional Wastewater Treatment Plant; NPDES = National Pollutant Discharge Elimination System; Regional San = Sacramento Regional County Sanitation District; SWMP = stormwater management program; BMP = best management practice; EIR = environmental impact report; WSMP = Water Supply Management Program; AF/yr = acre-feet per year; NSJCGBA = Northeastern San Joaquin County Groundwater Banking Authority; GHG = greenhouse gas; FERC = Federal Energy Regulatory Commission; SWP = State Water Project; DWR = California Department of Water Resources; PG&E = Pacific Gas and Electric; EIS = environmental impact statement; CDFW = California Department of Fish and Wildlife; ITP = Incidental Take Permit; NMFS = National Marine Fisheries Service; BiOp = Biological Opinion; USACE = U.S. Army Corps of Engineers. Reclamation = U.S. Department of the Interior Bureau of Reclamation; USFWS = U.S. Fish and Wildlife Service.

The cumulative effects analysis considers programs and projects that could affect public services, utilities, and energy in the study area during the same time frame as the Delta Conveyance Project. For the most part, the study area is rural and contains limited public services and utilities. Public services are generally concentrated in urban areas where population is greater. The study area does contain a network of utilities including water, electricity, natural gas, and telecommunications lines.

The ongoing projects and programs in the study area would require construction to either build new facilities or implement restoration and habitat-enhancement goals. SWP/CVP operations would require repair, maintenance, or protection of infrastructure, such as levees, and may also include actions for water quality management, habitat and species protection, and flood management. These continuing actions could occur throughout the study area and are unlikely to result in a significant population increase that would affect public services and utilities by requiring expansion or construction of new facilities. These actions are also unlikely to involve construction that would physically conflict with an existing public service location such as a police or fire station. Construction could result in effects on utilities, such as contributing solid waste to a landfill; however, these ongoing projects including construction and operations are assumed to adhere to state and local waste-reduction goals related to recycling and waste diversion and are not anticipated to generate much solid waste. Construction could also result in conflicts with existing electric and natural gas lines; however, these effects would be temporary.

All action alternatives would involve construction of new infrastructure that would require the use of water, electricity, and other utilities. Construction of the action alternatives would also require surface excavation, ground improvements, and tunneling that could result in solid waste disposal or conflicts with existing power transmission lines. These construction effects are not anticipated to result in major effects on public services and utilities, even in combination with other ongoing projects and programs in the study area. Construction and operation of the action alternatives would not result in an increase in population that would necessitate expansion or construction of public services and utilities.

The action alternatives would use existing groundwater and surface water and would not require new water rights or a connection to existing water service providers. The action alternatives would involve constructing their own septic systems and, therefore, would not result in effects on existing wastewater utilities. The action alternatives would also require stormwater pollution prevention plans to manage stormwater, and stormwater would be reused on-site to the extent feasible. All action alternatives would generate some solid waste during construction, but this effect would not be significant because the action alternatives would adhere to current regulations related to waste diversion and recycling, and because the many landfills surrounding the Delta have sufficient capacity to handle the solid waste that would be generated from the action alternatives. Restoration and land-management activities would generate solid waste during construction, and it is likely that temporary effects could occur related to conflicts with existing utilities. Each project's managing agency would be tasked with coordinating with service providers to avoid disruptions in service.

Ongoing and reasonably foreseeable future projects would also result in short-term and/or long-term increases in energy use. All action alternatives would result in increases in the short-term and long-term use of energy relative to existing conditions. Construction activities would consume diesel and gasoline to power heavy-duty vehicles, as well as electricity to power TBMs and equipment. Construction activities would include implementation of air quality Environmental Commitments EC-7: *Off-Road Heavy-Duty Engines,* EC-8: *On-Road Haul Trucks,* EC-9: *On-Site Locomotives,* EC-10: *Marine Vessels,* and EC-13: *DWR Best Management Practices to Reduce GHG Emissions* (Appendix C1, *Environmental Commitments and Best Management Practices*), which include construction best management practices, such as minimizing idling times, maintaining all construction equipment in proper working condition, using renewable diesel, and implementing other measures to reduce pollutants. These measures would help improve equipment efficiency and reduce energy use of the action alternatives. Even if construction of the action alternatives were to occur simultaneously with other cumulative projects, the cumulative use of energy resources during construction would be consistent with normal construction practices. Construction of the action alternatives in combination with cumulative projects is not expected to create a significant cumulative effect on the supply and/or availability of energy sources.

Operation of all of the action alternatives would result in an increase in annual electricity use for pumping and water conveyance through the Delta; however, operation would not result in major effects on energy use. As part of operations, efficiencies would be implemented to reduce the potential for unnecessary, wasteful, or inefficient energy consumption. Other ongoing and reasonably foreseeable future projects that are anticipated to use more energy would contribute cumulatively to regional energy use. However, if these projects result in high demands of electricity, supplies would be sufficient such that there would not be a significant constraint on local or regional energy supplies.

3.21 Water Quality

This section describes the affected environment for water quality and analyzes effects that could occur in the study area from construction, operation, and maintenance of the action alternatives and compensatory mitigation, as well as the No Action Alternative. Mitigation and minimization measures that would avoid, minimize, rectify, reduce, or compensate potentially adverse effects are included as part of each action alternative. Additional information on the affected environment, methods, and the anticipated effects of the action alternatives action can be found in Delta Conveyance Project Draft EIR Chapter 9, *Water Quality* (California Department of Water Resources 2022).

3.21.1 Affected Environment

The study area for water quality consists of waterbodies upstream of the Delta, Suisun Marsh, Suisun Bay, San Francisco Bay, and SWP/CVP export service areas (i.e., the area in which effects may occur). The portion of the study area that is upstream of the Delta would not be affected by construction activities or compensatory mitigation. As such, the area upstream of the Delta is not discussed further in this document.

Existing surface water quality constituents in the study area that could be affected by the action alternatives include boron, dissolved oxygen, salinity constituents (i.e., electrical conductivity, chloride, bromide), mercury, nutrients, organic carbon, pesticides, selenium, trace metals, TSS and turbidity, and cyanobacteria and cyanotoxins.

Delta Conveyance Project Draft EIR Chapter 9, *Water Quality*, Section 9.2, *Environmental Setting* (California Department of Water Resources 2022), presents further a description of the existing water quality in the study area.

3.21.2 Environmental Consequences

This section describes the assessment methods used to analyze potential environmental effects and identifies the direct, indirect, and cumulative effects on water quality associated with the action alternatives, as well as the No Action Alternative.

3.21.2.1 Methods for Analysis

Construction Activities

Water quality effects associated with construction activities were assessed in a qualitative manner. The potential construction-related water quality effects were assessed considering many aspects of the work involved and potential environmental exposure to contaminants, including the following factors.

- Types of materials and contaminants that may be handled, stored, used, or produced at water-conveyance facilities during construction, and that could be released to the environment, and the related fate, transport, and harmful characteristics of the contaminants.

- Magnitude, timing, and duration of the potential contaminant discharges, and exposure sensitivity of waterbodies and beneficial uses that could be affected by the discharge.
- Routes of exposure for contaminants, sediment, and other constituents from the construction activity causing potential discharges to sensitive waterbodies, including likelihood of seasonal exposure to rainfall and runoff, proximity of inland work to drainage ways, and occurrence of direct instream discharges.

In addition, the analysis considered best management practices and environmental commitments incorporated into the action alternatives presented in Appendix C1, *Environmental Commitments and Best Management Practices.*

The evaluation of operations of the action alternatives addresses the water quality conditions that would occur when the action alternatives are operated to convey water through the proposed facilities.

Delta Conveyance Project Draft EIR Chapter 9, *Water Quality*, Section 9.3.1, *Methods of Analysis* (California Department of Water Resources 2022), presents a more detailed description of the assessment methodology and modeling tools used to characterize water quality in the study area and the methods for evaluating operations effects.

No Action Alternative

The No Action Alternative takes into account changing climatic conditions, projects, plans, and programs that would be reasonably expected to occur in the foreseeable future if none of the action alternatives were approved and the proposed actions' purpose and need were not met. Many of these projects, such as construction of desalination plants or water recycling facilities, would involve construction and operation of facilities by individual public water agencies to ensure local water supply reliability for their respective constituents.

Construction and operation of water supply–reliability projects have the potential to affect the water quality of surface waters within the four regions. Table 3.21-1 provides examples of how water quality could be affected.

Table 3.21-1. Examples of Effects on Water Quality from Construction and Operation of Projects in Lieu of the Project

Project Type	Potential Water Quality Effects	Region(s) in Which Effects Would Likely Occur [a]
Increased/ accelerated desalination	<u>Potential Construction Effects</u> Temporary water quality degradation as a result of erosion or siltation caused by earthmoving activities or by the accidental release of hazardous construction chemicals if the construction areas are not properly managed through implementation of construction best management practices. <u>Potential Operations and Maintenance Effects</u> Long-term water quality degradation for salinity from brine disposal in the zone of initial mixing with ocean waters.	Northern coastal, southern coastal

Project Type	Potential Water Quality Effects	Region(s) in Which Effects Would Likely Occur [a]
Groundwater management	<u>Potential Construction Effects</u> Temporary water quality degradation as a result of groundwater discharges during well development and testing. <u>Potential Operations and Maintenance Effects</u> Temporary water quality degradation as a result of groundwater discharges during well maintenance.	Northern coastal, southern coastal
Groundwater recovery (brackish water desalination)	<u>Potential Construction Effects</u> Temporary water quality degradation as a result of erosion or siltation caused by earthmoving activities or by the accidental release of hazardous construction chemicals if the construction areas are not properly managed through implementation of construction best management practices; temporary water quality degradation as a result of groundwater discharges during well development and testing. <u>Potential Operations and Maintenance Effects</u> Long-term water quality degradation for salinity from brine disposal in the zone of initial mixing with ocean waters.	Northern inland, southern coastal, southern inland
Water recycling	<u>Potential Construction Effects</u> Temporary water quality degradation as a result of erosion or siltation caused by earthmoving activities or by the accidental release of hazardous construction chemicals if the construction areas are not properly managed through implementation of construction best management practices. <u>Potential Operations and Maintenance Effects</u> None	Northern coastal, northern inland, southern coastal, southern inland
Water use efficiency measures	<u>Potential Construction Effects</u> Temporary water quality degradation as a result of erosion or siltation caused by earthmoving activities or by the accidental release of hazardous construction chemicals if the construction areas are not properly managed through implementation of construction best management practices; temporary water quality degradation as a result of groundwater discharges during well development and testing. <u>Potential Operations and Maintenance Effects</u> None	Northern coastal, northern inland, southern coastal, southern inland

[a] See Chapter 2, *Project Description and Alternatives*, Section 2.5, *No Action Alternative*, for a complete definition of the geographic regions.

Because SWP/CVP operations would remain similar for the foreseeable future, the No Action Alternative would not cause water quality in, the Delta, Suisun Marsh, Suisun Bay, San Francisco Bay, and the SWP/CVP export service areas to change appreciably from existing conditions. Rather, water quality changes in the study area would primarily be driven by climate change and sea level rise, and occur primarily in the Delta, which is the waterbody most susceptible to the effects of sea water intrusion. The resulting effect would be differing proportions of Delta primary source waters (e.g., Sacramento River, San Joaquin River, San Francisco Bay) throughout the Delta. Thus, the No Action Alternative assessment focuses on water quality changes in the Delta, relative to existing conditions.

3.21.2.2 Effects and Mitigation

This section presents the effects of the No Action Alternative and compensatory mitigation under the action alternatives on the water quality in study area surface waterbodies. The effects of the construction are presented first, followed by separate effects discussions related to implementing compensatory mitigation for the constituents carried forward for detailed analysis, per the results of the screening analysis. Effects discussions also are provided for the action alternatives effects on the risk of release of pollutants from project inundation, drainage patterns, and consistency with water quality control plans. Effects on the following, resulting from facility operations, are discussed in Delta Conveyance Project Draft EIR Chapter 9, *Water Quality*, Section 9.3.3.2, *Impacts of the Project Alternatives on Water Quality* (California Department of Water Resources 2022).

- Boron
- Bromide
- Chloride
- Electrical Conductivity
- Mercury
- Nutrients
- Organic Carbon
- Dissolved Oxygen
- Selenium
- Pesticides
- Trace Metals
- Turbidity/Total Suspended Solids
- Cyanobacteria Harmful Algal Blooms (CHABS)
- Risk of Release of Pollutants from Inundation of Project Facilities
- Drainage Patterns

For more information on the effect of the action alternatives on water quality in waterbodies upstream of the Delta as a result of operations, refer to the Delta Conveyance Project Draft EIR Chapter 9, *Water Quality* (California Department of Water Resources 2022).

Impact WQ-1: Effects on Water Quality Resulting from Construction of the Water-Conveyance Facilities

No Action Alternative

There would be no construction of conveyance facilities with the No Action Alternative.

All Action Alternatives

The potential water quality concerns associated with construction-related activities include the following major categories of contaminants.

- **Suspended sediment.** Turbidity-producing construction activities include bed and bank disturbance during cofferdam placement and removal, channel dredging adjacent to the new intake locations, and the placement of bed and bank armoring. These activities would occur periodically wherever in-water construction activities occur and may increase turbidity (i.e., reduce water clarity) that can affect aquatic organisms and increase the costs and effort of removal in municipal/industrial water supplies. Downstream sedimentation can affect aquatic habitat or cause a nuisance if it affects functions of agricultural or municipal intakes.
- **Organic matter**. Eroded soils caused by construction activities may contribute turbidity and oxygen-demanding substances (i.e., reduce dissolved oxygen levels) that can affect aquatic organisms. Organic carbon may increase the potential for disinfection byproduct formation in municipal drinking water supplies.
- **Nutrients.** Eroded soils caused by construction activities and associated runoff may contribute nitrogen, phosphorus, and other key nutrients that can contribute to nuisance biostimulation of algae and vascular aquatic plants, which may affect municipal water supplies, recreation, aquatic life, and aesthetics.
- **Petroleum hydrocarbons.** Spills from construction equipment may contribute toxic compounds to aquatic life, and oily sheens may reduce oxygen/gas transfer in water, foul aquatic habitats, and reduce water quality for municipal supplies, recreation, and aesthetics.
- **Trace constituents (metals, pesticides, synthetic organic compounds).** The construction footprint for the action alternatives includes areas with known or potentially contaminated sediments (e.g., metals, organochlorine pesticides, and polychlorinated biphenyls), indicating the potential for release and dispersal of these contaminants, some of which are associated with existing impairments identified for Delta waterbodies on the state's CWA Section 303(d) list. Eroded soil or construction-related materials (e.g., paints, coatings, cleaning agents) may contain these constituents that can be toxic to aquatic life.
- **Pathogens.** Construction-related materials and trash can contain bacteria, viruses, and protozoans that may affect aquatic life and increase human health risks via municipal water supplies, reduced recreational water quality, or contaminated shellfish beds.
- **Other inorganic compounds.** Construction-related materials and trash can contain inorganic compounds such as acidic/basic materials that can change pH and may adversely affect aquatic life and habitats. Concrete contains lime, which can increase pH levels, and drilling fluids may alter pH.

Aquatic life beneficial uses are likely the most sensitive to construction-related effects on water quality; refer to Delta Conveyance Project Draft EIR Chapter 12, *Fish and Aquatic Resources,* for additional discussion of the effects of construction (California Department of Water Resources 2022).

The applicant would be required to obtain authorization for construction activities under the State Water Board's National Pollutant Discharge Elimination System (NPDES) Stormwater General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities (Order No. 2009-0009-DWQ/NPDES Permit No. CAS000002), and prepare and implement associated SWPPPs. In addition, all runoff and dewatering water at the intakes, tunnel shaft sites, and Southern Complex and Bethany Complex construction sites would be diverted to an on-site water treatment plant at each location and tested to determine whether it would require treatment prior to discharge from the site. Furthermore, construction activities would be conducted in conformance to applicable federal and state regulations pertaining to grading and erosion control, and contaminant spill control and response measures. The applicant would implement construction-related environmental commitments for water quality protection. Details on these mitigation measures and environmental commitments can be found in Appendix C1, *Environmental Commitments and Best Management Practices*. With implementation of the General Construction Permit requirements, on-site treatment of runoff and dewatering water prior discharge, and construction-related environmental commitments, construction of the action alternatives would not cause constituent discharges of sufficient frequency and magnitude to result in a marked increase of exceedances of water quality objectives/criteria, or markedly degrade water quality with respect to the constituents of concern.

The applicant would be required to obtain authorization for compensatory mitigation construction activities under the State Water Board's General Construction Permit and prepare and implement associated SWPPPs. In addition, the applicant would implement construction-related environmental commitments for water quality protection, as identified in Appendix C1, *Environmental Commitments and Best Management Practices*. With implementation of the construction-related environmental commitments, construction of the compensatory mitigation would not cause constituent discharges of sufficient frequency and magnitude to result in a substantial increase of exceedances of water quality objectives/criteria, or substantially degrade water quality with respect to the constituents of concern.

Based on the information presented above, including proposed environmental commitments, the effects on water quality resulting from construction of the water-conveyance facilities under all action alternatives does not appear to be significant.

Impact WQ-2: Effects on Boron Resulting from Compensatory Mitigation

No Action Alternative

The greatest increases in boron concentrations under the No Action Alternative, relative to existing conditions, would occur in the Sacramento River at Emmaton, San Joaquin River at Antioch, Sacramento River at Mallard Island, primarily in the months of June through December. Contra Costa Pumping Plant #1, Old River at SR 4, Victoria Canal, would have the greatest boron increases in April and May. Banks and Jones Pumping Plants also would have increased boron concentrations, in all months. There would be minimal changes in boron levels in Barker Slough at North Bay Aqueduct, South Fork Mokelumne River at Terminous, and San Joaquin River at Empire Tract. Boron levels would be less than applicable water quality criteria and objectives under both existing conditions and the No Action Alternative.

All Action Alternatives

Natural habitats proposed for compensatory mitigation in the Delta are not major sources of boron to receiving waters. Compensatory mitigation would result in negligible, if any, change in boron concentrations in the Delta, Suisun Marsh, Suisun Bay, San Francisco Bay, or the SWP/CVP export service areas. Therefore, this impact does not appear to be significant.

Impact WQ-3: Effects on Bromide Resulting from Compensatory Mitigation

No Action Alternative

Monthly average bromide concentrations would increase in the Sacramento River at Emmaton, San Joaquin River at Antioch, and Sacramento River at Mallard Island, particularly in the months of July through December. The San Joaquin River at Empire Tract, Contra Costa Pumping Plant #1, Old River at SR 4, Victoria Canal, and Banks and Jones Pumping Plants also would experience higher monthly average bromide during some months, though to a lesser degree. There would be minimal changes in monthly average bromide concentrations in Barker Slough at North Bay Aqueduct and South Fork Mokelumne River at Terminous. These effects, however, would be due to climate change and sea level rise, not changes in SWP/CVP facilities and operations.

All Action Alternatives

Natural habitats proposed for compensatory mitigation in the Delta are not sources of bromide to receiving waters. Compensatory mitigation would not result in markedly higher bromide concentrations in the Delta, Suisun Marsh, Suisun Bay, San Francisco Bay, and SWP/CVP export service areas. Therefore, this impact does not appear to be significant.

Impact WQ-4: Effects on Chloride Resulting from Compensatory Mitigation

No Action Alternative

Monthly average chloride concentrations would increase in the Sacramento River at Emmaton, San Joaquin River at Antioch, Sacramento River at Mallard Island, particularly in the months of July through December. The San Joaquin River at Empire Tract, Contra Costa Pumping Plant #1, Old River at SR 4, Victoria Canal, and Banks and Jones Pumping Plants also would experience higher monthly average chloride concentrations during some months, though to a lesser degree. There would be minimal changes in monthly average chloride concentrations in Barker Slough at North Bay Aqueduct and South Fork Mokelumne River at Terminous. Additionally, at Contra Costa Pumping Plant #1 there would be a small potential for increased frequency of exceeding the *Water Quality Control Plan for the San Francisco Bay/Sacramento–San Joaquin Delta Estuary* (Bay-Delta WQCP) chloride objective of 250 milligrams per liter (mg/L). These effects, however, would be due to climate change and sea level rise. Chloride concentrations could increase in Suisun Marsh.

All Action Alternatives

Natural habitats proposed for compensatory mitigation in the Delta are not major sources of chloride to receiving waters. Compensatory mitigation would not result in markedly higher chloride concentrations in the Delta, the Delta, Suisun Marsh, Suisun Bay, San Francisco Bay, and SWP/CVP export service areas. Therefore, this impact does not appear to be significant.

Impact WQ-5: Effects on Electrical Conductivity Resulting from Compensatory Mitigation

No Action Alternative

Monthly average electrical conductivity levels would increase in the Sacramento River at Emmaton, particularly in the months of July through December. The San Joaquin River at Jersey Point, San Joaquin River at Prisoners Point, San Joaquin River at San Andreas Landing, San Joaquin River at

Vernalis, San Joaquin River at Brandt Bridge, Old River near Middle River, Old River at Tracy Bridge, Sacramento River at Rio Vista, Sacramento River at Threemile Slough, and Banks and Jones Pumping Plants also would experience higher monthly average electrical conductivity levels during some months, though to a lesser degree. Monthly average electrical conductivity levels also would increase in Suisun Marsh. There would be minimal change in electrical conductivity levels in the Sacramento River at Steamboat Slough and South Fork Mokelumne River at Terminous. Modeling showed an increase in the exceedance of the Bay-Delta WQCP electrical conductivity objectives applicable to the Sacramento River at Emmaton, Banks Pumping Plant, San Joaquin River at Vernalis, San Joaquin River at Brandt Bridge, Old River near Middle River, and Old River at Tracy Bridge. These effects, however, would be due to climate change and sea level rise.

All Action Alternatives

Natural habitats proposed for compensatory mitigation in the Delta are not major sources of electrical conductivity to receiving waters and watershed and seawater contributions. Compensatory mitigation would not result in markedly higher electrical conductivity levels in the Delta, Suisun Marsh, Suisun Bay, San Francisco Bay, or the SWP/CVP export service areas. Therefore, this impact does not appear to be significant.

Impact WQ-6: Effects on Mercury Resulting from Compensatory Mitigation

No Action Alternative

Long-term average water column concentrations of mercury would increase slightly under the No Action Alternative in Barker Slough at the North Bay Aqueduct, Sacramento River at Emmaton and Mallard Island, San Joaquin River at Antioch, Contra Costa Pumping Plant #1, Old River at SR 4, and Banks and Jones Pumping Plants. Long-term average water column concentrations of mercury would decrease in Victoria Canal, South Fork Mokelumne River at Terminous and San Joaquin River at Empire Tract. Long-term average water column concentrations of methylmercury would increase at all of these Delta assessment locations, except South Fork Mokelumne River at Terminous and San Joaquin River at Empire Tract, where there would be no increase. Increases in methylmercury concentrations in largemouth bass as a result of the increases in water column concentrations would be less than 0.1 milligrams per kilogram (mg/kg) wet weight at all Delta assessment locations.

All Action Alternatives

Implementation of the CMP, which includes the creation of freshwater emergent perennial wetlands, seasonal wetlands, and tidal habitats, could result in new sources of methylmercury within the Delta. Mercury methylation occurs under anoxic conditions in sediments, flooded shoreline soils, and, to a lesser degree, in the water column. Increased methylmercury is also associated with wetting and drying cycles. These new sources of methylmercury could result in higher methylmercury concentrations in adjacent Delta waters and uptake into the tissues of fish residing within and immediately adjacent to these wetland habitats where elevated levels of methylmercury could be created.

The freshwater emergent perennial wetlands and seasonal wetlands would be located on Bouldin Island and would not be hydrodynamically connected with adjacent Delta waters. As part of management of the new wetlands, water may be discharged from the wetlands to adjacent Delta waterways through existing drains or outfalls. As part of adaptive management, monitoring of the discharge would be conducted and the discharges modified (e.g., to a detention basin) should monitoring results show the wetland discharges to be a net exporter of methylmercury to Delta waters. Thus, the wetlands to be created on Bouldin Island would not contribute to measurable increases in methylmercury concentrations in waters and biota of the Delta or make the existing mercury-related CWA Section 303(d) impairment within the Delta measurably worse.

Location(s) and size(s) of the new tidal habitat are generally proposed for the Yolo Bypass and Cache Slough Complex and would be selected in accordance with the tidal habitat mitigation framework in Appendix C3, *Compensatory Mitigation Plan for Special-Status Species and Aquatic Resources.* The new tidal habitats would be hydrodynamically connected with adjacent Delta waters and conditions that are conducive to increased mercury methylation and uptake from water into fish tissues may occur within and adjacent to the new tidal habitats, relative to comparable Delta habitats. However, not all types of wetland habitats have the same potential for methylmercury generation, and tidal wetlands in the Delta are not necessarily significant net producers or exporters of methylmercury to adjacent waterbodies (California Department of Water Resources 2020:7).

Regularly inundated tidal wetlands that do not fully dry between wetting cycles generate less methylmercury than seasonally flooded wetlands and high-tidal marsh (Alpers et al. 2008:10). Likewise, permanently flooded wetlands in the Delta managed for wildlife, and seasonally flooded wetlands to a lesser degree, produced far less methylmercury than do agricultural wetlands managed for rice production (Alpers et al. 2014:282). The degree to which methylmercury generation occurs in four Delta tidal wetlands, evaluated as part of methylmercury control studies for the Delta mercury total maximum daily load (TMDL) found that concentrations did not significantly increase on ebb tides over those entering the wetlands on flood tides (California Department of Water Resources 2020:7). Thus, these restored tidal wetlands are unlikely to significantly increase methylmercury concentrations in the wetlands themselves and adjacent Delta waters. Likewise, none of the four Delta tidal wetlands studied contributed significantly to net annual methylmercury loads in surrounding waters. Another study of a natural tidal marsh in the western Delta, Browns Island, found it to be a relatively small net source of methylmercury, and extrapolation of these results to all 33 square kilometers of existing Delta tidal wetlands indicated they are a minor source, contributing only 3% of the external riverine methylmercury loads (Bergamaschi et al. 2011:1368). Studies outside the Delta have also found tidal wetlands to be net sinks for total mercury and methylmercury or only a minor source of methylmercury to nearby surface waters (Mitchell et al. 2012:7; Turner et al. 2018:153). Seasonal and spatial variability in methylmercury production and export were observed in all of these studies so that site-specific planning and monitoring should inform the design and management of compensatory mitigation tidal habitat to understand hydrodynamic and biogeochemical interactions as part of mercury control actions (McCord and Heim 2015:738; Bergamaschi et al. 2011:1369).

The extent to which fish exposed to tidal wetlands bioaccumulate mercury has been monitored in the North San Francisco Bay where fish tissue concentrations within restored tidal wetlands were not higher than in reference tidal wetlands (Robinson et al. 2018:18). To estimate how fish tissue concentrations could be affected by aqueous methylmercury concentrations in four restored Delta tidal marshes, monthly tidal ebb and flow mercury concentration data from the California Department of Water Resources (2020) were used to model tissue concentrations in 350-millimeter largemouth bass fillets using the Delta TMDL model (Central Valley Regional Water Quality Control Board 2010:73). Modeled fish tissue mercury concentrations did not differ significantly between exposures to ebb and flood flow concentrations at three of the four tidal wetlands using Wilcoxon Signed Rank test ($p>0.05$) and were significantly greater in flood water concentrations (i.e., those entering the tidal marsh) at North Lindsay Slough ($p<0.01$). These calculations suggest that fish tissue mercury concentrations would not significantly increase within CMP tidal habitat or in the Delta waters surrounding these habitats.

While these studies suggest a low potential for increases in methylmercury in the waters and fish tissues in restored tidal wetlands, these conditions are site-specific and vary over time and, therefore, may not be predictive of mercury methylation in all tidal wetlands created within the Delta. Measurable increases in methylmercury concentrations in waters and fish within and near the new tidal habitats could potentially occur. Methylmercury is CWA Section 303(d)-listed within the Delta. As such, if the new tidal habitats have higher aqueous methylmercury concentrations than surrounding Delta water, they could make the existing CWA Section 303(d) mercury-related impairment discernably worse. Because mercury is bioaccumulative, elevated waterborne methylmercury concentrations that could occur in new tidal habitats would bioaccumulate in aquatic organisms that could, in turn, pose increased health risks to wildlife or humans consuming those organisms, relative to existing conditions. The effect of new tidal habitats created in accordance with the CMP on mercury concentrations in Delta organisms residing within the wetlands and immediately adjacent Delta waters has the potential to be significant.

Mitigation Measure WQ-6: *Develop and Implement a Mercury Management and Monitoring Plan* would be implemented with the goal to minimize generation of methylmercury within the new tidal habitats. Details on Mitigation Measure WQ-6 are provided in Appendix C2, *Mitigation Measures*. Tidal habitat design would be guided by this mitigation measure, which requires development of a comprehensive Mercury Management and Monitoring Plan and a site-specific mercury management plan or plans.

Factors affecting methylmercury generation and transport would need to be considered in the design and management of CMP wetlands because methylmercury production in wetland habitats is complex and governed by site-specific conditions. Methylmercury production in wetland habitats is affected by organic matter in the sediments, organic carbon levels, dissolved oxygen levels, pH, sulfate concentration, iron concentrations, temperature, salinity, and available pools of inorganic mercury present. Wetlands can create ideal biogeochemical conditions for inorganic mercury to methylate to methylmercury since they are dominated by high organic matter soils/sediments and often receive sediment inputs, both of which are sources of dissolved organic carbon that is important to supporting the methylation process. Organic matter fuels microbial activity while also increasing biochemical oxygen demand (which depletes sediment oxygen levels) and decreasing oxidation-reduction potential in water and sediment. In anoxic sediments (where oxygen is absent), sulfate and iron-reducing bacteria methylate inorganic mercury in their cells. In a sense, these bacteria breathe sulfate rather than oxygen in a form of anaerobic respiration. The form of inorganic mercury present also determines the uptake rates by the sulfate and iron-reducing bacteria cells that methylate the inorganic mercury present. Finally, the exchange of water with areas of the Delta outside the restored habitat will affect sediment and mercury exchange.

The potential to control or reduce methylmercury generation and/or concentrations in tidal habitats exists based on past and ongoing research (California Department of Water Resources et al. 2020:7-1; McCord and Heim 2015:732; Alpers et al. 2014:285; California Department of Public Health 2013:12; Davis et al. 2012:20) and the Mercury Management and Monitoring Plan will describe the need to consider the various environmental parameters as part of deciding where to site the restoration habitats, the size of tidal habitat to be developed at each site, design criteria, and how best to manage water and sediment exchange and vegetation to minimize the potential for mercury methylation. Restored tidal wetlands in the Delta are not necessarily significant net producers or exporters of methylmercury to adjacent waterbodies (California Department of Water Resources 2020:7). Thus, it is feasible for tidal habitat siting and design of restored tidal wetlands to create conditions that minimize sources of inorganic mercury available for methylation, provide for water and sediment exchange to minimize microbial methylation of mercury associated with anoxic conditions, or use other approaches informed by research to not make the existing Delta mercury impairment discernably worse.

Mercury and methylmercury concentration data collected as tidal habitats are created and managed, (e.g., water, sediment, and fish tissue concentrations) would inform the need to adaptively manage these tidal habitats cooperatively with input from the State Water Board and Central Valley Regional Water Quality Control Board (RWQCB) to ensure that methylmercury generation and concentrations in and around the new tidal habitats would not make the current CWA Section 303(d) Delta mercury-related impairment measurably worse. For example, vegetation management would lower the levels of organic matter in the sediments, reducing the carbon source used by bacteria in mercury methylation, and decreasing anoxic conditions (i.e., the lack of oxygen) in sediments so that the presence of oxygen creates conditions which limit methylation by bacteria. Hence, minimizing conditions conducive to mercury methylation in the siting, design, and adaptive management of CMP tidal wetlands as described by Mitigation Measure WQ-6: *Develop and Implement a Mercury Management and Monitoring Plan* is the best available approach for controlling mercury methylation in tidal wetland restoration habitats (McCord and Heim 2015:734; Davis et al. 2012:20). This determination is made based on past research findings regarding creating/monitoring such habitats and implementing practicable measures to minimize mercury methylation rates and methylmercury concentrations in sediment and the water column, which is then available to aquatic organisms.

While there are uncertainties associated with the total acres of CMP tidal wetland to be created and the effectiveness of the siting and design criteria in controlling mercury methylation within these habitats, restored tidal wetlands in the Delta have not been found to be significant net sources of methylmercury to surrounding waters and are a relatively small contributor of total mercury and methylmercury in the Delta compared to upstream inputs. Therefore, based on the knowledge gained from creating and monitoring tidal wetland habitats in the Delta and elsewhere to date, this mitigation measure would ensure that the CMP wetlands are designed, sited, and managed in a manner that is effective in preventing methylmercury levels in water and fish tissue of the new tidal habitats from becoming significantly greater than in comparable existing habitats elsewhere in the Delta, thereby not making the existing Delta mercury impairment discernably worse.

Based on these findings and implementation of proposed mitigation measures, the effects on mercury resulting from compensatory mitigation under all action alternatives does not appear to be significant.

Impact WQ-7: Effects on Nutrients Resulting from Compensatory Mitigation

No Action Alternative

The changes in Delta source waters under the No Action Alternative, relative to existing conditions, would have varying effects on nutrients. Areas of the Delta that have a reduced proportion of Sacramento River water coupled with a higher proportion of San Joaquin River water, such as Contra Costa Pumping Plant #1, Old River at SR 4, and Victoria Canal, could have higher concentrations of total nitrogen and total phosphorus under the No Action Alternative because of the relatively higher concentrations in San Joaquin River water.

All Action Alternatives

Some compensatory mitigation activities would occur on land in the Delta that was formerly used for agriculture. Reducing agricultural lands would decrease the use of fertilizers, further reducing nutrient inputs. Any newly created wetlands or enhanced habitat would filter stormwater to remove nutrients and either improve (i.e., decrease) or have little to no effect on nutrient concentrations, relative to the No Action Alternative. The creation of additional aquatic plant life could have minor effects on nutrient dynamics and speciation. For example, water column concentrations of total phosphorus and nitrogen may increase or decrease in localized areas as a result of increased or decreased suspended solids while dissolved nutrient concentrations may be locally changed as result of plant decay or nutrient sequestration. Overall, nutrient concentrations are not expected to change appreciably, relative to the No Action Alternative. Consequently, compensatory mitigation would not result in markedly higher nutrient concentrations in the Delta, Suisun Marsh, Suisun Bay, San Francisco Bay, or the SWP/CVP export service areas. Therefore, this impact does not appear to be significant.

Impact WQ-8: Effects on Organic Carbon Resulting from Compensatory Mitigation

No Action Alternative

Monthly average dissolved organic carbon (DOC) concentrations under the No Action Alternative would differ minimally from the concentrations under existing conditions at most Delta assessment locations.

All Action Alternatives

Agriculture and wetlands are both sources of organic carbon for Delta waters. The conversion of lands from agriculture to wetlands and other natural habitats could result in either a net decrease or increase in organic carbon loading for the Delta. The contributions of organic carbon to the Delta from all sources is highly variable, with rivers contributing the most and wetlands contributing the least. Implementation of compensatory mitigation is not expected to cause a long-term increase in DOC concentrations because the land area proposed for restoration would be relatively small compared to existing Delta land area and other external and internal sources of DOC. Consequently, compensatory mitigation would not result in markedly higher DOC concentrations in the Delta, Suisun Marsh, Suisun Bay, San Francisco Bay, or the SWP/CVP export service areas. Therefore, this impact does not appear to be significant.

Impact WQ-9: Effects on Dissolved Oxygen Resulting from Compensatory Mitigation

No Action Alternative

Of the factors that primarily influence dissolved oxygen concentrations in the Delta, channel velocities and presence of oxygen-demanding substances would be similar to existing conditions, and water temperatures would be slightly higher, which could slightly decrease in dissolved oxygen saturation concentrations.

All Action Alternatives

Any newly created wetlands or enhanced habitat created under the CMP would filter stormwater to remove solids and either improve or have little to no effect on dissolved oxygen concentrations. Compensatory mitigation in the Delta would not result in markedly lower dissolved oxygen concentrations in the Delta, Suisun Marsh, Suisun Bay, San Francisco Bay, or the SWP/CVP export service areas. Therefore, this impact does not appear to be significant.

Impact WQ-10: Effects on Selenium Resulting from Compensatory Mitigation

No Action Alternative

Long-term average selenium concentrations under the No Action Alternative would differ minimally from concentrations under existing conditions at all Delta assessment locations. There would be no change in the selenium concentrations in whole-body fish tissue, bird eggs (invertebrate diet and fish diet), and fish fillets, and concentrations would not exceed relevant benchmarks. Selenium concentrations in sturgeon in the Sacramento River at Emmaton and Mallard Island, and San Joaquin River at Antioch would increase. Whole sturgeon tissue selenium concentrations would exceed low effect concentration (i.e., concern levels) in below normal, dry, and critical years in the San Joaquin River at Antioch and the Sacramento River at Mallard Island under both existing conditions and the No Action Alternative.

All Action Alternatives

Implementation of the CMP, namely the creation of tidal habitats that would be hydrodynamically connected to Delta channels, could create new areas with slower water velocities and associated increases in water residence times that, if sufficiently large, promote greater selenium uptake and recycling by plants, algae, and microorganisms. In algae, less-bioaccumulative dissolved forms of selenium, such as selenate, are biotransformed into the more bioaccumulative organoselenium. An increase in more bioavailable forms of particulate selenium could result in increased selenium concentrations in fish and aquatic-dependent birds through dietary uptake.

Location(s) of the new tidal habitat would generally be in the lower Yolo Bypass and Cache Slough Complex and specific locations and sizes would be selected in accordance with the tidal habitat mitigation framework in Appendix C3, *Compensatory Mitigation Plan for Special-Status Species and Aquatic Resources*. Because specific locations and sizes of the CMP tidal habitat are currently undetermined, the extent that water residence times within the created tidal habitats would differ from that of adjacent Delta waters is unknown. However, the tidal habitat is expected to be predominantly sited in the northern Delta, and its area is expected to be less than 1% of the total acres of the Delta's wetted habitat. Therefore, any potential increases in selenium bioaccumulation would occur in a very small geographic area of the Delta even if some tidal habitat resulted in longer residence times that are conducive to greater bioaccumulation of selenium.

Implementation of the CMP tidal habitat is not expected to cause notable additional bioaccumulation of selenium in Delta aquatic life and aquatic-dependent birds in and near the created habitats that would adversely affect beneficial uses for several reasons. First, the CMP tidal habitats would not involve actions that increase selenium loading, thus would not greatly increase selenium concentrations in the study area waterbodies. Second, modeled water and fish tissue selenium concentrations, with the exception of sturgeon in the western Delta during low flows, are below levels of concern. Third, the CMP tidal habitats would contain a very small fraction of all Delta primary production, thus would have little, likely immeasurable, effects on average selenium levels in phytoplankton or aquatic-dependent wildlife and fish throughout the Delta. Fourth, it is not certain that the magnitude of greater residence time in the restoration tidal habitats would result in measurably higher (i.e., significantly greater) average selenium bioaccumulation into phytoplankton within the tidal habitats as compared to other wetted habitats throughout the Delta. Nor is it certain that changes to selenium forms or concentrations in algae, should they occur in the tidal habitats, would result in statistically significant increases in average selenium concentrations in aquatic-dependent wildlife and fish in those habitats. Even if this were to occur at some of the tidal habitats where tidal water exchange rates were low, their total acreage would not be of sufficient magnitude or geographic extent to affect average selenium levels in phytoplankton or aquatic-dependent wildlife and fish within the northern Delta, or across the Delta. Furthermore, the tidal habitats would have tidal exchange of water and are unlikely to have increased residence times compared to adjacent habitats such that there would be measurably higher bioaccumulation into phytoplankton within the tidal habitats.

Selenium is CWA Section 303(d)-listed for impairments in Suisun Bay and San Francisco Bay. Nevertheless, as described above, the CMP tidal habitat would not be expected to measurably increase selenium concentrations, including the most bioavailable forms, in Delta outflow due to the comparably limited acreage of tidal habitat to be created. This coupled with the large tidal exchanges in these bays would result in negligible, likely immeasurable, changes in selenium concentrations and forms in Suisun Bay and San Francisco Bay.

Based on the above discussion, the CMP would result in negligible, if any, change in selenium in study area waterbodies relative to existing conditions. As such, the CMP would not cause additional exceedance of applicable selenium water quality criteria/objectives by frequency, magnitude, and geographic extent that would result in adverse effects on any beneficial uses of any study area waterbodies. Because selenium concentrations are not expected to increase markedly, the CMP would not cause long-term degradation of selenium in study area waterbodies that would result in markedly increased risk for adverse effects on any beneficial uses. Furthermore, the CMP would not increase selenium concentrations by frequency, magnitude, and geographic extent to cause measurably higher body burdens of selenium in aquatic organisms that result in increasing the health risks to wildlife (including fish) or humans consuming those organisms. Finally, the CMP would not further degrade selenium concentrations by measurable levels on a long-term basis in any study area waterbody on the state's CWA Section 303(d) list such that beneficial use impairment would be made discernibly worse.

Based on these findings, the effects on selenium resulting from compensatory mitigation under all action alternatives does not appear to be significant.

Impact WQ-11: Effects on Pesticides Resulting from Compensatory Mitigation

No Action Alternative

No marked changes in Delta pesticide concentrations would occur under the No Action Alternative, relative to existing conditions. Pesticide use in the Sacramento River and San Joaquin River watersheds would continue separate from facility operations. Current pesticide control programs, including TMDLs and Central Valley RWQCB amendments to the *Water Quality Control Plan for Sacramento River and San Joaquin River Basins to Establish Salinity Water Quality* for the control of diazinon, chlorpyrifos, and pyrethroids will continue to minimize past pesticide-related impairments and prevent potential future impairments in surface waters, including inflows to the Delta and Delta waters.

All Action Alternatives

Herbicides would be applied for site preparation to remove nonnative vegetation and to support establishment of new plantings as part of implementation of the CMP. Natural habitats contribute fewer pesticides to receiving waters than agricultural areas where pesticides are applied. Any newly created wetlands or enhanced natural habitat could also filter stormwater to remove solids and either improve or have no effect on pesticide concentrations in discharges to receiving waters, relative to the No Action Alternative. As such, restoration areas are expected to somewhat reduce, rather than increase, runoff of pesticides in adjacent waterbodies. Therefore, this impact does not appear to be significant.

Impact WQ-12: Effects on Trace Metals Resulting from Compensatory Mitigation

No Action Alternative

Trace metals concentrations under the No Action Alternative would differ negligibly from concentrations that occur under existing conditions. Because of the similarity of metals concentrations across the source waters and that 95th percentile concentrations are less than water quality criteria, more frequent exceedances of aquatic life criteria for aluminum, copper, cadmium, chromium, lead, nickel, silver, and zinc in the Delta would not occur under the No Action Alternative. Further, no mixing of Delta source waters could result in a concentration of arsenic, aluminum, iron, and manganese greater than the highest source water concentration, and given that the average water concentrations for these metals do not exceed water quality criteria, more frequent exceedances of drinking water criteria in the Delta would not occur under the No Action Alternative.

All Action Alternatives

Natural habitats contribute fewer trace metals to receiving waters than agricultural or urban areas. Any newly created wetlands or enhanced habitat created under the CMP would also filter stormwater to remove solids and either improve or have no effect on trace metal concentrations, relative to the No Action Alternative. Compensatory mitigation would not result in markedly higher trace metal concentrations in the Delta, Suisun Marsh, Suisun Bay, San Francisco Bay, or SWP/CVP export service areas. Therefore, this impact does not appear to be significant.

Impact WQ-13: Effects on Turbidity/Total Suspended Solids Resulting from Compensatory Mitigation

No Action Alternative

TSS and turbidity levels under the No Action Alternative could increase relative to existing conditions throughout the Delta. This potential increase is based on a recent study that projects climate change will cause increases in large precipitation events that will drive flow increases and subsequently cause more sediment to be deposited within the Delta over the next century. As such, sediment loading from Delta tributary inflows may increase under the No Action Alternative, relative to existing conditions.

All Action Alternatives

Natural habitats containing banks covered with vegetation tend to be a sink (i.e., trap) for TSS and turbidity, while runoff from agricultural and urban areas tend to be sources of TSS and turbidity. Any newly created wetlands or enhanced habitat created under the CMP would also filter stormwater to remove solids and either improve or have little to no effect on TSS and turbidity, relative to the No Action Alternative. Compensatory mitigation would not result in markedly higher TSS or turbidity in the Delta, Suisun Marsh, Suisun Bay, San Francisco Bay, or SWP/CVP export service areas. Therefore, this impact does not appear to be significant.

Impact WQ-14: Effects on Cyanobacteria Harmful Algal Blooms (CHABs) Resulting from Compensatory Mitigation

No Action Alternative

CHABs would be expected to occur with similar or greater frequency throughout the study area for the No Action Alternative, relative to existing conditions. With climate change associated with the No Action Alternative in 2040, there would be the potential for earlier *Microcystis* bloom initiation in Delta waters and also the potential for more frequent large blooms. This would be driven by climate change that would increase water temperatures in the Lower Sacramento River, San Joaquin River, and Delta. Higher water temperatures earlier in the year could enable *Microcystis* and other cyanobacteria blooms to begin occurring more often in the Delta in June rather than July as is typical under existing conditions. Cyanobacteria also have a competitive advantage over other algae at higher water temperatures, particularly those at or above 25°C (77°F). To the extent that future climate change leads to lower inflows to the Delta from the Sacramento and San Joaquin Rivers, such effects would be expected to result in longer residence times for various areas in the Delta, which also would further favor larger cyanobacteria blooms in areas of the Delta where residences times are longest (e.g., Discovery Bay, Franks Tract, Mildred Island, Stockton Deep Water Ship Channel).

All Action Alternatives

Implementation of the CMP, namely the creation of tidal habitats in the North Delta Habitat Arc (i.e., especially the areas within the lower Yolo Bypass and Cache Slough) that would be hydrodynamically connected to Delta channels, could create new areas where water residence time and water temperatures would be sufficiently high to support *Microcystis* and other CHABs, where such blooms do not currently exist. The other types of compensatory mitigation (i.e., valley/foothill riparian, freshwater emergent perennial wetland, seasonal wetland, lake/pond) would be located on Bouldin Island and not hydrodynamically connected with Delta channels. As such, these other types of new habitats would not affect CHAB formation within the Delta, relative to the No Action Alternative.

It should be noted that cyanobacteria are ubiquitous within the Delta as part of the overall phytoplankton community. As such, cyanobacteria would be present within any newly created tidal habitat. The issue is not one of presence/absence of cyanobacteria at these new tidal habitats but rather whether the new tidal habitat sites provide highly suitable conditions for CHABs. This is important because high amounts of cyanobacteria biomass (i.e., blooms) are often accompanied by sufficiently high cyanotoxin levels to pose risks of adverse effects, and even mortality, on aquatic life and wildlife using and feeding in these habitats or immediately adjacent Delta waters that receive flushing from these habitats. There are five environmental factors (i.e., water temperature, channel velocities and associated turbulence/mixing, residence time, nutrients, and water clarity and its effects on irradiance) that provide favorable conditions for CHAB development. These environmental factors are considered in the discussion below to assess whether the new tidal habitat sites would provide highly suitable conditions for CHABs, relative to existing conditions.

The new tidal habitats would be located within the North Delta Habitat Arc, especially those areas within the lower Yolo Bypass and Cache Slough Complex, which was chosen, in part, because it is a region that is less likely to support CHABs (ESA 2022:5).

CHABs are also not problematic in the Cache Slough or Yolo Bypass regions even though the areas are characterized as freshwater habitat (i.e., ~0 ppt). Depending on the specific location within Cache Slough, residence time ranges from 0 to 20 days (Downing et al. 2016:13, 387) while median summer temperatures are above 20°C (69°F) (ESA 2022:7). Similarly, just upstream of Cache Slough in the Sacramento Deep Water Ship Channel, median water temperatures exceed 23°C (73°F) and residence time ranges from 20 to 50 days (Downing et al. 2016:13387; ESA 2022:7). Although both locations have water temperature and residence time that are sufficient to support CHABs, neither location has a history of CHABs. In fact, visual observations of *Microcystis* occurrence collected by the applicant and California Department of Fish and Wildlife during their fish and water quality surveys at discrete stations throughout the Delta from 2007 to 2019 show little to no *Microcystis* in the water column of the Deep Water Ship Channel (ESA 2022:5). Similarly, just downstream in Cache Slough, visual observations of *Microcystis* are generally low (ESA 2022:5). The only times visual observations (i.e., ranked 4 on a scale of 0 to 5 with 5 being the highest) of *Microcystis* were high in Cache Slough was in the drought years of 2015 and 2016. Further analysis of the visual observation data in the Cache Slough region show that the frequency of *Microcystis* occurrence is low (ESA 2022:5). Although the exact reasons why CHABs are not problematic in the Cache Slough region remain unknown, water residence time and gradients in mixing likely control the phytoplankton community within Cache Slough (Stumpner et al. 2020:1, 13).

There is some uncertainty related to the design of the wetlands (e.g., depth, amount of aquatic vegetation, and exact location). However, design of the tidal habitat would consider hydrologic regime and channel morphology (backwater areas with low velocities and high residence time can create conditions that foster CHABs) to help ensure potential effects related to CHABS are minimized. As such, newly created tidal habitats would have daily tidal flushing to ensure no marked increase in residence time, relative to existing conditions. Although tidal habitats would be designed to reduce potential for CHAB formation, it is possible that along the edges of the new tidal habitat there could be small areas of increased residence time, elevated water temperatures, decreased water column turbulence and mixing, and turbidity (which affects irradiance). Depending on the vegetation in the tidal habitat, there could be some increased nutrient concentrations (from decomposing vegetation). However, the presence of vegetation would generally decrease the potential for CHAB formation because plants would likely outcompete cyanobacteria for nutrients and sunlight.

Although there are some characteristics of the newly created tidal habitats that could increase residence time and water temperatures along the margins, implementation of the CMP is not expected to cause substantial additional *Microcystis* or other cyanobacteria production for the following reasons. First, tidal restoration sites would be sited in areas of the North Delta Habitat Arc where conditions are not conducive to CHAB formation. Second, the design of the tidal habitats is such that there would be daily hydrologic exchange that would ensure that there would not be substantially increased residence time compared to adjacent habitats. Third, if the tidal habitats were to be located in Cache Slough, the mixing gradients and residence time would continue to prevent substantial cyanobacteria production.

Based on the above findings, under all action alternatives the effects on CHABs resulting from compensatory mitigation does not appear to be significant.

Impact WQ-15: Risk of Release of Pollutants from Inundation of Project Facilities

No Action Alternative

There would be no effect on the risk of release of pollutants from inundation of water-conveyance facilities because there would be no new conveyance facilities under the No Action Alternative.

All Action Alternatives

The action alternatives water-conveyance facilities would be designed to accommodate the 200-year flood event, including anticipated sea level rise. Thus, the action alternatives would pose a low risk of releasing facility-related pollutants upon water-conveyance facility inundation and the impact does not appear to be significant.

The compensatory mitigation would be situated in areas where flooding could occur; however, these areas would not be a substantial source of pollutants to adjacent waterways. Any pollutants, such as mercury or herbicides that could potentially be released from the compensatory mitigation sites into adjacent waterways, would be at sufficiently low levels and loads. Therefore, the risk of release of pollutants from inundation of project facilities under all action alternatives does not appear to be significant.

Impact WQ-16: Effects on Drainage Patterns as a Result of Project Facilities

No Action Alternative

There would be no effect on drainage patterns because there would be no new conveyance facilities under the No Action Alternative.

All Action Alternatives

While the action alternatives would result in substantial alteration of drainage patterns on lands used for construction and water-conveyance facilities, the drainage modifications would not result in substantial on-site or off-site erosion. Moreover, construction would not contribute substantial additional sources of polluted runoff or cause siltation or pollution to enter one or more affected waterbodies at levels and frequency that would adversely affect one or more beneficial use.

While there would be reconfiguration of land to implement the compensatory mitigation, which would thereby change site drainage patterns, there would be no new impervious areas created. Thus, the compensatory mitigation would not result in substantial on-site or off-site erosion, contribute substantial additional sources of polluted runoff, or cause siltation or pollution to enter one or more affected waterbodies at levels and frequency that would adversely affect one or more beneficial use. Therefore, the effects on drainage patterns from construction of project facilities under all action alternatives does not appear to be significant.

Impact WQ-17: Consistency with Water Quality Control Plans

No Action Alternative

There would be no effect on consistency with water quality control plans because there would be no new conveyance facilities under the No Action Alternative.

All Action Alternatives

Construction of the action alternatives would be subject to meeting applicable water quality objectives in these Water Quality Control Plans (WQCPs). Implementation of WQCP requirements for construction activities would be achieved through various permits that would be required, such as the State Water Board's NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (Order 2009-0009-DWQ/NPDES Permit CAS000002) and CWA Section 401, Water Quality Certifications issued for Section 404 permits.

Construction of the compensatory mitigation would be subject to meeting applicable water quality objectives in applicable WQCPs, with implementation achieved through various permits that would be required. Therefore this impact does not appear to be significant.

3.21.2.3 Cumulative Analysis

The cumulative effects analysis for water quality considers past, present, and reasonably foreseeable future projects and programs in combination with the effects of the action alternatives. Future water quality conditions in the study area are expected to be different from existing conditions as a result of the cumulative effects of past, present, and reasonably foreseeable future projects, population growth, climate change, and changes in water quality regulations. The cumulative water quality effects of the plans, policies, and programs will vary, with some having the potential to contribute to degradation of water quality, whereas others will improve water quality in certain areas. Population growth may produce increased constituent loadings to surface waters through increased urban stormwater runoff and increased treated wastewater discharges. Climate change is anticipated to cause salinity increases in the western and southern Delta due to sea level rise. Conversely, changes in water quality regulations, such as restrictions on urban stormwater runoff, completion of TMDLs to lessen or eliminate existing beneficial use impairments through improved water quality, more restrictive regulations on publicly owned treatment works discharges, new or more restrictive water quality objectives in RWQCB WQCPs, generally are in a direction that will result in improvements in water quality.

Table 3.21-2 summarizes reasonably foreseeable plans, policies, and programs included in the cumulative analysis, and resulting effects on water quality.

1 **Table 3.21-2. Plans, Policies, and Programs Included in the Cumulative Analysis**

Program/Project	Agency	Status	Description of Program/Project	Effects on Water Quality
Regulatory-, Discharge-, and Source Control-Related Actions				
SRWTP Facility Upgrade Project (EchoWater Project)	Regional San	Final EIR certified September 2014; construction has been initiated	Upgrade existing secondary treatment facilities to advanced unit processes including improved nitrification/ denitrification and filtration.	Reduced discharge concentration and mass of many constituents in wastewater to Sacramento River. The applicant will not rely on Regional San's wastewater discharges to meet Project obligations.
Regional Wastewater Control Facility Modifications Project	City of Stockton	Final certified March 2019; construction has been initiated	Modifications to various unit processes including improved nitrification/ denitrification.	Reduced discharge concentration of nitrate plus nitrite in wastewater to San Joaquin River. The applicant will not rely on Stockton's wastewater discharges to meet Project obligations.
Sacramento Stormwater Quality Partnership	Sacramento County, Sacramento, Citrus Heights, Elk Grove, Folsom, Galt, and Rancho Cordova	Ongoing and future actions	Development and implementation of federal stormwater compliance programs.	Reduced discharge concentration and mass of many constituents in stormwater to Sacramento River.
San Joaquin County, Stockton, and Tracy Stormwater Management Programs	San Joaquin County, Stockton, Tracy, and the State Water Board	Ongoing and future actions	Development and implementation of federal stormwater compliance programs.	Reduced discharge concentration and mass of many constituents in stormwater to San Joaquin River.
Yolo County Stormwater Management Program	Yolo County, Public Works Division	Ongoing and future actions	Development and implementation of federal stormwater compliance programs.	Reduced discharge concentration and mass of many constituents in stormwater to Yolo Bypass.
Irrigated Lands Regulatory Program	Central Valley RWQCB	Ongoing and future actions	Prevent agricultural discharges from impairing the waters that receive runoff.	Reduced discharge concentration and mass of many constituents in agricultural drainage to the Delta and tributaries.
Grassland Bypass Project, 2010–2019	Reclamation and San Luis & Delta-Mendota Water Authority	Ongoing and future actions	Agricultural drainage management actions to reduce selenium discharges.	Goal is regulatory compliance for reduced selenium discharges to San Joaquin River.
Agricultural Drainage Selenium Management Program Plan	Reclamation and San Luis & Delta-Mendota Water Authority	Ongoing and future actions	Agricultural drainage management actions to reduce selenium discharges.	Goal is regulatory compliance for reduced selenium discharges to San Joaquin River.
American River Methylmercury TMDL	Central Valley RWQCB	Ongoing and future actions	Regulatory and implementation actions to achieve compliance with water quality objectives.	Goal is reduced source loading of mercury and methylmercury formation.

Program/Project	Agency	Status	Description of Program/Project	Effects on Water Quality
Cache Creek, Bear Creek, Sulphur Creek, and Harley Gulch Mercury TMDL	Central Valley RWQCB	Ongoing and future actions	Regulatory and implementation actions to achieve compliance with water quality objectives.	Goal is reduced source loading of mercury and methylmercury formation.
Central Valley Diuron TMDL	Central Valley RWQCB	Ongoing and future actions	Regulatory and implementation actions to achieve compliance with water quality objectives.	Goal is reduced source loading of diuron pesticide.
Central Valley Diazinon and Chlorpyrifos TMDL	Central Valley RWQCB	Ongoing and future actions	Regulatory and implementation actions to achieve compliance with water quality objectives.	Goal is reduced source loading of diazinon and chlorpyrifos pesticide.
Central Valley Salt and Nitrate Control Program	Central Valley RWQCB	Ongoing and future actions	Regulatory and implementation actions to achieve compliance with water quality objectives.	Goal is reduced source loading of salt to surface water and groundwater, and loading of nitrate to groundwater.
Clear Lake Mercury TMDL	Central Valley RWQCB	Ongoing and future actions	Regulatory and implementation actions to achieve compliance with water quality objectives.	Goal is reduced source loading of mercury and methylmercury formation.
Clear Lake Nutrients TMDL	Central Valley RWQCB	Ongoing and future actions	Regulatory and implementation actions to achieve compliance with water quality objectives.	Goal is reduced source loading of nutrients.
Sacramento and Feather Rivers Diazinon TMDL	Central Valley RWQCB	Ongoing and future actions	Regulatory and implementation actions to achieve compliance with water quality objectives.	Goal is reduced source loading of diazinon pesticide.
Sacramento County Urban Creeks Diazinon and Chlorpyrifos TMDL	Central Valley RWQCB	Ongoing and future actions	Regulatory and implementation actions to achieve compliance with water quality objectives.	Goal is reduced source loading of diazinon and chlorpyrifos pesticide.
Sacramento River (Upper) Cadmium, Copper, and Zinc TMDL	Central Valley RWQCB	Ongoing and future actions	Regulatory and implementation actions to achieve compliance with water quality objectives.	Goal is reduced source loading of cadmium, copper, and zinc.
Sacramento–San Joaquin Delta Methylmercury TMDL	Central Valley RWQCB	Ongoing and future actions	Regulatory and implementation actions to achieve compliance with water quality objectives.	Goal is reduced source loading of mercury and methylmercury formation.
Sacramento–San Joaquin Delta Diazinon and Chlorpyrifos TMDL	Central Valley RWQCB	Ongoing and future actions	Regulatory and implementation actions to achieve compliance with water quality objectives.	Goal is reduced source loading of diazinon and chlorpyrifos pesticide.
Salt Slough Selenium TMDL	Central Valley RWQCB	Ongoing and future actions	Regulatory and implementation actions to achieve compliance with water quality objectives.	Goal is reduced source loading of selenium.
San Joaquin River Dissolved Oxygen TMDL	Central Valley RWQCB	Ongoing and future actions	Regulatory and implementation actions to achieve compliance with water quality objectives.	Goal is reduced source loading of oxygen-demanding substances.

Program/Project	Agency	Status	Description of Program/Project	Effects on Water Quality
San Joaquin River Diazinon and Chlorpyrifos TMDL	Central Valley RWQCB	Ongoing and future actions	Regulatory and implementation actions to achieve compliance with water quality objectives.	Goal is reduced source loading of diazinon and chlorpyrifos pesticide.
San Joaquin River Salt and Boron TMDL	Central Valley RWQCB	Ongoing and future actions	Regulatory and implementation actions to achieve compliance with water quality objectives.	Goal is reduced source loading of salts and boron.
San Joaquin River Selenium TMDL	Central Valley RWQCB	Ongoing and future actions	Regulatory and implementation actions to achieve compliance with water quality objectives.	Goal is reduced source loading of selenium.
Central Valley Pyrethroid Pesticide TMDL	Central Valley RWQCB	Ongoing and future actions	Regulatory and implementation actions to achieve compliance with water quality objectives.	Goal is reduced source loading of pesticides.
Central Valley Organochlorine Pesticide TMDL	Central Valley RWQCB	Ongoing and future actions	Regulatory and implementation actions to achieve compliance with water quality objectives.	Goal is reduced source loading of legacy organochlorine pesticides.
Stockton Urban Waterbodies Pathogen TMDL	Central Valley RWQCB	Ongoing and future actions	Regulatory and implementation actions to achieve compliance with water quality objectives.	Goal is reduced source loading of pathogens in urban stormwater runoff.
Sulphur Creek Mercury TMDL	Central Valley RWQCB	Ongoing and future actions	Regulatory and implementation actions to achieve compliance with water quality objectives.	Goal is reduced source loading of mercury and methylmercury formation.
Biological Opinion for the Reinitiation of Consultation on the Coordinated Operations of the Central Valley Project and State Water Project	USFWS, Reclamation	Ongoing and future actions	Actions and operations to protect endangered fish, including coldwater pool management, real-time operations adaptive management, and hatcheries investments.	Actions may affect seasonal and long-term Delta water quality conditions.
Biological Opinion for the Reinitiation of Consultation on the Coordinated Operations of the Central Valley Project and State Water Project	U.S. Department of Commerce, NMFS, Reclamation	Ongoing and future actions	Actions and operations to protect endangered fish, including coldwater pool management, real-time operations adaptive management, and hatcheries investments.	Actions may affect seasonal and long-term Delta water quality conditions.
Restoration Actions				
Franks Tract Restoration ("Futures")	CDFW	Proposed	Habitat enhancement plan for Franks Tract in the Delta	Goal is for plan to achieve Delta water quality objectives.
Ecosystem Restoration Program Conservation Strategy	CDFW	Ongoing	Actions to address the critical environmental conditions in the Delta and Suisun Marsh/Bay including Delta flows and habitat restoration.	Changes in tidal prism and salinity patterns; potential incremental increase methylmercury formation and contribution to Delta load.

Program/Project	Agency	Status	Description of Program/Project	Effects on Water Quality
Suisun Marsh Habitat Management, Preservation, and Restoration Plan	CDFW, USFWS, Reclamation, and Suisun Marsh Charter Group	Ongoing	Seasonal wetland and tidal marsh restoration actions in Suisun Marsh.	Changes in tidal prism and salinity patterns; potential incremental increase methylmercury formation and contribution to Delta load.
Dutch Slough Tidal Marsh Restoration Project	DWR	Final EIR certified September 2014	Seasonal wetland and tidal marsh restoration actions in western Delta.	Changes in tidal prism and salinity patterns; potential incremental increase methylmercury formation and contribution to Delta load.
Cache Slough Area Restoration	DWR and CDFW	Ongoing and future actions	Enhancement and restoration of existing and potential open water, marsh, floodplain and riparian habitat in northern Delta.	Changes in tidal prism and salinity patterns; potential incremental increase methylmercury formation and contribution to Delta load.
Liberty Island Conservation Bank	Reclamation District 2093	Ongoing	Tidal marsh restoration project in southern Yolo Bypass.	Changes in tidal prism and salinity patterns; potential incremental increase methylmercury formation and contribution to Delta load.
California Water Action Plan and California Water Action Plan Update 2016	CNRA, CDFA, and CalEPA	Initiated in January 2014	This plan lays out a roadmap for actions that would fulfill 10 key themes. In addition, the plan describes certain specific actions and projects that call for improved water management throughout the state.	Actions implemented may affect seasonal and long-term Delta water quality conditions.
California EcoRestore	DWR	Initiated in 2015	Implements a suite of actions for up to 30,000 acres of fish and wildlife habitat restoration and enhancement in the Delta, Suisun Marsh, and Yolo Bypass.	Potential for effects on water quality at various Delta locations related to changes in hydrodynamics near restoration actions.

CalEPA = California Environmental Protection Agency; CDFA = California Department of Food & Agriculture; CDFW = California Department of Fish and Wildlife; Central Valley RWQCB = Central Valley Regional Water Quality Control Board; CNRA = California Natural Resources Agency; DWR = California Department of Water Resources; SRWTP = Sacramento Regional Wastewater Treatment Plant; EIR = environmental impact report; NMFS = National Marine Fisheries Service; Reclamation = Bureau of Reclamation; Regional San = Sacramento Regional County Sanitation District; SRCSD = Sacramento Regional County Sanitation District; State Water Board = State Water Resources Control Board; TMDL = total maximum daily load; USFWS = U.S. Fish and Wildlife Service.

Facility Construction

Construction of all action alternatives, which could occur over an approximately 14-year period, could result in effects on water quality due to the numerous construction-related activities that would occur adjacent to and within the Delta. Although construction activities could occur over many years, each individual construction component, and its potential effects on water quality, would be temporary in nature. Hence, construction-related effects could cumulate with effects from other projects, but would do so temporarily, during the duration of the effect, and would not do so over longer periods of time like permanent effects tend to do. Moreover, environmental commitments and construction best management practices, discussed further below, would minimize construction-related effects on water quality.

Construction of new water-conveyance facilities under all action alternatives could result in periodic and temporary elevated turbidity/TSS levels in surface waters adjacent to construction activities due to the erosion of disturbed soils and associated sedimentation entering Delta waterways or other construction-related wastes (e.g., concrete, asphalt, cleaning agents, paint, and trash). In addition, the use of heavy earthmoving equipment adjacent to Delta waterways may result in spills and leakage of oils, gasoline, diesel fuel, and related petroleum contaminants used in the fueling and operation of such construction equipment. The extensive construction activities that would be necessary to implement the new conveyance facilities would involve a variety of land disturbances in the Delta including vegetation removal; grading and excavation of soils; establishment of roads, bridges, staging, and storage areas; in-water sediment dredging and dredge material storage; and hauling and placement or disposal of excavated soils and dredge materials.

Construction of individual action alternative components (e.g., north Delta diversion intakes and fish screens) would involve site preparation and earthwork immediately adjacent to a waterbody. As such, their construction would include water quality protection actions in the form of environmental commitments (Appendix C1, *Environmental Commitments and Best Management Practices*) and related water quality protection actions issued in agency permits required for construction and operation of facilities. Such actions would include SWPPPs that would minimize erosion of soils into waterbodies and would minimize/eliminate the direct spilling of earthmoving equipment fuels, oils, and other construction materials into waterbodies, thus minimizing any effects on water quality in adjacent waterbodies. Other water quality protection actions issued in agency permits would include those in the State Water Board's NPDES General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities (Order 2009-0009-DWQ/NPDES Permit CAS000002), project-specific waste discharge requirements or CWA Section 401 water quality certification from the appropriate RWQCB, California Department of Fish and Wildlife Streambed Alteration Agreements, and CWA Section 404 dredge and fill permits. The implementation of construction-related environmental commitments (Appendix C1, *Environmental Commitments and Best Management Practices)* and abiding by agency-issued permits needed for construction activities will reduce potential construction-related water quality effects in the Delta. Thus, construction activities associated with the action alternatives would not contribute considerably to any cumulative water quality condition in the Delta.

Facility Operations

Based on existing conditions and factors affecting constituent concentrations, the cumulative conditions for constituents in the Delta, Suisun Marsh, Suisun Bay, San Francisco Bay and the SWP/CVP export service areas would have varying degrees of accumulation and effects dependent upon the location. For more information on the cumulative effects of operations, refer to Delta Conveyance Project Draft EIR Chapter 9, *Water Quality* (California Department of Water Resources 2022).

Compensatory Mitigation

Wetland habitats to be constructed in the Delta are known to methylate mercury at higher rates than most other aquatic habitats. Hence, the creation of the compensatory mitigation wetlands, including tidal habitats, would be expected to contribute to additional mercury methylation and bioaccumulation of mercury in the wetlands themselves and adjacent Delta waters.

Mitigation Measure WQ-6: *Develop and Implement a Mercury Management and Monitoring Plan,* would be implemented with the goal to minimize generation of methylmercury within compensatory mitigation sites.

3.22 Water Supply

The large-scale operation of the SWP, including the facilities proposed in the action alternatives, is outside USACE authority under Section 408, Section 404, and Section 10. Therefore, while the effects of operations of the action alternatives are discussed briefly and qualitatively in this Draft EIS, a more in-depth analysis of operations and associated effects on the environment is provided in the Delta Conveyance Project Draft EIR (California Department of Water Resources 2022).

For a full analysis of effects as a result of operations, please see Delta Conveyance Project Draft EIR, Chapter 6, *Water Supply* (California Department of Water Resources 2022). Descriptions of estimated changes to water supply resources are presented in the Delta Conveyance Project Draft EIR to provide a basis for understanding potential effects on other resource areas.

Water deliveries associated with the Delta Conveyance Project are beyond the scope of USACE and water diversions are dependent on several factors not under the control or influence of USACE. Information regarding the amounts of water delivered by the state can be found at the following website: https://water.ca.gov/Library/Modeling-and-Analysis/Central-Valley-models-and-tools/CalSim-3/DCR2021.

3.22.1 Affected Environment

Water supplies and approaches to water supply management vary significantly throughout California depending on supply sources and various urban, agricultural, and environmental water needs. The general study area for the water supply analysis includes the Delta region, areas upstream of the Delta region (if modeling indicates a potential change as a result of implementation of the action alternatives), and the SWP and CVP export service areas (i.e., areas that receive water from the Delta watershed that is delivered by the Harvey O. Banks [Banks Pumping Plant], C. W. "Bill" Jones Pumping Plants [Jones Pumping Plant], or the North Bay Aqueduct). The Delta watershed includes tributary rivers that flow into the Delta from the Sacramento River and San Joaquin River Basins. In general, the Delta watershed is represented by the drainage of the Central Valley except for the Tulare Lake area. Areas outside of the Delta watershed that receive water from the Delta watershed include Tulare Lake, Solano County, Napa County, San Francisco Bay Area, Central Coast, and Southern California.

3.22.2 Environmental Consequences

3.22.2.1 Effects and Mitigation

No Action Alternative

Water supply effects are not evaluated under NEPA; therefore, an analysis of the No Action Alternative is not included in this Draft EIS. For a description of the CEQA No Project Alternative as it relates to water supply, please see Delta Conveyance Project Draft EIR Chapter 6, *Water Supply* (California Department of Water Resources 2022).

Action Alternatives

Changes in average annual water supplies based on model simulation results for the action alternatives are compared against existing conditions. Because water supply effects would result from operation of the action alternatives, the effects discussed here were compared to the existing condition, as required in CEQA. A more in-depth analysis of effects on water supply is provided in Delta Conveyance Project Draft EIR Chapter 6, *Water Supply*, and detailed results for monthly and annual changes are presented in Delta Conveyance Project Draft EIR Appendix 5A, *Modeling Technical Appendix* (California Department of Water Resources 2022).

All action alternatives would result in similar effects on water supply and are discussed together below. These descriptions are estimates of potential changes in SWP and CVP water supply that could result from implementation of the Delta Conveyance Project. As described previously, the large-scale operation of the SWP is outside USACE authority under Section 408, Section 404, and Section 10 and the changes to water supply are provided here for informational purposes for the reader. For a full analysis please see Delta Conveyance Project Draft EIR, Chapter 6 (California Department of Water Resources 2022).

Total State Water Project Deliveries

Average annual SWP deliveries have the capacity to increase from existing conditions under all action alternatives for the long-term average, dry water years, and critical water years. Modeled long-term average annual increases could be 12% for Alternatives 2b and 4b and 15% for Alternatives 1, 3, and DWR's Preferred Alternative. Increases to SWP deliveries are also possible during dry and critical water years, with models indicating a range between 9% for Alternatives 2b and 4b and 13% for Alternatives 1, 3, and DWR's Preferred Alternative.

State Water Project Table A[31] Deliveries

Average annual SWP Table A deliveries have the capacity to increase under the long-term average, dry water years, and critical water years under all action alternatives. On a long-term average, Table A deliveries could be 11% for Alternatives 2b and 4b and 13% for Alternatives 1, 3, and DWR's Preferred Alternative. During dry and critical water years, increases of Table A deliveries could be 15% for Alternatives 2b and 4b and 23% for Alternatives 1, 3, and DWR's Preferred Alternative.

State Water Project Article 56 and Article 21 Deliveries

Average annual SWP Article 56 deliveries could increase under the long-term average and dry and critical water years compared to deliveries under existing conditions. On a long-term average, Article 56 deliveries could increase between 11% for Alternatives 1, 3, and DWR's Preferred Alternative and 15% for Alternatives 2b and 4b over existing conditions. During dry and critical years, Article 56 deliveries could increase 29% for Alternatives 1, 3, and DWR's Preferred Alternative and 34% for Alternatives 2b and 4b.

Average annual SWP Article 21 deliveries could also increase under the long-term average and, depending on the action alternative, could decrease or increase under dry and critical water years compared to deliveries under existing conditions. On a long-term average, Article 21 deliveries

[31] In the 1960s, the applicant began entering into long-term water supply contracts (referred to as Table A Contracts) with 32 water districts or agencies to provide water from the SWP.

could increase 159% for Alternatives 2b and 4b, 250% for Alternatives 1 and 3, and 254% for DWR's Preferred Alternative over existing conditions. During dry and critical water years, Article 21 deliveries could decrease 6% under Alternatives 2b and 4b; however, they would remain essentially the same for Alternatives 1, 3, and DWR's Preferred Alternative.

State Water Project Feather River Service Area

No changes to annual deliveries to the SWP Feather River Service Area under the long-term average is expected when compared to existing conditions. During dry and critical water years, deliveries are expected to remain similar to existing conditions and for Alternatives 1, 2b, 3, 4b, and DWR's Preferred Alternative.

Central Valley Project Deliveries

The long-term average annual total CVP deliveries for all the action alternatives is expected to remain essentially the same. During dry and critical water years, most action alternatives could result in increases in deliveries.

CVP Settlement and Exchange Contractors do not show any change in average annual deliveries and under dry and critical dry water years as those deliveries are under water rights that are unaffected by the operations of the north Delta intakes.

Chapter 4
Other Statutory Requirements

The National Environmental Policy Act (NEPA) requires that an environmental impact statement (EIS) discuss how a proposed action and alternatives, if implemented, could induce growth. Under authority of NEPA, Council on Environmental Quality (CEQ) regulations require EISs to consider the potential indirect effects of a proposed action "that are later in time or farther removed in distance but are still foreseeable." Indirect effects "may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate and related effects on air, water and other natural systems" (40 Code of Federal Regulations [CFR] § 1508.8[b]).

This chapter provides an evaluation of potential growth inducement, considering the possibility that constructing the proposed action or any of the action alternatives could create indirect effects outside of the study area by generating demand for additional growth or by removing obstacles to additional growth in a city or county.

This chapter also provides an analysis of compliance with Executive Order 11988, Floodplain Management, requiring federal agencies to take action to reduce the risk of flood loss, restore the natural and beneficial values of floodplains, and minimize the effects of floods on human safety, health, and welfare.

4.1 Growth-Inducing Effects

This section describes the environmental setting, methods for analysis, and effects of direct and indirect growth inducement that could result from construction, operation, and maintenance of the proposed action and alternatives, and mitigation to reduce those effects.

4.1.1 Environmental Setting

Growth induced by a project should generally consider adopted local or regional land use plans. A project that is not consistent with the land use and growth management plans and policies for the area (e.g., growth beyond that reflected in adopted plans and polices) may have additional adverse secondary effects of growth beyond those previously evaluated. Local and regional land use plans are only one of several factors that local and regional growth depend upon. These other factors include the following.

- Cost of housing
- Employment opportunities
- Capacity of other public services (e.g., schools, health services, wastewater treatment facilities, availability of transportation services)
- Use constraints such as floodplains, sensitive habitat areas, and seismic risk zones

Population growth projections from 2025 through 2060 were reviewed for each county in the study area (California Department of Finance 2021). The study area consists of six counties—Sacramento, San Joaquin, Yolo, Solano, Contra Costa, and Alameda Counties. From 2025 through 2060, population growth is projected to steadily increase across the study area. The largest population is expected to remain in Alameda County throughout the period of analysis (Figure 4-1) (California Department of Finance 2021).

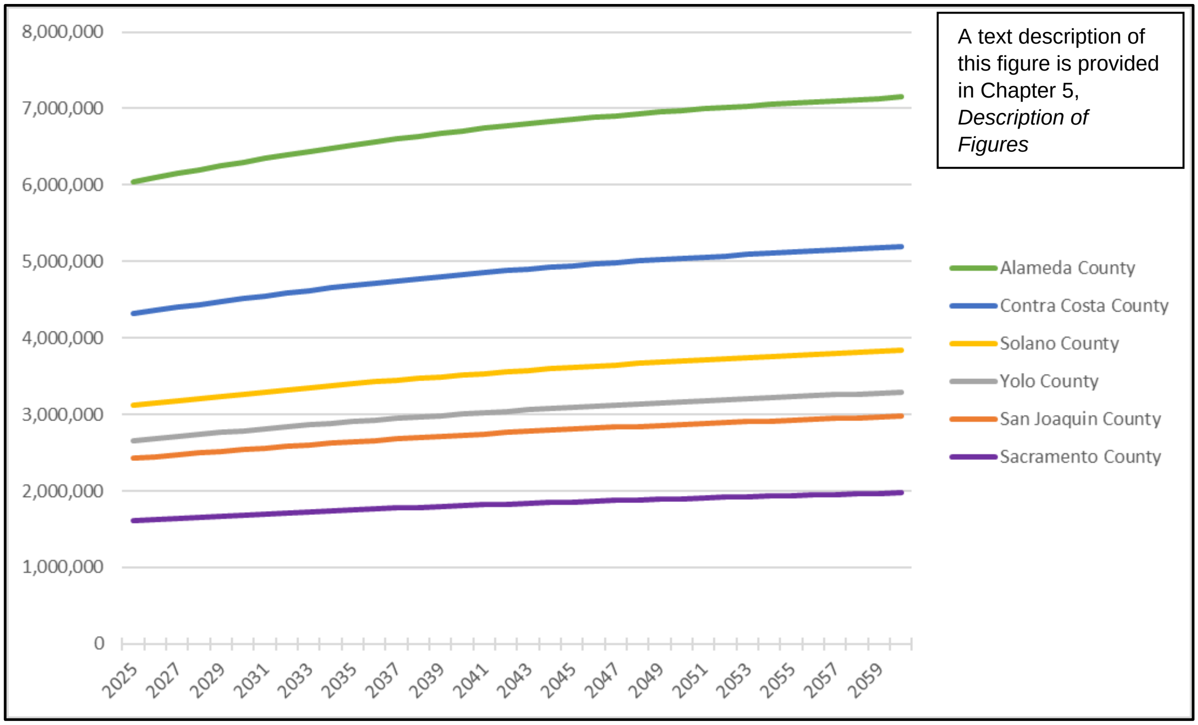


Figure 4-1. Projected Population Growth across the Study Area by County

4.1.2 Environmental Effects

This section describes the potential for direct and indirect growth inducement that could result from construction, operation, and maintenance of the action alternatives.

4.1.2.1 Methods for Analysis

Each of the action alternatives would involve the construction and operation of water-conveyance facilities. The analysis of direct growth inducement potential provided in Section 4.1.2.2, *Effects and Mitigation*, evaluated whether the action alternatives could foster economic or population growth or directly necessitate the construction of additional housing in the surrounding environment. The analysis compared the number of construction and permanent operations and maintenance jobs associated with the action alternatives with the labor force located in the Sacramento–San Joaquin River Delta (Delta) vicinity. The analysis then evaluated the capacity of the local labor force to meet project-generated employment demand. The action alternatives would not include the expansion of the State Water Project (SWP)/Central Valley Project (CVP) service area.

The action alternatives were evaluated for their potential to stimulate additional housing development and the need for services by (1) construction of new access roads in the vicinity of project facilities, thereby removing lack of roadway infrastructure as an obstacle to development and enabling growth; and/or (2) reducing the risk of flooding, thereby removing flood risk as an obstacle to development.

The action alternatives also have the potential to induce growth through the net increase (or decrease) in annual average water deliveries. Because operation of the action alternatives is not under U.S. Army Corps of Engineers (USACE) authority, growth as a result of operations is only briefly summarized here. Readers should also refer to the *Delta Conveyance Project Draft Environmental Impact Report* (Delta Conveyance Project Draft EIR) Chapter 31, *Growth Inducement* (California Department of Water Resources 2022), for additional information.

4.1.2.2 Effects and Mitigation

Direct Growth Inducement

Construction Jobs

Based on the highest projected employment needs across all action alternatives during the peak construction period, construction would require approximately 3,321 construction workers (Chapter 3, *Affected Environment and Environmental Consequences*, Section 3.17, *Socioeconomics*). Construction would take place between Sacramento and Stockton. It is expected 85% of the required construction jobs, approximately 2,823 workers, would be drawn from the labor force of five Delta counties of the project area—Contra Costa, Sacramento, San Joaquin, Solano, and Yolo[1]. This would total approximately 4% of the 71,000 construction jobs reported in 2019 in four of the five counties (Sacramento, San Joaquin, Solano, and Yolo) (California Employment Development Department 2021). Given the percent of construction jobs in relation to the area industry, it is not expected that a substantial influx of workers would be required to fill the peak workforce of 3,321 expected construction jobs because the existing labor force in the five Delta counties would be adequate for the Delta Conveyance Project.

Based on Chapter 3, *Affected Environment and Environmental Consequences*, Section 3.17, *Socioeconomics*, it is estimated up to 15% of the 3,321 workers may come from out of state and reside in the vicinity temporarily. This would mean approximately 498 workers may come from outside of the five-county Delta region during the peak construction year. As stated in Section 3.17, if needed, an estimated 79,000 vacant housing units are available to accommodate workers from outside the region who may choose to commute on a workweek basis or who may choose to relocate temporarily or permanently. This is enough to accommodate the estimated peak of 498 workers and their families who may temporarily or permanently relocate to the five-county region from outside of the area. Given the availability of housing in the project vicinity, nonlocal workers would be readily accommodated by existing facilities; therefore, the influx of workers during construction of the action alternatives would not induce substantial new housing development.

Permanent Jobs

As discussed in Chapter 3, *Affected Environment and Environmental Consequences*, Section 3.17, *Socioeconomics*, there would be a very small increase in regional economic activity as a result of operating and maintaining the action alternatives. The estimated number of workers required would be similar across the alternatives. These workers are anticipated to live in the Delta region and would represent a very small percentage total regional employment. It is likely this small number of new jobs would readily be filled by the local labor force and would not induce additional

[1] Alameda County was excluded based on proximity of the project construction footprint to the nearest potential workforce in the County (roughly 20 miles away over Altamont pass).

growth in the area. Assuming some or all jobs were specialized and required workers from outside the local labor pool, given the availability of housing in the vicinity, these workers would be readily accommodated by existing housing; therefore, the influx of these workers during operation of the action alternatives would not induce substantial new housing development.

Indirect Growth Inducement Associated with Facility Construction and Operation

Access Roads within the Project Work Area

The action alternatives would involve construction of new permanent access roads at locations within the project work area to provide access to conveyance structures and other project facilities (see Chapter 2, *Project Description and Alternatives,* for more detail). In general, construction of roads in relatively undeveloped areas has the potential to induce growth by facilitating access to such areas—that is, by removing lack of roadway infrastructure as an obstacle to growth. Permanent access roads would remain and largely be located on agricultural or open space lands. The existing roads, including Interstate (I-)5, Byron Highway, and State Route (SR) 12 and SR 4, are close to the proposed alignments and facility sites, with the majority of the permanent access roads being short segments providing a direct route between an existing road and a given project facility. Therefore, new permanent roads would not provide access to substantial areas of agricultural or undeveloped lands not already served by area roads, and the relatively limited segments of permanent access roads would not induce urban development.

Flood Risk Reduction

Project activities are not anticipated to have any substantial effect or change on potential for flooding in the study area and downstream areas (Chapter 3, *Affected Environment and Environmental Consequences;* Section 3.9, *Flood Protection;* Section 3.18, *Surface Water;* and Section 3.22, *Water Supply*). It is not expected there would be changes to land use or zoning designations in the study area; therefore, no large-scale or substantial development would be expected. It is not anticipated there would be any indirect effect of flood risk reduction on growth under any action alternative because none of the action alternatives would substantially alter levees in the study area and reduce the potential for flooding in the study area. Specifically, levee modifications on Bouldin Island and Lower Roberts Island would not change land use as to increase residential or commercial developments in those areas because the ring levee at the Twin Cities Complex would be removed after construction, and levees modifications would not increase flood protection to adjacent properties. All project facilities would be designed to be protected from the 200-year flood event and sea level rise in year 2100.

Indirect Growth Inducement Effects Associated with Increased Water Deliveries

While all action alternatives would increase the potential delivery of water south of the Delta when compared to existing conditions, the total volume of additional water is not expected to induce population growth. Rather, increased water supply is likely to be used to meet current demand. Further, increased deliveries may restore contract volumes that have been reduced because of regulatory rules and operational agreements or could be used to supplement or reduce groundwater use under the Sustainable Groundwater Management Act. Finally, there is not a strong discernable link between water deliveries and rate of population growth, and there are several factors outside of water delivery, such as housing and employment, that influence and drive population growth. For additional analysis see the Delta Conveyance Project Draft EIR Chapter 31, *Growth Inducement* (California Department of Water Resources 2022).

4.2 Irreversible and Irretrievable Commitments of Resources/Significant Irreversible Environmental Changes

As stated in 40 CFR § 1502.16 of the CEQ Regulations, a NEPA analysis must identify, as part of the environmental consequences discussion in an EIS, any irreversible or irretrievable commitments of resources that would be involved in the proposed action or reasonable alternative(s), should they be implemented.

This section fulfills the requirement to address irreversible and irretrievable commitments of resources. Irreversible commitments of resources are those that cause, through direct or indirect effects, use or consumption of resources in such a way that they cannot be restored or returned to their original condition despite mitigation, or that commit future generations to similar uses. An irretrievable commitment of resources occurs when a resource is removed or consumed. These types of effects are evaluated to ensure that consumption is justified.

All of the action alternatives would involve a commitment of a range of natural, physical, and fiscal resources as follows.

- Nonrenewable resources such as gasoline and diesel oil would be used to power construction equipment and vehicles.
- Wood products, a resource that renews slowly, would be used during construction.
- Aggregate would be needed to produce concrete for conveyance facilities and other project facilities.
- Fossil fuels would also be used to produce cement, aggregate, steel, and petroleum-based products, and other construction materials.
- Nonrenewable energy resources would be necessary to operate, trucks, pumps, and equipment used for operations and routine maintenance.
- Additional electrical power from a renewable resource would be dedicated to lighting and operations.
- Energy resources would be required to power pumps at the intakes and to transport water through the Delta.
- Land that would be physically altered by construction of the intakes, forebay, conveyance facilities, and compensatory mitigation would be committed to the new use for the foreseeable future, representing a permanent commitment of the land and decreasing the amount of land available for other uses. Depending on the action alternatives, between approximately 1,300 and 3,300 acres of land variously designated as agricultural, residential, commercial/industrial, public, and recreational/open space would be permanently altered. Access to the acquired lands would be limited to authorized personnel, and public access—including access to informal recreational sites along the Sacramento River at the intake locations—would be restricted.

- Any construction would require a substantial one-time expenditure of funds for the costs of construction, compensation for land purchases, and right-of-way/acquisition. The action alternatives would also require funding for operation and periodic maintenance in perpetuity.
- An increased commitment of public maintenance services (e.g., increased road maintenance due to increases in construction traffic, new electrical utility services, and operation and maintenance of conveyance facilities) would also be required.

Benefits of the action alternatives would consist of improved water supply reliability and water quality for water users in the SWP export service areas and greater resilience against future risks to SWP operations as a result of climate changes and seismic risks. These and other benefits are expected to outweigh the commitment of these resources.

4.3 Compliance with Executive Order 11988 – Floodplain Management

4.3.1 Executive Order 11988

Executive Order 11988 (May 24, 1977) requires federal agencies, when taking an action, to avoid short- and long-term adverse effects associated with the occupancy and alteration of floodplains, and they must avoid direct and indirect support of floodplain development whenever there is a reasonable and feasible alternative. If the only reasonable and feasible alternative involves siting an action in a floodplain, the agency must minimize potential adverse effects associated with occupancy and modification of floodplains and explain why the action is proposed in the floodplain.

In February 1978, the Water Resources Council issued *Floodplain Management Guidelines for Implementing E.O. 11988*. Executive Order 11988 guidelines were amended in 2015 to include and establish the Federal Flood Risk Management Standard (FFRMS) and a Process for Further Soliciting and Considering Stakeholder Input (now Executive Order 13690). FFRMS requires agencies to expand floodplain management from a base flood elevation to a higher vertical elevation for federally funded projects; encourage the use of natural system and ecosystem process solutions where possible; and consider climate change, resiliency, and vulnerable populations during floodplain management.

The amended EO 11988 floodplain management guidelines provide analysis of the executive order, definitions of key terms, and an eight-step decision-making process for carrying out the executive order's directives (Water Resources Council 2015). The eight-step process requires a determination of whether the action alternatives are in the base floodplain; public review of floodplain analyses; evaluation of alternatives to developing in the floodplain; identification of effects and measures to minimize them; and public disclosure of the decisions regarding floodplain development prior to implementation of the action alternatives.

The following eight-step decision-making process for carrying out the Executive Order 11988 directives provides information on the action alternatives' compliance with guidance for developing within a floodplain.

Step 1: Determine if a proposed action is in a floodplain (100-year floodplain or 1% chance flood or 500-year or 0.2% if the action falls under the definition of critical, discussed

separately below). As described in Chapter 2, *Project Description and Alternatives*, A 200-year level of flood protection would be provided for all new facilities. For levee modifications, a similar or greater level of flood protection would be required for the modified levee.

The guidelines (Part II, Decision-Making Process, Introduction) outline the parameters of critical actions and include activities that create, maintain, or extend the life of structures or facilities that produce or store highly volatile, toxic, or water-reactive materials; house sensitive or relatively immobile populations including hospitals and schools; and hold irreplaceable records, utilities, and/or emergency services (Water Resources Council 2015). To summarize, as noted in the guidelines, a critical action is "any activity for which even a slight chance of flooding is too great." Under the action alternatives, facilities to be constructed along the levees would be designed to provide flood neutrality during construction and operations. Facilities located along the levees, including temporary levees, would be designed to provide continued flood management at the same level of flood protection as the existing levees; or if applicable, to a higher standard for flood management engineering and permitting requirements if the standards are greater than the existing levee design. Levee design and engineering would be designed to accommodate the 200-year flood event with sea level rise in addition to following the most recent urban, rural, or Delta levee criteria applicable to the existing levee. In addition, the action alternatives would not create, maintain, or extend the life of facilities in the floodplain because such facilities can be built as part of the No Action Alternative. Accordingly, the action alternatives are not considered a critical action because levee modifications (described in Chapter 2, *Project Description and Alternatives*) are intended to withstand flood conditions and reduce flood risk.

Step 2: Early public review. The NEPA process provides for public disclosure; this Draft EIS is one instrument for public review of the action alternatives. As discussed in Chapter 1, *Introduction and Purpose and Need*, USACE solicited comments from the public following issuance of the Notice of Intent and provided scoping materials to the public. In light of the coronavirus disease 2019 (COVID-19) pandemic, no in-person scoping meetings were held. Appendix H, *Scoping Report,* includes a complete scoping report and copies of all comments received. Once the Draft EIS is complete, USACE is required to notify agencies and the public that it is available for review. The official notification—referred to as a Notice of Availability—is published in the *Federal Register* and is usually also printed in newspapers in the vicinity of the action alternatives and mailed to individuals who have requested it. Issuance of the Notice of Availability initiates a review period during which the lead agency receives and collates public and agency comments on the action alternatives and the EIS. In addition to public disclosure activities completed in compliance with NEPA guidelines, other processes have provided opportunities for the public to review the action alternatives. Public review was a mandated element of the California Environmental Quality Act process guiding the Delta Conveyance Project Draft EIR, which has performed extensive public scoping outreach (see Appendix F, *Public Involvement*).

Step 3: Identify and evaluate reasonable and practicable alternatives to locating in a floodplain. The alternatives screening analysis evaluated potential off-site locations for the action alternatives and concluded that there are no feasible sites that would meet the purpose and need. The nature of the action alternatives and their design requires them to be implemented along a water source within the Delta. The Delta spans numerous Flood Insurance Rate Map panels and contains several Federal Emergency Management Agency flood zones. Federal Emergency Management Agency maps indicate that much of the central Delta—essentially all of the nonurban Delta—is within Special Flood Hazard Areas and considered to be subject to inundation by the 1% annual chance flood. General engineering and environmental analyses have been performed for the action alternatives, following the identification and screening process discussed in Chapter 2, *Project Description and Alternatives*, and in Appendix D, *Alternatives Screening Analysis*.

Step 4: Identify impacts of the proposed action. This Draft EIS analyzes the environmental effects potentially resulting from the action alternatives pursuant to NEPA requirements. Environmental effects associated with the action alternatives are discussed in Chapter 3, *Affected Environment and Environmental Consequences*.

Step 5: Minimize, restore and preserve. As described above, under the action alternatives, facilities to be constructed along the levees would be designed to provide flood neutrality during construction and operations and would provide continued flood management at the same level of flood protection as the existing levees or higher. Levee design and engineering would be designed to accommodate the 200-year flood event with sea level rise in addition to following the most recent urban, rural, or Delta levee criteria applicable to the existing levee. Additionally, actions undertaken for compensatory mitigation would restore three freshwater ponds along I-5 and wetland, open water, and upland natural communities on Bouldin Island, as described in Appendix C3, *Compensatory Mitigation Plan for Special-Status Species and Aquatic Resources*. Channel margin enhancements associated with compensatory mitigation actions would likely occur along migration corridors that also provide a certain level of flood protection for adjacent properties. Channel margin restoration would improve channel geometry, similar to what is current practiced by USACE and other flood management agencies when implementing levee improvements.

Step 6: Re-evaluate alternatives. To ensure that the Draft EIS contains an appropriate range of alternatives to support compliance with Section 404 of the Clean Water Act, the alternatives development and screening approach was designed to satisfy both the Section 404(b)(1) guidelines and NEPA and its implementing regulations. Chapter 2, *Project Description and Alternatives*, provides an overview of the alternatives development and screening process. Appendix D, *Alternatives Screening Analysis,* provides additional detail.

Step 7: Findings and a public explanation. To conclude the NEPA process, a Record of Decision for the preferred alternative will be publicly issued following the Final EIS.

Step 8: Implement action. If the preferred alternative is approved, the applicant, California Department of Water Resources, intends to construct the preferred alternatives as soon as possible.

Chapter 5
Description of Figures

5.1 Introduction

Descriptions of the figures presented in the Delta Conveyance Project Draft Environmental Impact Statement (Draft EIS) and associated appendices are provided below. The U.S. Army Corps of Engineers (USACE) is committed to making this Draft EIS equally accessible for all reviewers; therefore, this Draft EIS was developed to comply with applicable accessibility laws. In furtherance of this objective and due to the complexity of certain maps, graphs, and other figures, descriptive text is included in this chapter specifically for readers who may benefit from descriptive text of figures but do not use assistive devices for screen reading. Descriptive text is not provided for graphs and figures where the same information is also provided in data tables. If you have difficulty accessing material in this Draft EIS, please contact us at mailto:DLL-DCP-EIS@usace.army.mil. This chapter is not required by NEPA and is not used to support the findings in Chapter 3 of the Draft EIS.

5.2 Chapter 1

Figure Number	Figure Title	Description of Figure
1-1	Sacramento–San Joaquin Delta	Figure 1-1 shows a map of the Delta as far south as Lathrop and Manteca and as far north as West Sacramento.

5.3 Chapter 2

Figure Number	Figure Title	Description of Figure
2-1	Project Alignments	Figure 2-1 shows the alternative alignments, (Central, Eastern, and Bethany Reservoir) and respective major facilities, including shafts, intakes, and tunnels.
2-2	Typical Intake Configuration	Figure 2-2 shows a typical intake configuration where water would flow through cylindrical tee fish screens mounted on the intake structure to a sedimentation basin before reaching the intake outlet (tunnel inlet) shaft at each site.
2-3	Schematic of Delta Conveyance Project Intake Facilities	Figure 2-3 shows the schematic of project intake facilities where water would flow through cylindrical tee fish screens mounted on the intake structure to a sedimentation basin before reaching the intake outlet (tunnel inlet) shaft at each site.

Figure Number	Figure Title	Description of Figure
2-4	Schematic of Permanent and Temporary Levees	Figure 2-4 shows the schematic of permanent and temporary levees, which would include the temporary relocation and realignment of SR 160 at the intakes.
2-5	Key Components of a Tunnel Drive (6,000-cfs alternatives)	Figure 2-5 shows the key components of a tunnel drive, including use of tunnel boring machines and construction of tunnel shafts (launch, maintenance, and reception).
2-6	Twin Cities Double Launch Shaft Plan (permanent condition)	Figure 2-6 shows the location of the double launch shaft at the Twin Cities Complex.
2-7	South Delta Pumping Plant Facilities	Figure 2-7 shows the major characteristics of the South Delta Pumping Plant Facilities.
2-8	Southern Complex on Byron Tract	Figure 2-8 shows the Southern Forebay located on Byron Tract at the southern end of the main tunnel, northwest of Clifton Court Forebay and separated from it by Italian Slough.
2-9	Schematic of Delta Conveyance Project Facilities under Alternatives 1, 2b, 3, and 4b	Figure 2-9 shows how water in the forebay would flow south into a Southern Forebay Outlet Structure and be conveyed in two tunnels to the South Delta Outlet and Control Structure.
2-10	Southern Complex West of Byron Highway (Alternatives 1, 2b, 3, and 4b)	Figure 2-10 shows the major characteristics of the Southern Complex West of Byron Highway for Alternatives 1, 2b, 2c, 4b, and 4c.
2-11	Potential Land Reclamation Areas	Figure 2-11 shows that lands to be reclaimed would be those areas used during construction.
2-12	Project Schematic Alternatives 1 and 2b	Figure 2-12 is a schematic of all central alignment features and shows the project features.
2-13	Road Modifications under Alternatives 1 and 2b	Figure 2-13 shows proposed road modifications specific to the central alignment (Alternatives 1 and 2b).
2-14	Project Schematic Alternatives 3 and 4b	Figure 2-14 shows the schematic of the conveyance facilities associated with the eastern alignment (Alternatives 3 and 4b).
2-15	Road Modifications under Alternatives 3 and 4b	Figure 2-15 shows proposed road modifications proposed for Alternative 3 and 4b.
2-16	Project Schematic DWR's Preferred Alternative, Bethany Reservoir Alignment	Figure 2-16 is a schematic diagram depicting the conveyance facilities associated with DWR's Preferred Alternative.
2-17	Bethany Reservoir Pumping Plant and Surge Basin	Figure 2-17 shows the major characteristics of the Bethany Reservoir pumping plant and surge basin.
2-18	Bethany Reservoir Aqueduct Route with Tunnel Reaches	Figure 2-18 shows the major features of the Bethany Reservoir aqueduct route and tunnel reaches.
2-19	Road Modifications under DWR's Preferred Alternative	Figure 2-19 shows the road modifications proposed for DWR's Preferred Alternative.

1 # 5.4 Chapter 3
2

Figure Number	Figure Title	Description of Figure
3.2-1	Williamson Act Parcels in the Study Area	Figure 3.2-1 shows the areas of nonrenewal in the study area.
3.2-2	Farmland Classification in the Study Area	Figure 3.2-2 shows about 65,000 acres of Grazing Land, Semi-Agricultural and Rural Commercial Land, and Farmland of Local Potential, categories that are not included in estimates of Important Farmland.
3.8-1	Environmental Justice Study Area	Figure 3.8-1 displays the study area for environmental justice which consists of the census tracts and block groups intersected by the footprint of the project.
3.8-2	Minority and Hispanic Population in the Study Area	Figure 3.8-2 depicts the places and census blocks with greater than 50% minority populations within the study area.
3.8-3	Census Tracts with 20% or More Households with Median Household Income Less Than $60,000	Figure 3.8-3 shows study area census block groups where 20% or more households have a median household income below $60,000.
3.14-1	Marine Facilities	Figure 3.14-1 illustrates the location of the commercial marine facilities and the five public access ferry services that operate within the transportation study area.
3.19-1	Project Study Area	Figure 3.19-1 shows that the study area (the area in which impacts may occur) for transportation consists of the facility construction areas, as well as the State Highway System and local roadway segments that could be affected by construction-related and operations and maintenance employee traffic activities associated with the project.
3.19-2	Railroad Facilities	Figure 3.19-2 shows railroads in the transportation study area.

3

4 # 5.5 Chapter 4
5

Figure Number	Figure Title	Description of Figure
4-1	Projected Population Growth across the Study Area by County	Figure 4-1 shows that projected population growth throughout most of the study area is charted to be slight to none through 2060.

6

7 # 5.6 Appendix A

8 No figures.

5.7 Appendix B

No figures.

5.8 Appendix C

See Delta Conveyance Project Draft EIR Chapter 39, *Descriptions of Figures*, Section 39.5, *Chapter 3*, for Chapter 3 figure text descriptions (California Department of Water Resources 2022).

5.9 Appendix C1

No figures.

5.10 Appendix C2

No figures.

5.11 Appendix C3

See Delta Conveyance Project Draft EIR Chapter 39, *Descriptions of Figures*, Section 39.5.6, *Appendix 3F,* for Appendix C3 figure text descriptions (California Department of Water Resources 2022).

5.12 Appendix D

No figures.

5.13 Appendix E

No figures.

5.14 Appendix F

No figures.

5.15 Appendix G

No figures.

5.16 Appendix H

No figures.

5.17 Appendix I1

No figures.

5.18 Appendix I2

No figures.

5.19 Appendix I3

See Delta Conveyance Project Draft EIR Chapter 39, *Descriptions of Figures*, Section 39.15.2, *Appendix 13B*, for Appendix I3 figure text descriptions (California Department of Water Resources 2022).

5.20 Appendix J

No figures.