



DEPARTMENT OF THE ARMY  
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT  
1325 J STREET  
SACRAMENTO, CA 95814-2905

## RECORD OF DECISION

**ACTION ID:** SPK-2019-00899

**PROJECT NAME:** Delta Conveyance Project

**APPLICANT:** California Department of Water Resources

This document constitutes the Record of Decision (ROD) of the U.S. Army Corps of Engineers, Sacramento District (Corps) for the Delta Conveyance Project (DCP). This ROD marks the completion of the National Environmental Policy Act (NEPA) process at a programmatic level and documents the environmental review and rationale for the Corps' path forward regarding potential, future permit decisions regarding the DCP. It is based on the analysis contained in the *Delta Conveyance Project Final Programmatic Environmental Impact Statement* (FEIS<sup>1</sup>), published in the Federal Register on November 21, 2025 (90 FR 52661<sup>2</sup>), and all supporting documents. Agency coordination and consultation and compliance with relevant environmental laws such as the National Environmental Policy Act (NEPA), Endangered Species Act (ESA), National Historic Preservation Act (NHPA), and Essential Fish Habitat (EFH) consultation under the Magnuson-Stevens Fishery Conservation and Management Act, are outlined below.

This ROD is not a final permit decision. The FEIS is a programmatic document that analyzes the broad environmental impacts of corridor-level alternatives. Final permit decisions for specific project components (e.g., a particular intake, a bridge crossing) are contingent upon subsequent, site-specific evaluations. As detailed engineering designs become available, the applicant, California Department of Water Resources (DWR) must provide complete applications for each proposed activity requiring Department of the Army (DA) authorization. The Corps will then conduct tiered, project-level reviews, which may include supplemental NEPA documentation, to ensure compliance with all applicable laws and regulations, including Section 404(b)(1) of the Clean Water Act (CWA).

### 1. INTRODUCTION AND OVERVIEW

Information about the proposed project, subject to one or more of the Corps' regulatory authorities, is provided in Section 1. The Corps' scope of analysis can be found in Section 2; framework for future permit evaluations in Section 3; purpose and need in Section 4; and alternatives discussion in Section 5. Sections 6 through 9 are

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<sup>1</sup> <https://cdxapps.epa.gov/cdx-enepa-ll/public/action/eis/details?eisId=5333>

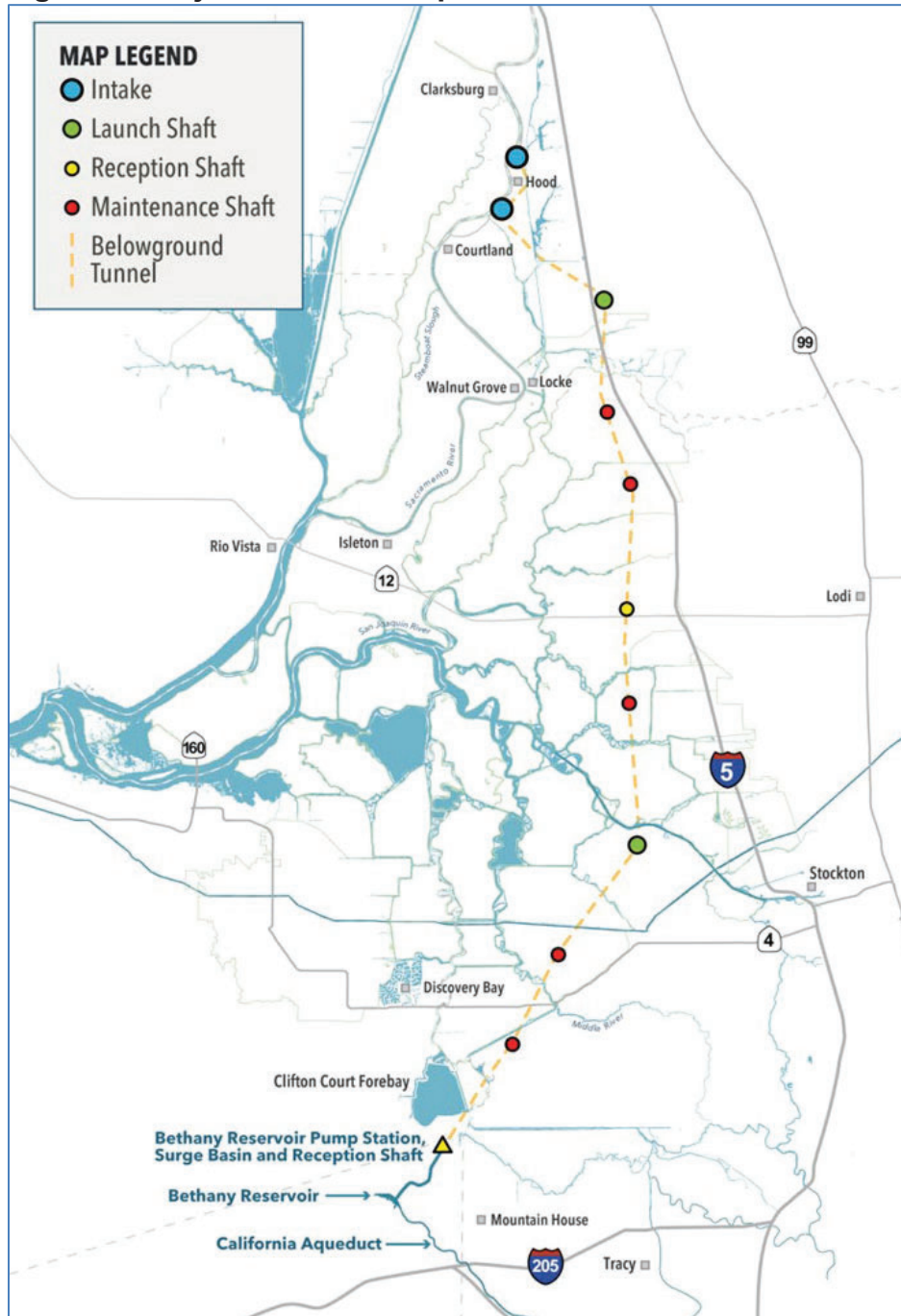
<sup>2</sup> <https://www.federalregister.gov/documents/2025/11/21/2025-20586/environmental-impact-statements-notice-of-availability>

environmental resources evaluations, including compliance with applicable laws and policy. The Corps' final framework for permit evaluations and findings are documented in Sections 10 and 11 of this ROD.

## 1.2 Activity Location

The proposed project is located in the Sacramento-San Joaquin Delta within Sacramento, San Joaquin, Contra Costa, and Alameda Counties.

**Figure 1: Project Location Map**



### **1.3 Description of Activity Requiring a Permit**

DWR submitted a permit application to the Corps on June 15, 2020, requesting a United States (U.S.) Department of the Army (DA) permit to construct and maintain the DCP (proposed action). The proposed action, as described in the FEIS, would construct new State Water Project (SWP) water diversion and conveyance facilities in the Sacramento-San Joaquin Delta to be operated in coordination with existing SWP infrastructure, creating a dual-conveyance system.

The proposed action, identified as the Bethany Reservoir Alignment (Applicant's Preferred Alternative), consists of two new 3,000 cubic feet per second (cfs) intakes on the east bank of the Sacramento River located between the communities of Hood and Courtland. Water would be diverted into a single, 45-mile-long, 36-foot-diameter tunnel. The tunnel would convey up to 6,000 cfs of water from the Sacramento River along an eastern alignment to a new Bethany Reservoir Pumping Plant and Surge Basin near the community of Mountain House, CA. From the pumping plant, water would then be conveyed through a new pipeline aqueduct to a discharge structure on the northern shore of the existing Bethany Reservoir for delivery into the SWP system.

A DA permit is required because the proposed action would involve excavating and discharging fill material into waters of the U.S. under Section 404 of the CWA and placing structures and/or working in navigable waters of the U.S. under Section 10 of the Rivers and Harbors Act of 1899 (RHA). In addition, permission from the Secretary of Army is required because the proposed action would result in permanent and/or temporary alteration(s) or use of USACE civil works projects under Section 14 of the RHA (33 U.S.C. § 408) (Section 408). A real estate outgrant pursuant to Army Regulation 405-80 *Management of Title and Granting Use of Real Property* is also required for the tunnel to cross under the Stockton Deep Water Ship Channel, a federal navigation project, in accordance with Engineer Regulation 405-1-12 *Real Estate Handbook*.

This ROD documents the conclusion of the NEPA process. It does not grant Section 408 permission, a real estate outgrant, or a Section 10/404 permit. A decision on the Section 408 request for permission will be made by the Commander of the South Pacific Division (in accordance with applicable Section 408 delegations), and any real estate or permit decisions will be made by the District Engineer through separate future actions.

### **1.4 Background and Public Involvement**

The DCP has a long regulatory history. The Corps previously acted as a cooperating agency for the California WaterFix project, which was withdrawn in 2019. For the current project, DWR released a Notice of Preparation for an Environmental Impact Report (EIR) on January 15, 2020, and conducted eight public scoping meetings. A representative from the Corps attended six of these meetings.

On August 20, 2020, the Corps issued a Notice of Intent to prepare an EIS and a Public Notice pursuant to 33 C.F.R. § 325.3, initiating a 60-day federal scoping period. Due to

public health considerations related to the COVID-19 pandemic and the extensive prior scoping conducted by DWR, the Corps provided enhanced public scoping, including a dedicated email inbox to receive scoping comments and a presentation on the proposed action and EIS process, which was maintained on a Corps' DCP information webpage<sup>3</sup> throughout the process to keep interested parties updated on project details, meeting information, meeting materials, NEPA documents, and Endangered Species Act (ESA) and National Historic Preservation Act (NHPA) compliance.

Following publication of the Draft EIS on December 16, 2022, the Corps held a 90-day public comment period, hosted three virtual public meetings and one in-person public workshop, and received approximately 2,600 individual comments from approximately 250 letters, public comment forms, and verbal comment. These comments were considered in the preparation of the FEIS and are responded to in Appendix 3 of the FEIS.

Following publication of the FEIS on November 21, 2025, the Corps received six comment letters. Copies of the letters and the Corps' responses to comments on the FEIS can be found in Attachment A. Similar comments were received and addressed during the Draft EIS public comment period. In preparing this ROD, the Corps considered all comments received. None of the comments brought forward significant new circumstances or information relevant to environmental concerns that would require a supplement to the FEIS (33 C.F.R. Part 325, Appendix B (1988)<sup>4</sup>). Any new site-specific issues raised will be addressed in subsequent tiered, project-level reviews.

## **1.5 Preliminary Jurisdictional Determination**

DWR conducted a preliminary delineation of potential waters of the U.S. and submitted an aquatic resource delineation to the Corps for concurrence. On March 10, 2022, the Corps concurred with the delineation and determined that there are approximately 16,600 acres of potential waters of the U.S. present within the 135,639-acre delineation study area, which encompasses the project footprint and a surrounding buffer (FEIS, Appendix 1, Chapter 3, Section 3.5.1). Because of the large size of the study area and the lack of access to private property, aquatic resources were mapped via interpretation of aerial imagery, topographical maps, LiDAR imagery, and vegetation maps in a Geographical Information System (GIS). No pedestrian field surveys were completed. Final site-specific pedestrian field surveys for aquatic resources within the proposed project footprint will be verified by the Corps before any permit decision is made.

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<sup>3</sup> <https://www.spk.usace.army.mil/Missions/Regulatory/Delta-Conveyance/>

<sup>4</sup> On July 3, 2025, the U.S. Army Corps of Engineers (USACE) published an interim final rule (90 FR 29465 (July 3, 2025)), promulgating 33 C.F.R Part 333 to codify the National Environmental Policy Act Implementing Procedures for the Regulatory Program and Section 408 Permissions. The interim final rule was effective on July 3, 2025, and states that "[p]ermit applications ... submitted before the effective date of this rule will continue to use the rule in place at the time the application or request was submitted" (90 FR 29465, 29471). The Corps received a complete permit application for the proposed project on June 15, 2020; therefore, the EIS and this ROD have been prepared in accordance with the requirements of NEPA and USACE regulations implementing NEPA in place in 2020 (i.e., 33 C.F.R Part 230 and Part 325, Appendix B).



## 2. SCOPE OF ANALYSIS

The Corps' regulatory authority for the proposed action is under Section 404 of the CWA for the discharge of dredged or fill material into waters of the U.S., and Section 10 of the RHA for structures or work in or affecting navigable waters of the U.S.

Consistent with the Corps' NEPA procedures applicable to the DCP (33 C.F.R. Part 325, Appendix B (1988) and 33 C.F.R. Part 230 (1988)), the scope of analysis for this FEIS includes the direct, indirect, and cumulative environmental effects of the activities requiring the Corps' authorization (e.g., Section 408 permission, a real estate outgrant, or a Section 10/404 permit). The Corps' analysis focuses on the environmental consequences of the alteration of a Corps Civil Works project (Section 408), real estate outgrant, discharge of dredged or fill material (CWA Section 404), the placement of structures in navigable waters (RHA Section 10), and the aquatic resource effects associated with the construction and physical presence of the conveyance infrastructure and compensatory mitigation habitat.

As part of the CWA Section 404(b)(1) Guidelines analysis, the Corps also evaluates secondary effects, which are effects on an aquatic ecosystem associated with a discharge but that do not result from the actual placement of the fill. For the proposed action, these include the following reasonably foreseeable physical consequences of constructing the conveyance facilities and compensatory mitigation habitat in and over waters of the U.S., including but not limited to:

(1) permanent conversion and loss of aquatic and wetland habitats within the physical footprints of the intakes, pumping plant facilities, and associated infrastructure.

(2) temporary impacts to water quality, benthic habitat, and aquatic species during in-water construction activities (e.g., dredging, cofferdam installation, and pile driving).

(3) localized alterations to riverine hydrodynamics, scour, and sediment transport immediately adjacent to the physical intake structures, and screens.

(4) aquatic habitat modifications resulting from the construction and establishment of proposed compensatory mitigation sites.

These effects are considered secondary because they are reasonably foreseeable consequences of constructing the intakes, associated infrastructure, and compensatory mitigation that require DA authorization.

The Corps also evaluated cumulative impacts, which are the impacts on the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions (33 C.F.R. Part 325, Appendix B (1988)). As required by the Corps' Public Interest Review for Department of the Army permits (33 C.F.R. § 320.4) and the public interest determination required for Section 408 permissions (Engineer Circular 1165-2-220), this analysis considers the combined influence of the proposed action's construction-related activities on the aquatic

ecosystem and all other relevant public interest factors in the context of broader regional activities affecting the Sacramento-San Joaquin Delta watershed, including other infrastructure development, land use changes, and ecological stressors.

The Corps' evaluation of secondary and cumulative effects relies on the broader environmental analysis contained in the FEIS. The FEIS evaluates the environmental consequences associated with the construction of the conveyance infrastructure and the localized physical changes associated with building those structures in the Delta.

The Corps considered the analysis in the FEIS, together with the associated Alternatives Screening Analysis (Appendix D), the Compensatory Mitigation Strategy (Appendix C3), the Biological Opinions issued by the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS), and the DWR's Environmental Impact Report (EIR), in developing a framework for future permit evaluations and evaluating reasonably foreseeable environmental effects associated with the proposed action.

While the Corps evaluates the physical environmental consequences associated with the construction and maintenance of the conveyance infrastructure, the Corps' regulatory authority under CWA Section 404 and RHA Section 10 does not extend to the operation of the proposed project. As explained in the FEIS, the Corps' regulatory authority under Section 404 of the CWA and Section 10 of the RHA does not extend to discretionary decisions regarding water allocation, contractual deliveries, water transfers, or other water management decisions. Such decisions are governed by other federal and state authorities, including DWR, the California State Water Resources Control Board and the U.S. Bureau of Reclamation, and cannot be regulated or enforced through Section 404 of the CWA or Section 10 of the RHA. The Bureau of Reclamation has addressed the operational impacts of the coordinated State Water Project and Central Valley Project, including the Delta Conveyance Project, in its own NEPA documents<sup>5</sup>.

### **3. FRAMEWORK FOR FUTURE PERMIT EVALUATION AND PHASED REVIEW**

The proposed action would involve the construction of new diversion intakes on the Sacramento River, a deep tunnel conveyance system, a southern pumping plant, an aqueduct, and associated infrastructure. Due to the massive scale, complexity, and extended construction timeline (estimated at approximately 14 years), the Corps anticipates that future permit requests will be evaluated through a phased, component-based review process. This tiered approach facilitates orderly project delivery, accommodates the progression of site-specific engineering designs, and ensures that each proposed work package undergoes appropriate project-level environmental review, public interest balancing, and regulatory oversight prior to authorization.

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<sup>5</sup> See Record of Decision for the Long-Term Operation of the Central Valley Project and State Water Project, U.S. Bureau of Reclamation, December 04, 2025. ([https://www.usbr.gov/mp/nepa/nepa\\_project\\_details.php?Project\\_ID=54661](https://www.usbr.gov/mp/nepa/nepa_project_details.php?Project_ID=54661)).

Routine physical maintenance activities associated with the proposed action's infrastructure (e.g., intake screen repairs, sediment management at the intakes, and structural upkeep) are expected to occur within the scope and footprint of the DCP. The long-term operation of the DCP (i.e., water diversions and routing) remains outside the Corps' regulatory jurisdiction.

Should future maintenance or facility modifications involve the discharge of dredged or fill material into waters of the U.S. beyond the scope of proposed project footprint, or require new structures or work in navigable waters, the need for additional authorization under CWA Section 404 or RHA Section 10 will be evaluated in accordance with applicable regulations.

Based on the conceptual construction schedule and facility locations detailed in the FEIS, the implementation of the project is anticipated to be divided into distinct geographic or functional phases (i.e., work packages).

**a. Phase 1 (Northern Facilities & Intakes):** Proposes the construction of Intakes B and C on the east bank of the Sacramento River. This includes cofferdam installation, dredging, levee modifications, intake structure construction, and fish screen installation. Because this involves direct modification of the Sacramento River flood control system, this phase will also require Section 408 Permission.

**b. Phase 2 (Tunnel Corridor & Shafts):** Proposes site preparation, grading, and construction of the tunnel launch and retrieval shafts, maintenance shafts, and the establishment of designated storage areas for Reusable Tunnel Material (RTM). While the deep tunneling itself occurs below jurisdictional waters, the surface footprint for shafts, access roads, and RTM placement could involve discharges of fill material into waters of the U.S.

**c. Phase 3 (Southern Facilities - Bethany Complex):** Proposes the construction of the Bethany Reservoir Pumping Plant, surge basin, aqueduct, and the discharge structure tying into the existing Bethany Reservoir.

**d. Phase 4 (Compensatory Mitigation):** Proposes the physical construction, grading, and hydrologic reconnection necessary to establish the compensatory mitigation sites required to offset the unavoidable impacts to aquatic habitat generated by the construction phases.

As detailed engineering and aquatic resource delineations are finalized for each component, the applicant must submit complete DA applications. Each proposed phase would be evaluated in separate decision-making processes, with specific limits, CWA Section 404(b)(1) compliance, and if a permit is issued, special conditions tailored to the activities and impacts of that phase.

**Table 1: Anticipated Activities and Authorizations per Work Package**

| <b>Phase / Work Package</b>      | <b>Primary Proposed Activities</b>                                                  | <b>Anticipated Corps Jurisdiction</b>                |
|----------------------------------|-------------------------------------------------------------------------------------|------------------------------------------------------|
| Phase 1: Northern Facilities     | Intakes B & C, cofferdams, dredging, levee work.                                    | Section 404, Section 10, Section 408                 |
| Phase 2: Tunnel Corridor         | Shaft pad construction, access roads, RTM handling/storage areas.                   | Section 404<br>Real estate outgrant                  |
| Phase 3: Southern Facilities     | Bethany pumping plant, surge basin, pipeline aqueduct, Bethany discharge structure. | Section 404                                          |
| Phase 4: Compensatory Mitigation | Earthwork, grading, and tidal/hydrologic reconnections for mitigation banks/sites.  | Section 404, Section 10 (depending on site location) |

#### 4. PURPOSE AND NEED

**a. Basic Purpose:** The basic purpose of the project is to convey water.

**b. Overall Project Purpose:** The overall project purpose is to improve diversion and conveyance facilities in the Sacramento-San Joaquin Delta (Delta) to ensure the reliability of State Water Project (SWP) water deliveries south of the Delta.

**c. Need:** As described in the FEIS, Section 1.2, to achieve the project purpose, the applicant identified the following specific needs:

(1) Minimize health and safety risks to California from Delta water supply unreliability, which would result from the anticipated impacts of sea level rise and climate change on Delta hydrodynamics and water quality.

(2) Minimize the risk of a significant disruption of SWP (and potentially Central Valley Project) water supplies that would result from a major earthquake causing a sudden and extensive failure of Delta levees and the subsequent inundation of Delta islands by saline water.

(3) Protect the ability of the SWP (and potentially the Central Valley Project) to deliver water when hydrologic conditions result in the availability of sufficient amounts of water, consistent with the requirements of state and federal law and the terms and conditions of water delivery contracts and other agreements.

(4) Provide operational flexibility to improve aquatic conditions in the Delta and better manage risks of further regulatory constraints on project operations.

## **5. ALTERNATIVES**

### **5.1 Alternatives Analysis**

The Corps has conducted a comprehensive alternatives analysis to satisfy the requirements of the CWA 404(b)(1) Guidelines at a programmatic level. This analysis was based on the Corps' independent review of information related to the proposed action, including the alternatives evaluated in the FEIS and the Alternatives Screening Analysis (FEIS, Appendix D). This review constitutes the Corps' current evaluation of all large-scale corridor alternatives.

The determination documented in this ROD establishes the corridor/alignment most likely to contain the Least Environmentally Damaging Practicable Alternative (LEDPA). Because the FEIS is a programmatic document, this broad alternatives analysis is expected to inform future tiered permit evaluations, which will consider whether specific, proposed construction activities remain consistent with this corridor/alignment based on detailed engineering designs available at the time of each permit evaluation. The evaluation of all subsequent, site-specific permit applications will be informed by this determination and will incorporate relevant analysis from this ROD and the FEIS, as appropriate.

### **5.2 Background for Screening of Alternatives**

The Corps determined that the FEIS identified and evaluated a reasonable range of conveyance concepts capable of meeting the operational and environmental objectives associated with the proposed project.

To ensure a consistent and comparable evaluation of aquatic resource impacts across all alternatives at this programmatic stage, the Corps evaluated impacts using baseline estimates derived from desktop aquatic resource delineations. While site-specific, field-verified delineations will be required for future individual permit decisions, the Corps determined that desktop delineations provide a reliable and consistent basis for comparing the relative scale of aquatic resource impacts among the broad corridor alternatives. Because all alignment alternatives rely on similar desktop delineation methodologies, this approach was applied uniformly across all alternatives to provide a conservative basis for comparison.

The Corps compared practicable alternatives based on both the extent and type of impacts to aquatic resources. The Corps evaluated the physical footprints of the intakes, tunnel shafts, pumping plants, and forebays. Impacts on resources such as perennial stream systems (the Sacramento River), tidal wetlands, and special aquatic sites were afforded particular consideration under the CWA Section 404(b)(1) Guidelines (40 C.F.R. § 230.10(c) and 230.11).

Following the screening process detailed in FEIS Appendix D, the Corps carried forward the remaining alternatives for further comparative evaluation under the CWA Section 404(b)(1) Guidelines. This evaluation considered the relative impacts of the remaining



alternatives to waters of the U.S. and the aquatic ecosystem while ensuring that each alternative satisfied the overall project purpose.

### **5.3 Screening Criteria**

Consistent with the CWA Section 404(b)(1) Guidelines (40 C.F.R. § 230.10(a)), the Corps evaluated conceptual alternatives to determine whether they were practicable. The following criteria, derived from the requirements for cost, existing technology, logistics, and consistency with the overall project purpose, were used for this screening.

An alternative was considered practicable only if it met all of the following criteria:

(1) The alternative is capable of being implemented using existing engineering approaches (e.g., existing tunnel boring technology).

(2) Construction and operational costs are not prohibitively expensive by any standard.

(3) The alternative meets the fundamental project purpose to modernize the physical water conveyance infrastructure in the Delta.

(4) The alternative provides sufficient seismic resiliency to minimize water supply disruption from a major earthquake.

(5) The alternative provides sufficient resiliency against the anticipated impacts of sea-level rise and climate change on Delta hydrodynamics and water quality.

Alternatives that satisfied these screening criteria were then evaluated under the CWA Section 404(b)(1) Guidelines to determine whether any would have less adverse impact on the aquatic ecosystem.

### **5.4 Programmatic NEPA Comparison of Alternatives**

In addition to the practicability screening discussed above, the Corps evaluated the alternatives carried forward for detailed analysis to compare their relative environmental, economic, and technical merits, consistent with NEPA. This programmatic comparison, based on the analyses in the FEIS, provides the rationale for identifying the Environmentally Preferable Alternative.

**a. Environmental Considerations:** As detailed in the FEIS, Appendix 1, Chapter 3, all action alternatives would result in significant temporary construction-related impacts to air quality, noise, and transportation. However, the alternatives differ substantially in their permanent impacts. The Central and Eastern Corridor Alignments (Alternatives 1, 2b, 3, and 4b) would require the construction of a large Southern Forebay, resulting in significantly greater permanent impacts to agricultural lands, terrestrial habitats, and waters of the U.S. in the central Delta compared to the Bethany

Reservoir Alignment. By utilizing existing reservoir capacity, the Bethany Reservoir Alignment avoids these specific impacts.

**b. Economic Considerations:** As analyzed in the FEIS, Appendix 1, Chapter 3, Section 3.17, all alternatives would generate significant, temporary positive economic effects through construction-related employment and spending. However, the Central and Eastern alignments would result in greater long-term adverse economic effects due to the conversion of a larger area of productive agricultural land for construction of a large Southern Forebay.

**c. Technical Considerations:** As described in the FEIS, Appendix 1, Chapter 2, all action alternatives were determined to be technically feasible using existing engineering and construction methods.

## 5.5 Alternatives Considered

**a. Through-Delta Conveyance Alternative:** This concept involved upgrading existing Delta channels and levees to convey water from the north Delta to the south Delta pumping facilities, without constructing a new isolated tunnel.

This alternative was determined not to be practicable because it fails to meet the overall project purpose. While it meets the criteria for availability and basic technology, it fails to adequately address the fundamental needs of seismic and climate change resiliency. Upgrading existing levees would not eliminate the vulnerabilities associated with seismically induced levee failure and subsequent salinity intrusion in the Delta, nor would it effectively manage the long-term effects of sea-level rise on water supply reliability. Because the alternative fails to meet fundamental components of the project purpose, it does not represent a practicable alternative under the CWA Section 404(b)(1) Guidelines. Accordingly, the Through-Delta Conveyance Alternative was eliminated from detailed study. A detailed evaluation of this alternative can be found in the FEIS, Appendix D, Alternatives Screening Analysis.

**b. Central Corridor Alignment (Alternatives 1 and 2):** This alternative proposed constructing the new intakes (Intakes B and C) on the Sacramento River and routing the 45-mile tunnel through the central portion of the Delta. This alignment would terminate at a newly constructed Southern Forebay adjacent to the existing Clifton Court Forebay, requiring extensive surface disturbance, discharges of fill, and levee modifications to integrate with the existing SWP pumping infrastructure.

The Central Corridor Alignment was determined to be practicable after being evaluated against all screening criteria. It utilizes existing technology, meets the purpose of seismic and climate resiliency via an isolated deep tunnel, and is logistically viable. Because it was found to be practicable, it was carried forward for a comparative evaluation of its environmental impacts. A detailed evaluation of this alternative can be found in the FEIS, Appendix D, Alternatives Screening Analysis.

**c. Eastern Corridor Alignment (Alternatives 3 and 4):** Similar to the Central Corridor, this alternative utilizes Intakes B and C but routes the tunnel further east before terminating at the newly constructed Southern Forebay.

This alternative was also determined to be practicable and was carried forward for detailed environmental review. A detailed evaluation of this alternative can be found in the FEIS, Appendix D, Alternatives Screening Analysis.

**d. Bethany Reservoir Alignment (Alternative 5, Proposed Action):** This alternative, the applicant's preferred alternative, consists of the same two 3,000 cubic feet per second (cfs) intakes (Intakes B and C) on the Sacramento River. However, the tunnel alignment continues further south and east, bypassing the need for a new Southern Forebay entirely. Instead, water would be pumped directly into the existing Bethany Reservoir via a new pumping plant and aqueduct complex near Mountain House.

This alternative was determined to be practicable as it fully satisfies all practicability screening criteria. It utilizes existing tunneling technology, provides the required seismic and climate resiliency, and its capacity of 6,000 cfs meets the water supply reliability objectives. As a practicable alternative, it was carried forward for a comparative evaluation of environmental impacts.

Compared to the Central and Eastern Corridor Alignments, the Bethany Reservoir Alignment would have fewer adverse environmental effects and impacts to waters of the U.S. While all three alignments share the exact same intake configurations on the Sacramento River and therefore possess identical direct impacts to the riverine aquatic ecosystem and fish-bearing habitats at the point of diversion, the Bethany Reservoir Alignment avoids the construction of the Southern Forebay.

**Table 2. Total Impacts to Waters of the U.S.**

| Alternative                     | Description                                             | Total Impacts to Waters of the U.S. (acres) |
|---------------------------------|---------------------------------------------------------|---------------------------------------------|
| Alternative 1                   | Central Alignment, 6,000 cfs, Intakes B and C           | 226.33                                      |
| Alternative 2                   | Central Alignment, 3,000 cfs, Intake C                  | 217.03                                      |
| Alternative 3                   | Eastern Alignment, 6,000 cfs, Intakes B and C           | 168.86                                      |
| Alternative 4                   | Eastern Alignment, 3,000 cfs, Intake C                  | 159.5                                       |
| Alternative 5 (Proposed Action) | Bethany Reservoir Alignment, 6,000 cfs, Intakes B and C | 60.98                                       |

*Source: Final Programmatic EIS, Appendix 1, Chapter 3, Table 3.5-11*

By eliminating the Southern Forebay, the Bethany Reservoir Alignment substantially reduces impacts to waters of the U.S. located in the vicinity of Clifton Court Forebay. The Central and Eastern alignments would require significant discharges of fill material

to construct the forebay embankments, control structures, and expansion areas. The Bethany Reservoir Alignment utilizes uplands for its southern pumping plant and discharges directly into an existing artificial reservoir, concentrating its southern surface footprint in areas of comparatively lower ecological value and avoiding large-scale fill in potential waters of the U.S.

## **5.6 Determination of Practicable Alternatives**

The Corps evaluated the full range of alternatives in accordance with the CWA Section 404(b)(1) Guidelines using a multi-step screening process to efficiently identify the alignment most likely to contain the LEDPA.

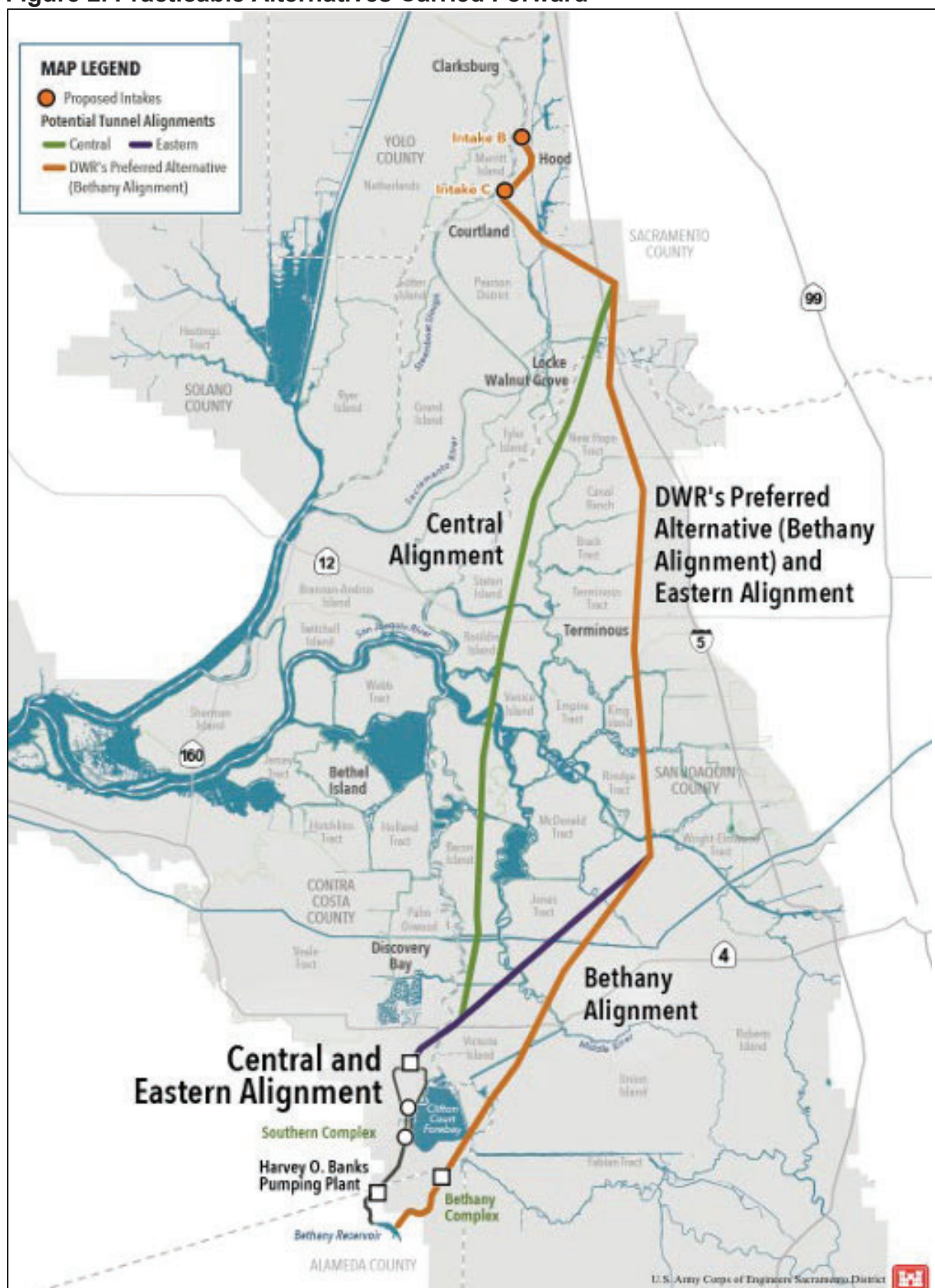
An initial screening was conducted to eliminate alternatives that were clearly not the alignment most likely to contain the LEDPA. This screening, based on the Corps' independent review of information contained in the FEIS and Appendix D, eliminated the following alternatives:

(1) No Action Alternative: Determined to be not practicable because it fails to meet the Overall Project Purpose (lacks seismic and climate resiliency).

(2) Through-Delta Conveyance: Eliminated from further detailed consideration because it fails to meet the project purpose regarding long-term reliability and seismic risk.

Based upon this initial screening, the Central Corridor, Eastern Corridor, and Bethany Reservoir Alignments were carried forward through the evaluation process. All three were found to be practicable.

Figure 2. Practicable Alternatives Carried Forward





## **5.7 Alternative Considered to be Environmentally Preferable**

As described in the FEIS, Appendix 1, Chapter 2, under the Central and Eastern Alignments, the construction of the Southern Forebay on Byron Tract is the largest single source of potential indirect impacts to waters of the U.S. These alternatives would result in major excavation requiring significant dewatering and ground improvement, which could alter local and regional groundwater hydrology and potentially affect adjacent waters of the U.S., including those within the Clifton Court Forebay area. Dewatering would also be required for the numerous tunnel shafts along these alignments. The Central Alignment (Alternatives 1 & 2) shafts are located within the Delta islands (e.g., Bouldin Island, Mandeville Island), which are characterized by high groundwater and organic soils, increasing the potential for localized indirect hydrological effects on nearby waters of the U.S. and agricultural drains.

The Bethany Reservoir Alignment avoids the construction of the Southern Forebay entirely. By doing so, it eliminates the single largest source of potential indirect impacts to waters of the U.S. While this alternative still requires dewatering for tunnel shafts, its southern facilities (Bethany Reservoir Pumping Plant and Surge Basin) would be located in uplands with different geological and hydrological characteristics than the central Delta islands, specifically located above flood elevation, indicating it is in an area less susceptible to widespread groundwater-related construction impacts compared to the Byron Tract location of the Southern Forebay.

The Central and Eastern Corridor Alignments, while practicable, were determined not to be the alignments most likely to contain the LEDPA because they would result in greater adverse impacts to aquatic resources, specifically waters of the U.S., due to the massive footprint of the required Southern Forebay, when compared to the Bethany Reservoir Alignment. Therefore, the Bethany Reservoir Alignment (Alternative 5) was found to be environmentally preferable.

## **5.8 Corps Determination of the Alignment Most Likely to Contain the LEDPA**

Based on this comparative evaluation of practicable alternatives, the Corps has determined that the Bethany Reservoir Alignment represents the corridor most likely to yield the LEDPA. This programmatic determination is based on the Corps' independent evaluation of the available information and reflects consideration of both the extent and type of impacts to waters of the U.S.

The Bethany Reservoir Alignment meets the overall project purpose while resulting in fewer adverse impacts to the aquatic ecosystem than the other practicable alternatives. Although all action alternatives share identical aquatic resource impacts at the Sacramento River intakes, the Corps determined that the Central and Eastern alignments would result in greater overall adverse effects to wetlands and mudflats due to the construction of the Southern Forebay, specifically the Byron Tract. Wetlands and mudflats are special aquatic sites and are afforded particular consideration under the CWA Section 404(b)(1) Guidelines (40 C.F.R. § 230.10(c) and 230.11).

This determination reflects the Corps' independent evaluation of the programmatic information and the comparative analysis of practicable alternatives conducted pursuant to the CWA Section 404(b)(1) Guidelines. Accordingly, the Corps determined that the Bethany Reservoir Alignment achieves the overall project purpose while resulting in the least adverse impact to the aquatic ecosystem, consistent with the requirements of the CWA Section 404(b)(1) Guidelines to avoid and minimize impacts to aquatic resources to the maximum extent practicable.

Accordingly, the Corps concludes that the Bethany Reservoir Alignment satisfies the requirements of the CWA Section 404(b)(1) Guidelines at a programmatic level and will serve as the designated alignment for all future, site-specific permit evaluations.

## **6. CONSIDERATION OF APPLICABLE LAWS AND POLICIES**

**a. National Environmental Policy Act (NEPA):** The Corps served as the lead federal agency for the preparation of the FEIS. The FEIS evaluated the construction and maintenance of the proposed action and analyzed the direct, indirect, and cumulative effects of practicable alternatives across various alignments. The Corps adhered to all NEPA procedural mandates, including public notice and timeline requirements, under the regulations in effect at the time the Notice of Intent was published (i.e., 40 C.F.R. §§ 1500 - 1508 (2020), 33 C.F.R. Part 230 (1988), and 33 C.F.R. § 325, Appendix B (1988)). The FEIS discloses the probable impacts of each alternative while accounting for the applicant's proposed mitigation. As project-level designs and studies mature, supplemental NEPA documentation (e.g., Environmental Assessment or Supplemental EIS) may be developed to support future permit decisions, including a decision on whether to issue a Section 408 Letter of Permission.

**b. Section 401 of the Clean Water Act Section 401 of the CWA:** This programmatic ROD concludes the NEPA review process for the proposed action and does not authorize any discharge of dredged or fill material into waters of the U.S. Consequently, a CWA Section 401 Water Quality Certification (WQC) is not required prior to the execution of this ROD. Pursuant to 33 U.S.C. § 1341 and 33 C.F.R. § 325.2(b)(1)(ii), the Corps shall not issue any future, site-specific DA permits for the project until the applicant obtains a CWA Section 401 WQC, or a waiver thereof, from the California State Water Resources Control Board. In accordance with 33 C.F.R. § 325.4(a)(1), any conditions set forth in a future WQC will be incorporated as binding special conditions into any corresponding Corps authorization(s). The Corps will conduct any required consultation with the USEPA as required by 40 C.F.R. § 401(a)(2) of the CWA prior to making a permit decision on any future actions proposed for the DCP.

**c. Endangered Species Act of 1973 (ESA):** The proposed action complies with Section 7 of ESA. Appendix 1, Section 3.4 (Fisheries and Aquatic Habitat) in the FEIS identifies potential impacts of the proposed action on federally listed threatened or

endangered species and the 2025 *Biological Assessment* (BA)<sup>6</sup> analyzes the potential effects of the proposed action on listed species, and details the project's activities, and evaluates how those activities might impact each species and its habitat.

For consultation with the National Marine Fisheries Service (NMFS), the Corps determined that the proposed action may affect and is likely to adversely affect the Federally-listed Chinook salmon, Sacramento River winter-run ESU and Central Valley spring-run ESU (*Oncorhynchus tshawytscha*), Green sturgeon, Southern DPS (*Acipenser medirostris*), Steelhead, California Central Valley DPS (*Oncorhynchus mykiss*) and/or their critical habitat.

Based on available information, the Corps determined that the proposed action would have no effect on the Southern Resident Killer Whale (SRKW) (*Orcinus orca*). The BA concludes that the proposed Delta Conveyance Project, including its operations, would have a negligible impact on the overall availability of Central Valley Chinook salmon. The Corps' federal action is limited to a decision on whether to permit the construction and maintenance of the proposed facilities. When operational impacts are separated from construction impacts, and construction impacts include implementation of the applicant's proposed avoidance and minimization measures during project construction, these negligible impacts become effectively "zero". Given that the construction activities would not appreciably diminish the quantity or quality of prey species available to SRKW, the Corps determined that the proposed action would have no effect on SRKW or its critical habitat. Therefore, formal consultation for this species was not required.

For consultation with the U.S. Fish and Wildlife Service (USFWS) the Corps determined that the proposed action may affect and is likely to adversely affect the Federally-listed Delta smelt (*Hypomesus transpacificus*), Longfin smelt (*Spirinchus thaleichthys*), San Joaquin kit fox (*Vulpes macrotis mutica*), Least Bell's vireo (*Vireo bellii pusillus*), Western yellow-billed cuckoo (*Coccyzus americanus occidentalis*), California red-legged frog (*Rana draytonii*), California tiger salamander (*Ambystoma californiense*), Giant garter snake (*Thamnophis gigas*), Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), Vernal pool fairy shrimp (*Branchinecta lynchi*), Vernal pool tadpole shrimp (*Lepidurus packardii*), and and/or their critical habitat. Additionally, the Corps determined the proposed action may affect but is not likely to adversely affect the California least tern (*Sternula antillarum browni*). The Corps also requested conference opinions for the following candidate species, which are proposed as threatened: Northwestern Pond turtle (*Actinemys marmorata*), Western spadefoot (*Spea hammondi*), and the Monarch butterfly (*Danaus Plexippus*).

The Corps received a Biological Opinion (BO) from the USFWS March 9, 2026, and a BO from NMFS on May 29, 2026, for proposed impacts to listed species as a result of constructing and maintaining the DCP. As applicable, compliance with the BOs will be added as special conditions to any future, site-specific, DA permit or authorization, if issued. The BOs are in Attachment B.

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<sup>6</sup> <https://www.spk.usace.army.mil/Portals/12/documents/regulatory/Delta%20Conveyance%20Project/BA/2024.05-DCP-Biological-Assessment-201900899.pdf>

**d. Fish and Wildlife Coordination Act (FWCA):** The proposed action complies with the FWCA. Appendix 1, Chapter 4 (Other Statutory Requirements) of the FEIS discusses how the Corps, as the lead federal agency, has coordinated with the USFWS and the NMFS throughout the NEPA process to solicit their views and recommendations on the project's impact on fish and wildlife resources, thereby satisfying the requirements of the FWCA. As cooperating agencies, the USFWS and NMFS participated in the preparation of the EIS; however, neither provided any substantive comments on compliance with the FWCA.

The execution of this programmatic ROD does not directly affect fish or wildlife species, as it does not authorize any discharge of dredged or fill material into waters of the U.S. or any work in navigable waters. Decisions on individual, future, site-specific DA permit applications for the DCP will comply with the FWCA. This compliance will be based on the Corps' ongoing coordination with the USFWS and NMFS during the tiered, project-level review process, ensuring that the conservation of wildlife resources is given equal consideration to other features of the proposed action prior to any permit authorization.

**e. Magnuson-Stevens Fishery Conservation and Management Act (MSA):** The proposed action is in compliance with the MSA. The FEIS evaluates the potential for the proposed action to adversely affect EFH. As stated in the FEIS, Appendix 1, Chapter 3, Section 3.4 (Fisheries and Aquatic Habitat), the Corps determined that the project's construction-related activities, such as in-water work for intake construction, could adversely affect EFH for Pacific salmon. As a result of EFH consultation, NMFS determined the proposed action adequately addressed, mitigated, and offset adverse impacts to EFH; therefore, no additional conservation measures were recommended.

The execution of this programmatic ROD does not directly affect EFH, as it does not authorize any discharge of dredged or fill material into waters of the U.S. or any work in navigable waters. Decisions on individual, future, site-specific DA permit applications for the DCP will comply with the MSA. This compliance will be based on the Corps' evaluation of adverse effects to EFH during the tiered, project-level review process. If consultation for adverse effects to EFH are needed in later phases/work packages, the Corps will reinitiate consultation as needed.

**f. Section 106 of the National Historic Preservation Act (NHPA):** The proposed action complies with Section 106 of the NHPA. The Corps, as the lead federal agency, has fulfilled its responsibilities under Section 106 for this programmatic stage of the undertaking. The Corps initiated consultation with the California State Historic Preservation Officer (SHPO), federally recognized Native American Tribes, and other interested parties. As documented in the FEIS, Appendix 1, Chapter 3, Section 3.7 (Cultural Resources), the Corps determined that the construction of the DCP is an undertaking with the potential to cause adverse effects on historic properties.

Due to the programmatic nature of the FEIS and the fact that detailed engineering designs for all project components are not yet complete, the Corps pursued the development of a Programmatic Agreement (PA) pursuant to 36 C.F.R. § 800.14(b).

The PA establishes a comprehensive, long-term process for the continued identification, evaluation, and treatment of historic properties during the subsequent design and construction phases of the project.

A final PA was executed by the Corps and the SHPO on August 22, 2025. The DWR is also an invited signatory to the PA. The executed PA is in Attachment C.

This PA stipulates the roles and responsibilities of all parties and outlines the specific procedures for future, tiered reviews that will occur as individual project components are designed. These procedures include, but are not limited to, finalizing the Area of Potential Effects (APE) for specific activities, conducting intensive cultural resource surveys, evaluating resources for National Register eligibility in consultation with the SHPO and consulting parties, and developing and implementing site-specific treatment plans to resolve any adverse effects.

The execution of this ROD does not authorize any ground-disturbing activities. The Corps will ensure that any future permit decisions for the DCP comply with the stipulations of the executed PA. Where applicable, adherence to the PA will be a special condition of any subsequent DA permit, if issued. Through the execution of the PA, the Corps has taken into account the effects of the undertaking on historic properties and has satisfied its Section 106 responsibilities for this stage of review.

**g. Section 176(C) of the Clean Air Act (CAA) General Conformity Rule**

**Review:** The proposed action has been analyzed for conformity applicability pursuant to regulations implementing Section 176(c) of the Clean Air Act (40 C.F.R. § 93, Subpart B). As detailed in the FEIS, Appendix 1, Chapter 3, Section 3.3, direct and indirect emissions from the proposed construction activities are projected to exceed the de minimis thresholds for Nitrogen Oxides (NO<sub>x</sub>), a precursor to ozone, in both the Sacramento Valley Air Basin and the San Joaquin Valley Air Basin.

Because the project's emissions would exceed these thresholds, a formal General Conformity Determination was required and was prepared for the project, located in Appendix 4 of the FEIS. This determination demonstrates that through the implementation of a comprehensive suite of on-site mitigation measures (as described in FEIS Appendix C1) and the applicant's commitment to fully offset remaining emissions through a Voluntary Emission Reduction Agreement (VERA) or equivalent mechanism (as required by Mitigation Measure AQ-1), the project conforms to the State Implementation Plan for the attainment and maintenance of the National Ambient Air Quality Standards. For this reason, the proposed action is in compliance with the Clean Air Act.

**h. Executive Order 11988: Floodplain Management:** As documented in Appendix 1, Chapter 4, Section 4.3 of the FEIS, the Corps conducted a detailed eight-step analysis to ensure compliance with this Executive Order. This analysis confirms the proposed action is located within the 100-year and 500-year floodplain of the Sacramento-San Joaquin Delta. As evaluated in the alternatives screening process (FEIS, Appendix D), there are no practicable alternatives that would meet the project's



fundamental purpose and need while being located outside of the floodplain. Potential impacts to the floodplain have been minimized to the maximum extent practicable. The FEIS documents that permanent project facilities will be designed and constructed to provide protection from, at a minimum, a 200-year flood event, including projected sea level rise for the year 2100. Furthermore, construction near federal project levees will be designed to be flood-neutral and maintain the existing level of flood protection. The public was notified of the project's location within the floodplain and had the opportunity to comment through the public review periods for the draft EIS and final EIS.

Prior to authorizing any specific construction activity, the Corps will ensure that the final project designs are compatible with state and local floodplain management requirements. This includes the applicant obtaining all necessary authorizations, such as an encroachment permit from the Central Valley Flood Protection Board (CVFPB), for any work that alters or encroaches upon a designated floodway.

Based on the comprehensive eight-step analysis documented in the FEIS, the Corps has determined that the proposed action is in compliance with Executive Order 11988.

**i. Effects on Corps Civil Works Projects Under Section 14 of the River and Harbors Act (33 USC 408):** The proposed action (Bethany Reservoir Alignment) involves activities that will alter existing federal civil works projects. Specifically, the construction of Intakes B and C on the east bank of the Sacramento River, and the routing of the tunnel beneath the federal levee system will require modifications to the Sacramento River Flood Control Project. The potential impacts of these construction activities on flood management infrastructure and levee integrity are analyzed in Appendix 1, Chapter 3, Section 3.9 (Flood Protection) and Section 3.10 (Geology and Seismicity) of the FEIS.

The execution of this programmatic ROD finalizes the NEPA review for the project corridor but does not grant Section 408 permission. Due to the tiered framework for future permit evaluations for this project, Section 408 compliance will be achieved as detailed engineering plans become available.

Prior to any construction that alters or occupies a federal levee, the applicant (DWR), in coordination with the non-federal sponsor (the Central Valley Flood Protection Board), must submit a complete Section 408 request for permission. Pursuant to Corps policy, the Corps will not issue any site-specific, tiered Section 404 or Section 10 permits for those project components until the required Section 408 permission has been formally granted.

## **7. CONSIDERATION OF MITIGATION MEASURES**

In evaluating the proposed action, the Corps has applied the mitigation requirements set forth in its regulations at 33 C.F.R. § 332, "Compensatory Mitigation for Losses of Aquatic Resources," which implements the CWA Section 404(b)(1) Guidelines. These regulations require a mitigation sequence where all practicable steps must first be taken

to avoid and then minimize adverse impacts to waters of the U.S. before considering compensatory mitigation for unavoidable impacts.

The applicant has, to the extent practicable at this programmatic stage, designed the project to avoid and minimize impacts. As discussed in the alternatives analysis, the selection of the Bethany Reservoir Alignment avoids the large impacts to waters of the U.S. that would have been associated with the construction of a new Southern Forebay. Further minimization of impacts will be required during the development of final, site-specific engineering plans. The remaining unavoidable adverse impacts on aquatic resources are analyzed in Appendix 1, Chapter 3, Section 3.5 of the FEIS.

To offset these unavoidable impacts, the applicant has drafted a *Compensatory Mitigation Plan* (FEIS, Appendix C3). The Corps has reviewed this plan and finds that it establishes a reasonable and practicable framework for providing compensatory mitigation that aligns with the preference hierarchy established in 33 C.F.R. § 332.3(b). This regulation establishes a preference for: (1) mitigation bank credits, (2) in-lieu fee (ILF) program credits, and (3) permittee-responsible mitigation.

As described in the *Compensatory Mitigation Plan*, the applicant intends to utilize this hierarchy as follows:

**a. Mitigation Bank or ILF Credits:** For impacts to certain specialized aquatic resource types, such as vernal pools and alkaline wetlands, the applicant proposes to purchase credits from existing, agency-approved mitigation banks or ILF's where such credits are available and appropriate. This aligns with the first and second preferences in the hierarchy.

**b. Permittee-Responsible Mitigation:** For impacts to other habitat types where mitigation bank or ILF credits are not available or sufficient to offset the impacts, the applicant proposes to implement large-scale, permittee-responsible mitigation at sites such as Bouldin Island (would create or enhance habitat in areas where it could be sustained with little maintenance) and the I-5 Ponds (would reconfigure three perennial ponds to develop habitat for giant garter snake and other species). The use of permittee-responsible mitigation is appropriate in this case, consistent with Corps regulations, due to the large and unique nature of the project's impacts for which sufficient bank or ILF credits are not available.

Final compensatory mitigation requirements for each project phase will be determined during the review of subsequent, site-specific permit applications. These requirements will be based on final, field-verified aquatic resource delineations and the confirmed extent of impacts waters of the U.S. Any permits issued by the Corps would incorporate special conditions to ensure all required compensatory mitigation is successfully implemented and complies with all applicable regulations, including the provisions of 33 C.F.R. § 332.

## **8. COMPLIANCE WITH 404(B)(1) GUIDELINES**

Because the FEIS analyzes impacts based on conceptual engineering and desktop aquatic resource delineations, this ROD cannot make a final, site-specific determination of compliance with the CWA Section 404(b)(1) Guidelines. Instead, this ROD establishes the programmatic framework that will govern all future CWA Section 404(b)(1) evaluations for the project. The FEIS and this ROD will inform future project-level compliance with the CWA Section 404(b)(1) Guidelines in the following ways:

**a. Establishment of the Alignment Most Likely to Contain the LEDPA:** As detailed in Section 5 of this ROD, the Corps has evaluated the alignment alternatives and determined that the Bethany Reservoir Alignment is the corridor most likely to contain the LEDPA. For each future work package, the Corps will review the scope and configuration of the project components to ensure their consistency with the FEIS and the Bethany Reservoir Alignment.

**b. Avoidance and Minimization Measures:** When the applicant submits a permit application for a specific project component (e.g., a work package for the tunnel shafts or the Bethany Complex), the Corps will review the proposed avoidance and minimization measures to confirm that the specific field-verified footprint of the discharge has been designed to avoid and minimize impacts to aquatic resources to the maximum extent practicable.

**c. Significant Degradation and Factual Determinations:** The Corps will use the field-verified aquatic resource delineations and detailed construction methods provided in future permit applications to make the required factual determinations regarding the physical, chemical, and biological effects of the specific discharge (40 C.F.R. § 230.11). Because these factual determinations are inherently site-specific and dependent upon detailed project design, it is not practicable to make such findings at this programmatic stage. The Corps will use these future, site-specific determinations to ensure that any discharge, considered individually and cumulatively, will not cause or contribute to significant degradation of waters of the U.S. (40 C.F.R. § 230.10(c)).

**d. Mitigation Adequacy:** The programmatic *Compensatory Mitigation Strategy* (FEIS Appendix C3) described in this ROD provides the baseline framework. However, the Corps will determine the final, required compensatory mitigation amounts and methods during the tiered review to ensure the specific discharge complies with the requirement to minimize adverse impacts (40 C.F.R. § 230.10(d)) and achieves the Corps' "no net loss" of aquatic resource functions and services policy.

In summary, no DA permit will be issued for any phase of the proposed project until the Corps has completed a tiered, site-specific evaluation and concluded that the specific proposed discharge fully complies with all provisions of the CWA Section 404(b)(1) Guidelines.

## **9. CWA SECTION 404 & RHA SECTION 10 PUBLIC INTEREST REVIEW**

Pursuant to 33 C.F.R. § 320.4(a), the Corps evaluates permit applications by balancing the reasonably foreseeable benefits of a proposed activity against its reasonably

foreseeable detriments to determine whether the activity would be contrary to the public interest. The Corps has conducted a comprehensive, programmatic Public Interest Review to evaluate the probable impacts of the overall project, consistent with the requirements of 33 C.F.R. § 320.4. This review is based on the extensive information contained in the FEIS and its appendices.

This programmatic Public Interest Review evaluates the overall project concept and the Bethany Reservoir Alignment; however, it does not authorize any specific construction activity. Authorization of work requiring a DA permit will occur only after the Corps reviews individual permit applications for specific work packages and makes a final public interest determination based on the detailed information available for that action.

#### **9.1 The Corps has considered all public interest factors, as follows:**

**a. Public and Private Need for the Project:** As described in the FEIS, Appendix 1, Chapter 1, Section 1.5, there is a public need for the proposed project. The project would address critical state interests by modernizing an aging water conveyance system to protect it from seismic risks and the long-term effects of extreme weather events and sea level rise. By improving the reliability of the State Water Project (SWP), the project supports public health and safety and the economic stability of regions that depend on this water supply.

**b. Conservation, Wetlands, and Fish and Wildlife Values:** As described in the FEIS, Appendix 1, Chapter 3, Sections 3.4 and 3.5, detriments include the permanent loss of waters of the U.S. from the construction of intakes, shafts, and other facilities. Construction would also cause temporary disturbances to aquatic and terrestrial habitats, including potential noise impacts on special-status fish and habitat fragmentation for terrestrial species. These detriments are weighed against the project's stated purpose of providing operational flexibility to improve aquatic conditions. Unavoidable impacts to waters of the U.S. would be addressed through a final compensatory mitigation plan, to be approved with each individual permit application, to ensure "no net loss" of aquatic resource functions and services.

**c. Economics:** As described in the FEIS, Appendix 1, Chapter 3, Section 3.17, the construction phase of the proposed project would have both positive and negative effects on the regional economy. The multi-billion-dollar project would have a substantial, short-term beneficial economic impact through the creation of several thousand construction-related jobs and associated labor income over the duration of the construction period. Conversely, construction would also result in a permanent adverse economic impact by removing agricultural land from production, leading to a loss of agricultural revenue and employment in the Delta region.

**d. Aesthetics:** As described in the FEIS, Appendix 1, Chapter 3, Section 3.1, project construction would permanently and significantly alter the visual character of the north Delta, converting a rural, agricultural landscape into one containing large, industrial-scale water intake facilities. The introduction of these structures would have

an adverse effect on scenic resources along the Sacramento River and State Route 160.

**e. General Environmental Concerns:** The primary environmental concerns are the substantial construction-related impacts to local communities from noise (FEIS, Appendix 1, Chapter 3, Section 3.15), traffic (FEIS, Appendix 1, Chapter 3, Section 3.19), and air emissions (FEIS, Appendix 1, Chapter 3, Section 3.3), as well as impacts to agricultural lands (FEIS, Appendix 1, Chapter 3, Section 3.2) and the aesthetic character of the Delta (FEIS, Appendix 1, Chapter 3, Section 3.1).

**f. Historic Properties:** As described in the FEIS, Appendix 1, Chapter 3, Section 3.7, the proposed project would result in adverse effects on historic and prehistoric cultural resources from ground-disturbing construction activities. A Programmatic Agreement (PA) has been executed by the Corps and the California SHPO (FEIS Appendix 7), which establishes the process for consultation and the development of treatment plans to resolve adverse effects as each work package is developed.

**g. Water Supply and Water Quality:** While the project's stated purpose is to improve water supply reliability, the operational aspects of water supply are outside the Corps' jurisdiction. Potential temporary adverse impacts to water quality during construction will be managed through site-specific Best Management Practices (BMPs) and compliance with the CWA Section 401 WQC, which must be obtained prior to working in waters of the U.S. The analysis of construction impacts on water quality is found in the FEIS, Appendix 1, Chapter 3, Section 3.21.

**h. Flood Hazards and Floodplain Management:** As described in the FEIS, Appendix 1, Chapter 3, Section 3.9 and Chapter 4, Section 4.3, all project facilities would be constructed to provide protection from, at a minimum, a 200-year flood event, including projected sea level rise. Modifications to federal project levees would be designed to be flood neutral. Project construction is not expected to increase flood risk.

**i. Land Use:** As described in the FEIS, Appendix 1, Chapter 3, Section 3.13, project construction would permanently change land use from predominantly agricultural open space to water conveyance infrastructure at the intake sites and other facility locations.

**j. Recreation:** As described in the FEIS, Appendix 1, Chapter 3, Section 3.16, project construction would have temporary adverse impacts on boating and shoreline recreation near the intake construction sites on the Sacramento River. The proposed project would also alter a portion of the shoreline at the Bethany Reservoir State Recreation Area.

**k. Food and Fiber Production:** As described in the FEIS, Appendix 1, Chapter 3, Section 3.2, project construction would convert Prime Farmland and other agricultural lands out of production, resulting in an adverse impact on food and fiber production in the Delta.



**l. Energy Needs:** As described in the FEIS, Appendix 1, Chapter 3, Section 3.20, project construction would result in considerable short-term consumption of energy. Construction activities would require substantial quantities of diesel and gasoline to power heavy equipment, trucks, and other vehicles over the multi-year construction period. While the applicant proposes to implement measures to improve efficiency, the overall energy demand for construction represents a considerable, temporary draw on regional energy resources. Routine physical maintenance of the facilities post-construction would require minor, intermittent energy consumption.

**m. Safety:** All intakes, tunnel shafts, pumping plants, and associated infrastructure in waters of the U.S. would be designed and constructed to meet all applicable federal and state safety standards, as described throughout the FEIS, Appendix 1, Chapter 2 (Project Description) and Section 3.12 (Hazards, Hazardous Materials, and Wildfire).

**n. Considerations of Property Ownership:** As described in the FEIS, Appendix 1, Chapter 3, Section 3.17, project construction would require the acquisition of private property. All acquisitions would be conducted in accordance with applicable federal and state laws.

**o. Navigation, Shore Erosion and Accretion, and Structures in Navigable Waters:** As described in the FEIS, Appendix 1, Chapter 3, Section 3.14, project construction would have temporary impacts on navigation during in-water construction at the intakes but is not expected to have long-term adverse effects on commercial or recreational navigation. Any work in navigable waters would require authorization under RHA Section 10.

**p. Air and Noise Quality:** As described in the FEIS, Appendix 1, Chapter 3, Sections 3.3 and 3.15, project construction would have substantial, temporary adverse impacts from construction activities on local air quality (from NO<sub>x</sub> emissions) and noise levels. These impacts would be managed through a combination of on-site mitigation measures and off-site mitigation, including the purchase of emission reduction credits.

## 9.2 Public Interest Determination

After considering all relevant public interest factors, the Corps has balanced the proposed project's reasonably foreseeable benefits and detriments at a programmatic level. The project would result in significant and unavoidable adverse impacts, most notably to the aesthetic and cultural landscape of the Delta, agricultural lands, and local communities during the long-term construction period.

However, the proposed project also addresses a critical public need to secure California's primary water supply against catastrophic failure from seismic events and long-term degradation from sea-level rise. Providing this reliability is a foundational policy objective of the State of California.

Based on the information currently available, the Corps has determined that the benefits of the overall project concept outweigh its detriments. Therefore, moving forward with a tiered, phased approach to future permit decisions on the Bethany Reservoir Alignment is not contrary to the public interest under 33 C.F.R. § 320.4.

This determination does not constitute approval of any future permit application. A final public interest determination will be made for each individual permit application to ensure that the specific proposed activity is not contrary to the public interest based on the detailed information available at that time.

## **10. FUTURE PERMIT DECISIONS AND SPECIAL CONDITIONS**

This ROD does not grant Section 408 permission, a real estate outgrant, or a Section 10/404 permit. Any future DA permits for individual phases or work packages of the proposed project will be evaluated through separate, tiered permit decisions in accordance with applicable laws and regulations.

Pursuant to Corps regulations at 33 C.F.R. § 325.4(a), the District Engineer may add special conditions to any DA permit when such conditions are necessary to satisfy legal requirements or to otherwise satisfy the public interest requirement. For this project, any future permit decisions will include project-specific special conditions, as appropriate, to ensure the proposed activities comply with the CWA Section 404(b)(1) Guidelines and are not contrary to the public interest.

Such conditions may include, but are not limited to:

(1) Final Compensatory Mitigation Plan: A requirement for the applicant to develop and receive Corps approval for a final compensatory mitigation and monitoring plan, consistent with 33 C.F.R. § 332, to offset all unavoidable, site-specific impacts to waters of the U.S.

(2) Compliance with Biological Opinions: A requirement for the applicant to implement all relevant reasonable and prudent measures and terms and conditions from the Biological Opinions issued by the USFWS and/or NMFS (Attachment B).

(3) Compliance with the Programmatic Agreement: A requirement for the applicant to adhere to all stipulations within the executed Programmatic Agreement for the protection of historic properties (Attachment C).

(4) Construction Constraints: Site-specific conditions related to construction timing, methods, and monitoring to minimize impacts on navigation, water quality, and sensitive species.

(5) Section 401 Water Quality Certification: A requirement for the applicant to obtain a project-specific CWA Section 401 WQC, or a waiver thereof, from the California State Water Resources Control Board for each specific discharge activity. All conditions of the certification will be incorporated into the DA permit.

(6) Section 408 Permission: A requirement for the applicant to obtain formal permission under Section 14 of the RHA (33 U.S.C. § 408) prior to any alteration, occupation, or use of a Corps civil works project (such as the Sacramento River Flood Control Project levees). Any conditions established by an approved Section 408 permission will be incorporated into the DA permit to ensure the activity does not impair the usefulness of the federal project and is not injurious to the public interest.

These and any other permit conditions will be determined during the Corps' evaluation of each individual permit application based on the detailed engineering designs and verified environmental information available at that time.

## 11. FINDINGS

a. The Corps served as the lead federal agency for the preparation of the *Delta Conveyance Project Final Programmatic EIS* (FEIS). The FEIS provides a comprehensive and sufficient programmatic analysis of environmental impacts to support the programmatic decision-making process. The purpose of this ROD is to conclude the Corps' responsibilities under the NEPA for this programmatic action and to document the Corps' determination of the corridor most likely to contain the LEDPA under the CWA Section 404(b)(1) Guidelines.

b. This ROD concludes the programmatic NEPA review for the Delta Conveyance Project. It does not authorize construction or constitute a final Department of the Army decision for any specific project component. Specifically, this ROD does not authorize the discharge of dredged or fill material into waters of the United States under Section 404 of the Clean Water Act; authorize structures or work in navigable waters of the United States under Section 10 of the Rivers and Harbors Act of 1899; grant permission to alter, occupy, or use a federal civil works project under Section 14 of the Rivers and Harbors Act of 1899 (33 U.S.C. § 408); or approve a real estate outgrant for the use of federally controlled lands or interests. Any authorization for construction activities under these authorities will require separate, tiered regulatory actions and decisions based on detailed engineering designs and the specific information available at the time of future permit review.

c. Based on the comprehensive alternatives analysis documented in Section 5 and the FEIS (Appendix D), the Corps has determined that the applicant's proposed project, the Bethany Reservoir Alignment, represents the corridor most likely to contain the LEDPA that meets the Overall Project Purpose, based on the information currently available regarding conceptual project design and aquatic resource impacts. This programmatic determination reflects the Corps' independent evaluation of practicability and environmental effects in accordance with the CWA 404(b)(1) Guidelines. It is based on the finding that other alternatives were either not practicable because they failed to meet the project's purpose and need (e.g., the No Action and Through-Delta alternatives) or were more environmentally damaging to the aquatic ecosystem (e.g.,

the Central and Eastern Corridor alignments requiring a massive new Southern Forebay).

**d.** The Corps' findings and determinations contained in this ROD reflect the Corps' consideration of all relevant factors required under applicable law. The Corps has relied on the analyses contained in the FEIS and other technical documentation to inform its judgment and programmatic decision-making for this action.

**e.** The Corps recognizes that the aquatic resource impact estimates analyzed in the FEIS are based on desktop delineations and conceptual engineering. This programmatic estimate informs the Corps' understanding of potential impacts and mitigation planning but does not authorize specific impacts. Future permit decisions will require field verification of aquatic resources and adjustment of authorized impacts and compensatory mitigation, as appropriate, to ensure full compliance with applicable regulations and the goal of "no net loss."

**f.** For future permit applications associated with the proposed project, the Corps anticipates that evaluation of off-site alternatives will not be necessary where proposed work is consistent with the Bethany Reservoir Alignment identified in this ROD. Instead, future, tiered permit evaluations are expected to strictly focus on alternatives within the Bethany Alignment, and project design modifications that further avoid and minimize impacts to waters of the U.S. through micro-siting adjustments, construction methods, and other minimization measures.

**g.** The Corps has fulfilled its responsibilities under Section 106 of the National Historic Preservation Act at a programmatic level through the execution of a Programmatic Agreement among the Corps and the California State Historic Preservation Officer, executed on August 22, 2025. The Corps finds that this agreement establishes an appropriate framework for the identification, evaluation, and treatment of historic properties during subsequent site-specific reviews.

**h.** The Corps has completed consultation with the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) under Section 7 of the ESA and has fulfilled its consultation responsibilities for Essential Fish Habitat (EFH) under Section 305(b) of the MSA. These consultations resulted in the issuance of Biological Opinions addressing construction effects of the proposed action. Future permit applications for specific work packages will be reviewed to ensure the proposed activities are consistent with the analysis and conclusions of these Biological Opinions. All applicable reasonable and prudent measures, and terms and conditions, will be incorporated as special conditions into any subsequent Department of the Army permit. Furthermore, pursuant to 50 CFR § 402.16, the Corps acknowledges its responsibility to re-initiate Section 7 consultation if new information reveals that the effects of the action may affect listed species or critical habitat in a manner or to an extent not previously considered, if the action is subsequently modified, or if a new species is listed or critical habitat is designated that may be affected by the action.

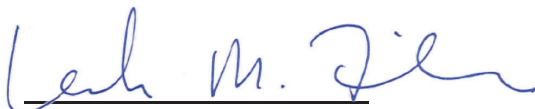
i. Compliance with Section 401 of the CWA and Section 14 of the RHA (33 U.S.C. § 408) will be required for future permit applications associated with the project. The applicant must obtain Section 401 WQC from the California State Water Resources Control Board, and formal Section 408 permission from the Corps for alterations to federal levees, prior to the issuance of any site-specific DA permit.

j. This ROD establishes a framework for future permit evaluations but does not authorize the commencement of construction. Under this tiered framework, the applicant will submit separate DA permit applications for functional work packages or geographic phases requiring authorization. For each future permit application, the Corps will conduct an independent evaluation of the specific proposed activity. Future permit evaluations will be guided by the analyses contained in the FEIS and this ROD, and additional environmental review will be conducted as appropriate to address site-specific effects.

k. The Corps recognizes that additional site-specific requirements will be necessary to ensure compliance with the Corps' Regulatory Program requirements. As described in Section 10 of this ROD, any DA permits issued for individual work packages will include special conditions designed to ensure compliance with applicable laws and regulations and to address avoidance, minimization, and compensatory mitigation for impacts to waters of the U.S.

l. Nothing in this ROD predetermines the outcome of any future DA permit decision, Section 408 permission, or real estate outgrant. The Corps retains full authority and discretion to evaluate each individual permit application independently and determine whether to issue, condition, or deny authorization based on the detailed, site-specific information available at the time of review and compliance with all applicable laws and regulations.

**PREPARED BY:**



Leah M. Fisher  
Regulatory Permit Specialist  
Special Projects Branch

16 June 2026

Date

**REVIEWED BY:**



Lisa M. Gibson  
Branch Chief  
Special Projects Branch

16 Jun 2026

Date





for Michael S. Jewell  
Division Chief  
Regulatory Division

17 June 2026

Date



Lisa H. Clay,  
Deputy District Counsel,  
Operations & Regulatory Divisions  
Office of Counsel

23 June 2026

Date

I have reviewed and evaluated, in light of the overall public interest, the documents and factors concerning the proposed action, as well as the stated views of interested agencies and the public. In doing so, I have considered the possible consequences of the proposed action in accordance with regulations published in 33 C.F.R. Parts 230 and 325, Appendix B (1988).

**APPROVED BY:**

MCTIGHE.ROBE  
RT.MATTHEW.1  
014047391

Digitally signed by  
MCTIGHE.ROBERT.MAT  
THEW.1014047391  
Date: 2026.06.26  
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Robert M. McTighe  
Commander, Sacramento District  
U.S. Army Corps of Engineers

26 June 2026

Date

# **Attachment A**

## **Response to Comments**

## **Response to Comments on the Final Environmental Impact Statement:**

**a.** On November 20, 2025, U.S. Environmental Protection Agency (EPA) Region 9 (Letter 1), in its capacity as a cooperating agency, submitted a letter acknowledging the programmatic nature of the Final EIS (FEIS). The EPA noted its understanding that the Corps cannot complete its review of the project proponent's, Department of Water Resources' (DWR's), permit requests until more detailed engineering designs are available and stated its intent to remain involved as the project progresses.

Response: The Corps acknowledges EPA's review of the FEIS and appreciates its continued valuable participation as a cooperating agency. The Corps concurs with EPA's understanding of the National Environmental Policy Act (NEPA) process for this project. The purpose of this FEIS is to analyze the environmental impacts of the project at a program-level, and subsequent permit decisions are contingent upon the receipt and review of detailed engineering plans. The Corps affirms its commitment to ongoing coordination with the EPA and other federal and state agencies. An electronic copy of the signed Record of Decision (ROD) will be provided to the EPA as requested.

**b.** On January 2, 2026, law firm Somach Simmons & Dunn (Letter 2), on behalf of the County of Sacramento, Sacramento County Water Agency, Sacramento Area Sewer District (SacSewer), and City of Stockton, maintains that the FEIS repeats the "legally deficient approach" of the Draft EIS by failing to take a "hard look" at the project's landside and operational impacts. The letter claims the FEIS ignores adverse "landside" (i.e., construction) impacts, specifically mentioning the Sacramento-San Joaquin Delta National Heritage Area and SacSewer's Harvest Water Program. They claim that operational impacts on Stockton's water supply, the EchoWater facility, public health (from Harmful Algal Blooms), and groundwater have not been adequately evaluated and request that the Corps deny the permit and require DWR to submit a revised Draft EIS that addresses both landside and operational impacts before any ROD is issued.

### Comment Issue 1: Failure to Analyze Project Operations

Comment Summary: The commenting agencies maintain that the FEIS is legally deficient for failing to analyze the operational impacts of the project on local water supply, wastewater facilities, public health, and groundwater.

Response: The Corps' scope of analysis for the proposed Delta Conveyance Project is limited to the direct and indirect effects of activities requiring a Department of the Army authorization. For this project, this includes the discharge of dredged or fill material into waters of the U.S. pursuant to Section 404 of the Clean Water Act (CWA) and work in navigable waters pursuant to Section 10 of the Rivers and Harbors Act (RHA). The operation of the conveyance facility is under the authority of the project proponent (DWR) and/or U.S. Bureau of Reclamation (USBR) and is not part of the federal action authorized or controlled by the Corps. Therefore, the analysis of operational impacts is correctly excluded from the Corps' NEPA scope. The FEIS properly refers to the project

proponent's (DWRs) Environmental Impact Report (EIR) for a more in-depth analysis of project operations.

#### Comment Issue 2: Failure to Analyze Landside/Construction Impacts

Comment Summary: The commenting agencies assert that the FEIS fails to take a "hard look" at landside impacts, including those to the Sacramento-San Joaquin Delta National Heritage Area and the SacSewer Harvest Water Program.

Response: The FEIS evaluates the impacts of project construction on resources within the study area. Potential effects on cultural, recreational, and agricultural resources, which contribute to the character of the National Heritage Area, are analyzed in the FEIS, Appendix 1, Chapter 3, Sections 3.7, 3.16, and 3.2, respectively. Impacts on public services and utilities, including facilities such as the Harvest Water Program, are addressed in Section 3.20. The Corps has determined that the FEIS provides a "hard look" at the effects of constructing the water conveyance facilities and that the level of analysis is appropriate for this programmatic-level decision.

#### Comment Issue 3: Procedural Request to Deny Permit and Revise EIS

Comment Summary: The commenting agencies request that the Corps deny the permit application and require DWR to prepare a revised Draft EIS prior to issuing a ROD.

Response: The Corps acknowledges the request. The purpose of this FEIS is to conclude the NEPA process for the programmatic phase of the project. Issuing a ROD for a programmatic EIS is a standard procedural step. The ROD does not constitute a final agency action or permit approval. Final permit decisions for specific project components will be made after the applicant submits information required for a complete application and after any required subsequent NEPA analysis is completed. A revised Draft EIS is not warranted at this time as there have been no changes to the proposed action or affected environment. The Corps will evaluate the need for additional NEPA analysis with permit applications for specific project components, as they are received.

#### Comment Issue 4: Submission of Prior EIR and Draft EIS Comments as Exhibits

Comment Summary: The commenting agencies attached extensive exhibits to their letter, including expert testimonies from State Water Board hearings and comment letters previously submitted regarding the State's EIR and the Corps' Draft EIS.

Response: The Corps acknowledges receipt of these exhibits. To the extent that the exhibits focus on project operations, water rights, and state-level California Environmental Quality Act (CEQA) compliance, these issues are outside the Corps' NEPA scope of analysis, as discussed in Comment Issue 1 above. To the extent the exhibits reiterate concerns regarding the physical impacts of landside construction (e.g., impacts to local utilities or the National Heritage Area), the Corps has determined that

these issues are substantially similar to the comments submitted by these same agencies during the Draft EIS public review period. The Corps provided detailed responses to those specific concerns in the FEIS, Appendix 3 (*Responses to Public Comments*). The submitted exhibits do not present significant new circumstances or information relevant to environmental concerns regarding the Corps regulatory authority that would require a Supplemental EIS pursuant to 33 C.F.R. Part 325, Appendix B, Paragraph 9(c).

c. On January 28, 2026, Solano County (Letter 3) provided comments reiterating its strong opposition to the proposed project. They claim that the FEIS improperly dismissed a "Through-Delta" levee-based alternative and contend that the Corps has impermissibly excluded the operational impacts of the tunnel from its analysis, arguing that NEPA requires a "hard look" at all direct and indirect project impacts. They maintain that by not analyzing operations, the FEIS fails to disclose the full extent of impacts on fisheries. The letter claims the FEIS does not adequately analyze the indirect and cumulative environmental consequences of the compensatory mitigation projects themselves. They dispute the FEIS's conclusion that newly created tidal habitat is unlikely to foster Harmful Algal Blooms (HABs), providing information that they believe demonstrates otherwise. The letter states the FEIS fails to adequately address potential transportation impacts affecting Solano County and Travis Air Force Base. Many of the concerns raised in this letter reiterate comments previously submitted by Solano County during the Draft EIS review period. The Corps provided detailed responses to those initial comments in the FEIS, Appendix 3 (*Responses to Public Comments*).

#### Comment Issue 1: Failure to Analyze Project Operations

Comment Summary: Solano County claims that under NEPA, the Corps' authority extends to the operational impacts of the Delta Conveyance Project and that the FEIS is deficient for excluding this analysis.

Response: The Corps' scope of analysis for the proposed Delta Conveyance Project is limited to the direct and indirect effects of activities requiring a Department of the Army authorization. For this project, this includes the discharge of dredged or fill material into waters of the U.S. pursuant to Section 404 of the CWA and work in navigable waters pursuant to Section 10 of the RHA. The operation of the conveyance facility is under the authority of the project proponent (DWR) and/or U.S. Bureau of Reclamation (USBR) and is not part of the federal action authorized or controlled by the Corps. Therefore, the analysis of operational impacts is correctly excluded from the Corps' NEPA scope. The FEIS properly refers to the State's EIR for a more in-depth analysis of project operations.

#### Comment Issue 2: Inadequate Analysis of Fisheries and Compensatory Mitigation



Comment Summary: Solano County asserts the FEIS fails to take a "hard look" at impacts on fisheries (from operations) and fails to disclose the consequences of the compensatory mitigation plan.

Response: As stated previously, project operations and their effects on resources such as fisheries are outside the Corps' regulatory authority. The environmental effects of constructing the compensatory mitigation sites proposed by the applicant were analyzed in Appendix 1, Chapter 3, Section 3.5, and Appendix C3 of the FEIS. The Corps has determined that this analysis constitutes the "hard look" required by NEPA for all activities within its jurisdictional purview. Thus, a supplemental NEPA document is not required at this time.

#### Comment Issue 3: Unsupported Conclusions on Harmful Algal Blooms (HABs)

Comment Summary: Solano County disputes the FEIS conclusion that newly created tidal habitat as part of compensatory mitigation is unlikely to generate HABs and provides information of existing HABs in the region.

Response: The FEIS acknowledges the potential for newly created wetlands to affect water quality. As described in Appendix 1, Chapter 3, Section 3.21 of the FEIS, the design of the compensatory mitigation tidal habitats will incorporate features to minimize conditions conducive to HAB formation, such as ensuring hydrologic exchange and avoiding long residence times. Further, Mitigation Measure WQ-14 requires the development and implementation of a management and monitoring plan to address HABs. The Corps has reviewed the information provided by the commenter and maintains that the analysis in the FEIS is adequate for this programmatic-level decision.

#### Comment Issue 4: Failure to Discuss Transportation Impacts to Solano County and Travis Air Force Base (AFB).

Comment Summary: Solano County states the FEIS fails to adequately analyze transportation impacts, particularly in relation to Travis Air Force Base (AFB).

Response: The transportation analysis in the FEIS (Appendix 1, Chapter 3, Section 3.19) evaluated the effects of construction-related traffic on the regional road network. The analysis concluded that while the project will contribute to traffic, the direct impacts near Travis AFB would be negligible, as project-related truck traffic in that specific area is estimated to be minimal. The Corps finds that the level of analysis in the programmatic FEIS is appropriate and sufficient.

#### Comment Issue 5: Failure to Include a Reasonable Range of Alternatives.

Comment Summary: Solano County claims the FEIS is invalid because it failed to analyze a "Through-Delta" armored levee alternative.

Response: The Corps considered a reasonable range of alternatives to meet the project's purpose and need. As detailed in the FEIS, Appendix D (*Alternatives Screening Analysis*), a through-Delta conveyance alternative was considered but eliminated from detailed study. This alternative was determined not to be practicable because it failed to adequately meet the overall project purpose, particularly regarding the fundamental needs for seismic resiliency and addressing risks from sea-level rise, when compared to the alternatives carried forward for full analysis. The Corps has determined that the range of alternatives evaluated in the FEIS is reasonable and sufficient to support an informed decision.

d. On February 9, 2026, San Joaquin County (Letter 4) restates concerns from their comments on the Draft EIS and maintains the FEIS remains deficient. They maintain that the FEIS improperly segments the project by failing to analyze the operational effects of the tunnel, which they contend falls within the Corps' authority as a direct, indirect, or secondary effect of the permitted action under NEPA and the Clean Water Act. They also claim that the FEIS fails to address an "arbitrary and truncated scope of alternatives," specifically by not fully analyzing a "Through-Delta" conveyance alternative. The letter claims the FEIS provides an inconsistent description of the final disposition of Reusable Tunnel Material (RTM) and asserts the material is unlikely to be reusable. And finally, they assert that the impact analyses for several resource areas (i.e., air quality, noise, vibration, socioeconomics, and transportation) are flawed and therefore the Draft EIS must be updated and recirculated for public review. Many of the concerns raised in this letter reiterate comments previously submitted by San Joaquin County during the Draft EIS review period. The Corps provided detailed responses to those initial comments in the FEIS, Appendix 3 (*Responses to Public Comments*).

#### Comment Issue 1: Failure to Analyze Project Operations

Comment Summary: San Joaquin County claims that the Corps improperly segmented its NEPA analysis by excluding project operations and their associated impacts on fisheries, water quality, and water supply for Delta users.

Response: The Corps' regulatory authority under Section 404 of the CWA and Section 10 of the RHA is limited to the direct and indirect effects of the construction and maintenance of the proposed conveyance facilities. The long-term operation of the project is not part of the federal action authorized or controlled by the Corps. Therefore, an analysis of operational impacts is correctly excluded from the Corps' NEPA scope. The FEIS properly refers to the State's EIR for a more in-depth analysis of project operations.

#### Comment Issue 2: Inadequate Range of Alternatives

Comment Summary: San Joaquin County asserts that the FEIS failed to analyze a reasonable range of alternatives by improperly dismissing a "Through-Delta" conveyance alternative.

Response: The Corps considered a reasonable range of alternatives to meet the project's purpose and need. As detailed in the FEIS, Appendix D (*Alternatives Screening Analysis*), a through-Delta conveyance alternative was considered but eliminated from detailed study. This alternative was determined not to be practicable because it failed to adequately meet the overall project purpose, particularly regarding the fundamental needs for seismic resiliency and addressing risks from sea-level rise, when compared to the alternatives carried forward for full analysis. The Corps has determined that the range of alternatives evaluated in the FEIS is reasonable and sufficient to support an informed decision.

### Comment Issue 3: Flawed Impact Analyses

Comment Summary: San Joaquin County identifies several areas where it believes the impact analyses are flawed, including health risks from air quality, noise thresholds and health impacts, tunnel boring vibration effects on levees, and impacts on recreation and transportation.

Response: The FEIS (Appendix 1, Chapter 3) contains analyses of the construction-related impacts on air quality (Section 3.3), noise (Section 3.15), geology and seismicity (including vibration, Section 3.10), socioeconomics (Section 3.17), and transportation (Section 3.19). These analyses are programmatic in nature and appropriate for this stage of project review. The Corps acknowledges the concerns raised, and notes that potential vibration impacts on levees under Corps' jurisdiction will be subject to further detailed review under the Section 408 permission process. Site-specific impacts and final mitigation requirements for all resources will be refined in subsequent, tiered NEPA analyses, once the Corps receives a complete permit application.

### Comment Issue 4: Inconsistent Description of Reusable Tunnel Material (RTM)

Comment Summary: San Joaquin County claims the FEIS is inconsistent regarding the disposition of RTM and asserts the material is unlikely to be reusable.

Response: The FEIS, Chapter 2, Section 2.6.1.4, states that the applicant will reuse RTM to the greatest extent feasible for project construction, such as for levee modifications and creating shaft pads. Material that cannot be beneficially reused will be stored in permanent, designated stockpile areas. The analysis acknowledges that not all material will be reused. The Corps has determined that the FEIS provides an adequate programmatic-level description of the handling and disposition of RTM.

e. On February 25, 2026, in a joint letter, the Delta Counties Coalition (DCC) (Letter 5), reiterates objections from their comments on the Draft EIS and asserts that the FEIS is legally deficient. The DCC claims that the Corps has improperly "segmented" its analysis by excluding the operational impacts of the project. They contend that the Corps' multiple permit authorities (CWA 404, RHA 10, RHA 408) give it "substantial control" over the entire project, thus requiring a comprehensive analysis of both construction and operations under NEPA. The letter claims the FEIS fails to

remedy a lack of meaningful engagement with Delta entities and improperly defers this responsibility to the applicant (DWR). The DCC states that the range of alternatives is too narrow and that the FEIS improperly dismissed a "Through-Delta" conveyance alternative involving levee reinforcement. The letter also identifies several specific resource topics where it believes the FEIS analysis is flawed, including fish screen efficacy, agricultural mitigation, groundwater impacts, recreation impacts on the National Heritage Area, air quality, and transportation. The DCC claims the FEIS is inconsistent on the final disposition of excavated material and concludes the FEIS is deficient and cannot support permit issuance, requesting that the Corps prepare and circulate a new, adequate EIS. Many of the concerns raised in this letter reiterate comments previously submitted by DCC during the Draft EIS review period. The Corps provided detailed responses to those initial comments in the FEIS, Appendix 3 (*Responses to Public Comments*).

#### Comment Issue 1: Improper Scope of Analysis and Failure to Analyze Project Operations

Comment Summary: The DCC claims that the Corps' NEPA review is improperly segmented and legally deficient because it does not analyze the operational impacts of the project.

Response: The Corps' scope of analysis for the proposed Delta Conveyance Project is limited to the direct and indirect effects of activities requiring a Department of the Army authorization. For this project, this includes the discharge of dredged or fill material into waters of the U.S. pursuant to Section 404 of the Clean Water Act (CWA) and work in navigable waters pursuant to Section 10 of the Rivers and Harbors Act (RHA). The operation of the conveyance facility is under the authority of the project proponent (DWR) and/or U.S. Bureau of Reclamation (USBR) and is not part of the federal action authorized or controlled by the Corps. Therefore, the analysis of operational impacts is correctly excluded from the Corps' NEPA scope. The FEIS properly refers to the State's EIR for a more in-depth analysis of project operations.

#### Comment Issue 2: Inadequate Impact Analyses and Public Engagement

Comment Summary: The DCC asserts that the FEIS provides inadequate analysis for multiple resources (e.g., recreation, air quality, transportation) and the Corps failed to provide for meaningful public engagement.

Response: The FEIS (Appendix 1, Chapter 3) provides a comprehensive, programmatic-level analysis of construction-related impacts for all resource areas identified by the commenter. Specifically, impacts are disclosed in the following FEIS sections: Fisheries and Aquatic Habitat (Section 3.4), Agriculture (Section 3.2), Groundwater (Section 3.11), Cultural Resources and Recreation (Sections 3.7 and 3.16, which encompass the National Heritage Area), Air Quality (Section 3.3), and Transportation (Section 3.19). Regarding impacts to recreation and the National Heritage Area, the Corps evaluated these under the CWA 404(b)(1) Guidelines as

potential secondary effects resulting from the authorized discharge of fill material during construction. The concerns raised by the commenter regarding long-term recreational degradation relate primarily to project operations, which, as stated above, are outside the Corps' scope of analysis. Because this is a programmatic FEIS, site-specific impacts and the precise effectiveness of certain mitigation measures (such as fish screen hydraulics) will be rigorously evaluated in future, tiered NEPA and CWA Section 404(b)(1) analyses. This will occur once the applicant submits complete permit applications containing detailed engineering designs for specific project phases. Furthermore, the Corps has already provided detailed responses to many of these specific resource concerns, which were previously raised by the DCC, in the FEIS, Appendix 3 (*Responses to Public Comments*).

#### Comment Issue 3: Inadequate Range of Alternatives and Disposition of Reusable Tunnel Material (RTM)

Comment Summary: The DCC claims the FEIS failed to consider a reasonable range of alternatives, specifically a "Through-Delta" alternative, and is inconsistent regarding the disposition of RTM.

Response: The Corps considered a reasonable range of alternatives to meet the project's purpose and need. As detailed in the FEIS, Appendix D (*Alternatives Screening Analysis*), a through-Delta conveyance alternative was considered but eliminated from detailed study. This alternative was determined not to be practicable because it failed to adequately meet the overall project purpose, particularly regarding the fundamental needs for seismic resiliency and addressing risks from sea-level rise, when compared to the alternatives carried forward for full analysis. The Corps has determined that the range of alternatives evaluated in the FEIS is reasonable and sufficient to support an informed decision. Regarding RTM, the FEIS (Chapter 2) clarifies that excavated material will be beneficially reused to the maximum extent feasible (e.g., for levee improvements and constructing facility pads). Material that cannot be reused will be permanently stored in designated, engineered stockpile areas. The Corps finds this description adequate for a programmatic analysis.

#### Comment Issue 4: FEIS Cannot Support Permitting

Comment Summary: The DCC concludes that the FEIS is deficient and cannot support the issuance of Corps permits.

Response: The FEIS is intended to satisfy the Corps' NEPA requirements at a programmatic level. The signing of a ROD for this FEIS does not constitute permit approval/denial. Future permit decisions on specific project components are contingent on the receipt of a complete permit application from the project proponent (DWR) and the completion of any necessary subsequent, tiered environmental reviews.

f. On March 27, 2026, law firm Soluri Meserve (Letter 6), on behalf of a Local Agencies of the North Delta ("LAND"), asserts that the FEIS is inadequate to support



permit issuance and fails to meet NEPA requirements. The letter claims that the Corps' jurisdiction under Section 404 and Section 408 extends to the operational effects of the project, and the FEIS is deficient for failing to analyze them. It disputes the Corps' reliance on the State's EIR for operational impacts and contends that the FEIS fails to properly disclose secondary and indirect impacts from the permitted fill activities, specifically citing impacts to navigation, sediment movement, and wetlands hydrology. The letter alleges that the alternatives screening process for determining the Least Environmentally Damaging Practicable Alternative (LEDPA) was arbitrarily constrained and did not properly consider a "Through-Delta armored levee" alternative. LAND also presents new information suggesting the FEIS fails to analyze the water demand required for construction (e.g., for concrete mixing), which could negatively impact local groundwater and surface water supplies and introduces new information regarding the discovery of the invasive golden mussel in the Delta in 2024. It claims that the project's concrete structures will create a vast new habitat for this mussel, and this secondary effect was not analyzed in the FEIS. The letter concludes that these deficiencies require a supplemental EIS and that the current FEIS cannot support permit issuance.

#### Comment Issue 1: Improper Jurisdictional Scope and Failure to Analyze Operations

Comment Summary: LAND claims that the Corps' authority under Section 404 CWA and Section 408 RHA requires it to analyze the operational impacts of the project on navigation, sediment, water supply, and hydrology.

Response: The Corps' scope of analysis for the proposed Delta Conveyance Project is limited to the direct and indirect effects of activities requiring a Department of the Army authorization. For this project, this includes the discharge of dredged or fill material into waters of the U.S. pursuant to Section 404 of the Clean Water Act (CWA) and work in navigable waters pursuant to Section 10 of the Rivers and Harbors Act (RHA). The operation of the conveyance facility is under the authority of the project proponent (DWR) and/or U.S. Bureau of Reclamation (USBR) and is not part of the federal action authorized or controlled by the Corps. Therefore, the analysis of operational impacts is correctly excluded from the Corps' NEPA scope. The FEIS properly refers to the State's EIR for a more in-depth analysis of project operations.

#### Comment Issue 2: Inadequate Alternatives Analysis (LEDPA)

Comment Summary: LAND asserts that the alternatives analysis was arbitrarily constrained and failed to properly consider a "Through-Delta" alternative as a practicable option.

Response: The Corps considered a reasonable range of alternatives to meet the project's purpose and need. As detailed in the FEIS, Appendix D (*Alternatives Screening Analysis*), a through-Delta conveyance alternative was considered but eliminated from detailed study. This alternative was determined not to be practicable because it failed to adequately meet the overall project purpose, particularly regarding the fundamental needs for seismic resiliency and addressing risks from sea-level rise,

when compared to the alternatives carried forward for full analysis. The Corps has determined that the range of alternatives evaluated in the FEIS is reasonable and sufficient to support an informed decision.

Comment Issue 3: Failure to Analyze New Information (Construction Water Demand and Golden Mussel)

Comment Summary: LAND claims that new and significant information has emerged regarding the project's construction water demand and the discovery of the invasive golden mussel, both of which require a Supplemental EIS.

Response: The Corps acknowledges the concerns regarding construction water demand and the recent discovery of the golden mussel. This FEIS provides a broad, program-level analysis of environmental impacts. Site-specific details, such as the precise sources of construction water and the development of an invasive species management plan to address the golden mussel, are issues that are appropriately deferred to subsequent, tiered environmental reviews. These project-level analyses will be completed before any final permit decisions are made for specific project components, once a detailed permit application is received by the Corps. A Supplemental Programmatic EIS is not required at this time, as these topics do not fundamentally change the programmatic-level comparison of alternatives, and the Corps will not make a permit decision without ensuring adequate analysis of alternatives of the specific proposed project when submitted.

Comment Issue 4: Inadequate Analysis of Secondary Impacts and Flood Control Funding

Comment Summary: LAND alleges the FEIS failed to disclose secondary impacts to wetlands and address impacts on funding for local flood control districts.

Response: The FEIS (Appendix 1, Chapter 3) analyzes potential direct and indirect impacts to wetlands and other waters in Section 3.5, and socioeconomic effects, including potential fiscal impacts on local governments and special districts, in Section 3.17. The analysis concludes that with the implementation of environmental commitments and mitigation measures, these construction-related impacts would not be significant. Final determinations regarding compensatory mitigation for unavoidable impacts will be made during the project-specific permit review process.



## REGION 9

SAN FRANCISCO, CA 94105

November 20, 2025

Lisa Gibson  
Chief, Special Projects Branch  
Regulatory Division  
U.S. Army Corps of Engineers  
1325 J Street, Room 860  
Sacramento, California 95814– 2922

Subject: EPA's comments on the Final Programmatic Environmental Impact Statement for the Delta Conveyance Project, Alameda, Contra Costa, Sacramento, San Joaquin, Solano, and Yolo Counties, California (EIS No. 20250147)

Dear Lisa Gibson:

The U.S. Environmental Protection Agency has reviewed the above-referenced document. We are providing comments pursuant to the National Environmental Policy Act and our NEPA review authority under Section 309 of the Clean Air Act. The CAA Section 309 role is unique to the EPA.

This Final Programmatic EIS analyzes the environmental impacts of constructing new conveyance facilities for the movement of water entering the Sacramento-San Joaquin Delta to the existing State Water Project in the south Delta, resulting in a dual-conveyance system. U.S. Army Corps of Engineers' federal control and responsibility involves activities in waters of the United States, modifications of a USACE civil works project, and real estate approval within a federal navigation channel. We note that the EIS has become a programmatic document and the Final EIS states that USACE cannot complete its review of the Department of Water Resource's request for these permits and permissions until expanded engineering designs and details are available. We appreciate that the Final EIS indicates that additional NEPA analyses may be appropriate, and finalization of project design and mitigation is pending.

The EPA is a cooperating agency on the project, and we appreciate USACE's coordination since the start of this planning process. Thank you for your responses to our comments on the Draft EIS and we look forward to continued involvement and coordination with USACE and other federal and state agencies as this project moves forward.

Thank you for the opportunity to review this Final EIS. We would appreciate receiving an electronic copy of the Record of Decision once it has been signed. If you have any questions, please contact me at (415) 947-4167, or contact Stephanie Gordon, the lead reviewer for this project, at (415) 972-3098 or [gordon.stephanies@epa.gov](mailto:gordon.stephanies@epa.gov).

Sincerely,

Jean Prijatel  
Manager  
Policy and Operations Branch



500 CAPITOL MALL, SUITE 1000, SACRAMENTO, CA 95814  
OFFICE: 916-446-7979 FAX: 916-446-8199  
SOMACHLAW.COM

January 2, 2026

Leah M. Fisher  
Project Manager  
U.S. Army Corps of Engineers  
[DLL-DCP-EIS@usace.army.mil](mailto:DLL-DCP-EIS@usace.army.mil)

Re: Comments on Final Programmatic Environmental Impact Statement for Delta  
Conveyance Project (Corps ID: SPK-2019-00899)

Dear Ms. Fisher:

On behalf of the County of Sacramento, Sacramento County Water Agency, Sacramento Area Sewer District (SacSewer) and City of Stockton (collectively, the Agencies), I am submitting these comments and accompanying exhibits (via DoD SAFE) on the November 21, 2025 Final Programmatic Environmental Impact Statement (Final EIS) for the proposed Delta Conveyance Project (DCP). The Agencies submitted extensive comments on the Draft EIS and are extremely disappointed that the Final EIS does not respond in any meaningful way to those comments. Nor does the Final EIS address the substantial evidence presented to DWR since completion of the DCP Final Environmental Impact Report (EIR), including the Agencies' Final EIR comments and expert testimony submitted in the DCP water right hearing currently pending before the Administrative Hearing Office of the State Water Quality Control Board (SWRCB). The substantial evidence submitted by the Agencies demonstrates the fatal flaws in the DCP Final EIR, which the Final EIS relies on, as well as the information developed by the California Department of Water Resources (DWR) after it certified the DCP Final EIR and approved the DCP.

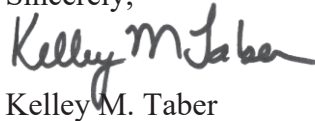
The Final EIS, prepared by DWR's consultants, maintains the same legally deficient approach of the Draft EIS, failing to take a hard look at the DCP's landside and operational impacts, including significant adverse impacts to local land uses and water supply. Landside impacts ignored by the Final EIS include (but are not limited to) substantial adverse impacts to the Sacramento-San Joaquin Delta National Heritage Area and SacSewer's landmark Harvest Water Program and EcoPlan, which threaten to jeopardize \$31 million in federal investment in Harvest Water, as well as impacts to the town of Hood water supply, among the many others described in the Agencies' comments and supporting evidence. Operational impacts not adequately evaluated by DWR or the Corps include (but are not limited to) impacts to water supply for the City of Stockton (the largest municipality wholly within the Delta), operation of SacSewer's EchoWater facility, public health and safety from harmful algal blooms, and groundwater within Sacramento County.

Leah M. Fisher, Project Manager  
U.S. Army Corps of Engineers  
Re: Comments on Final Programmatic EIS for DCP  
January 2, 2026  
Page 2

The Agencies appreciate the Final EIS's recognition that the U.S. Army Corps of Engineers (Corps) lacks the essential information to conduct National Environmental Policy Act (NEPA) review of the federal permits needed to construct and operate the DCP. Given the inability to issue permits, the Agencies do not understand why the Corps is proposing to issue a record of decision (ROD) on a legally inadequate programmatic EIS. NEPA does not require that the Corps complete an EIS to continue to evaluate and process permit applications for the DCP. Thus, there seems to be no point, or purpose, to issuing a ROD at this time. Given the myriad legal inadequacies of the Final EIS, and the lack of essential project information precluding any permitting decisions, the Corps should deny the proposed DCP permits and require DWR to submit a revised Draft EIS that adequately addresses both the landside and operational impacts of the DCP. The revised EIS will need to consider the evidence included with these comments.

The Agencies request that the Corps defer any decision related to the DCP other than denial of requested DCP permits and meet with the Agencies to discuss their concerns. You may contact me at [ktaber@somachlaw.com](mailto:ktaber@somachlaw.com) or (916) 469-3841 regarding these comments and to schedule meetings with the Agencies.

Sincerely,

Handwritten signature of Kelley M. Taber in black ink.

Kelley M. Taber

Exhibits via DoD SAFE - *List Attached*  
KMT:gl



## EXHIBITS

|            |                                                     |
|------------|-----------------------------------------------------|
| 12/17/2023 | Sacramento Regional (SacSewer) Comments to DCP FEIR |
| 12/17/2023 | County of Sacramento Comments to DCP FEIR           |
| 12/17/2023 | City of Stockton Comments to DCP FEIR               |

### D P W A – DELTA PUBLIC WATER AGENCY

|          |                                                                                                                                                                                                                                                                                                                |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DPWA-001 | Testimony Presentation of Susan C. Paulsen, Ph.D., P.E. for Delta Conveyance Project Water Rights Change Petition on behalf of Delta Public Water Agencies.                                                                                                                                                    |
| DPWA-002 | Written Testimony of Susan Paulsen, Ph.D., P.E. Provided on Behalf of Byron-Bethany Irrigation District, City of Stockton, Contra Costa County Water Agency, County of Contra Costa, County Of San Joaquin, County Of Solano, And Sacramento Area Sewer District (Collectively, “Delta Public Water Agencies”) |

### SACO – SACRAMENTO COUNTY

|          |                                                                                                                              |
|----------|------------------------------------------------------------------------------------------------------------------------------|
| SACO-001 | Written Testimony of Charles Salter, P.E.                                                                                    |
| SACO-003 | Charles Salter Summary Presentation                                                                                          |
| SACO-004 | Written Testimony of Nancy Morgan, Ph.D                                                                                      |
| SACO-014 | Nancy I.M. Morgan, Ph.D., Summary of Testimony: Impact of the DCP on the Sacramento-San Joaquin Delta National Heritage Area |
| SACO-015 | Written Testimony of Robert Benedetti, Ph.D.                                                                                 |
| SACO-018 | Robert Benedetti Summary Presentation: Tunnel Project and Delta Culture                                                      |
| SACO-019 | Written Testimony of Amber Veselka                                                                                           |
| SACO-021 | Amber Veselka, Summary of Testimony - Recreation                                                                             |
| SACO-022 | Written Testimony of Chrisandra J. Flores                                                                                    |
| SACO-024 | Chrisandra Flores Summary Presentation                                                                                       |
| SACO-025 | Written Testimony of Lupe Rodriguez, P.E., T.E.                                                                              |
| SACO-026 | Lupe Rodriguez Summary Presentation                                                                                          |
| SACO-031 | Written Testimony of Don Nottoli                                                                                             |

### SASD (SanReg) – SACRAMENTO AREA SEWER DISTRICT

|           |                                                                                         |
|-----------|-----------------------------------------------------------------------------------------|
| SASD-001  | Written Testimony of Bryan Young                                                        |
| SASD-003c | Bryan Young PowerPoint: Delta Conveyance Impacts on the Harvest Water <i>EcoPlan</i>    |
| SASD-004c | Written Testimony of Steffen Mehl, Ph.D.                                                |
| SASD-007  | Steffen Mehl Summary of Testimony: DCP Impacts to Harvest Water                         |
| SASD-008  | Written Testimony of Jaymee Marty, Ph.D.                                                |
| SASD-032  | Jaymee Marty bumble bee presentation for DCP Testimony                                  |
| SASD-009  | Written Testimony of Clarence Lunde, P.E.                                               |
| SASD-011  | Clarence Lunde PowerPoint presentation: Impacts of Proposed Delta Conveyance Project    |
| SASD-012  | Written Testimony of Susan Paulsen, Ph.D., P.E.                                         |
| SASD-014  | Susan Paulsen Summary of Testimony for Water Rights Hearing                             |
| SASD-015  | Written Testimony of Christoph Dobson                                                   |
| SASD-022c | Christoph Dobson Summary of Testimony: Impacts of the Proposed Delta Conveyance Project |

### **SCWA – Sacramento County Water Agency**

|          |                                                                                                                                     |
|----------|-------------------------------------------------------------------------------------------------------------------------------------|
| SCWA-001 | Written Testimony of Kerry Schmitz                                                                                                  |
| SCWA-021 | Kerry Schmitz Summary of Testimony presentation                                                                                     |
| SCWA-012 | Written Testimony of Laura Foglia, Ph.D.                                                                                            |
| SCWA-020 | Laura Foglia, Ph.D. (LWA) Summary of Testimony for Water Rights Hearing - Delta Conveyance Project: Analysis of Groundwater Impacts |

### **STKN – City of Stockton**

|           |                                                                          |
|-----------|--------------------------------------------------------------------------|
| STKN-001c | Written Testimony of C. Mel Lytle, Ph.D.                                 |
| STKN-018  | C. Mel Lytle Summary of Testimony for Water Rights Hearing               |
| STKN-004  | Written Testimony of Robert Granberg, P.E.                               |
| STKN-017  | Robert Granberg Summary of Testimony for Water Rights Hearing            |
| STKN-019c | Written Testimony of Susan Paulsen, Ph.D., P.E.                          |
| STKN-021  | Susan Paulsen, Ph.D., P.E. Summary of Testimony for Water Rights Hearing |

**JAMES BEZEK**  
Director

**MISTY KALTREIDER**  
Assistant Director

**MATT TUGGLE**  
Assistant Director

## DEPARTMENT OF RESOURCE MANAGEMENT



# SOLANO COUNTY

675 Texas Street, Suite 5500  
Fairfield, CA 94533-6342  
(707) 784-6765  
Fax (707) 784-4805

[www.solanocounty.gov](http://www.solanocounty.gov)

January 28, 2026

SENT VIA EMAIL: [DLL-DCP-EIS@usace.army.mil](mailto:DLL-DCP-EIS@usace.army.mil);  
[Leah.M.Fisher@usace.army.mil](mailto:Leah.M.Fisher@usace.army.mil)

U.S. Army Corps of Engineers, Sacramento District  
Attention: Leah Fisher  
Regional Permit Specialist, Regulatory Division  
1325 J Street, Room 1350  
Sacramento, California 95814

**Re: Delta Conveyance Project Final Environmental Impact Statement,  
US Army Corps of Engineers ID SPK-2019-00899**

Dear U.S. Army Corps of Engineers:

These comments are submitted by Solano County ("County") for the Delta Conveyance Project ("project", "DCP" or "tunnel") Final Environmental Impact Statement ("FEIS") prepared by the United States Army Corps of Engineers ("Corps") pursuant to the National Environmental Policy Act (42 U.S.C. § 4321 et seq. ["NEPA"]). The County previously submitted comments on the Draft Environmental Impact Statement ("DEIS") for the project.<sup>1</sup> This letter addresses the issues that the FEIS has failed to resolve based on our previous comments.

### **THE FEIS IMPERMISSIBLY FAILS TO ANALYZE OPERATIONS OF the TUNNEL**

#### **Hard Look Doctrine Requires Analysis of Direct and Indirect Impacts of the Corps' Permit Issuance**

The FEIS fails to fully analyze operations of the tunnel under NEPA. The County previous provided comments raising this issue.<sup>2</sup> The DEIS claims project operations are outside the Corps' authority under section 404 of the Clean Water Act and sections 10 and 14 of the Rivers and Harbors Act. (DEIS, p. 3.18-1.) The DEIS refers to the Draft Environmental Impact Report ("DEIR") for a more in-depth analysis of operations and associated effects on the environment. (DEIS, p. 3.18-1.) The FEIS repeats this approach. (FEIS, p. 3.0-2 [stating operations are discussed briefly and in a qualitative fashion].)

NEPA requires federal agencies to take a "hard look" at the environmental impact of a proposed project. (See *Robertson v. Methow Valley Citizens Council* (1989) 490 U.S. 332, 350 [*Robertson*]; see also *Nat'l Parks & Conservation Ass'n v. Bureau of Land Mgmt.* (2010) 606 F.3d 1058, 1072 [*Nat'l Parks*].) A hard look under NEPA requires consideration of both foreseeable direct and indirect impacts. (*Idaho Sporting Congress, Inc. v. Rittenhouse* (2002) 305 F.3d 957, 973.) While the United States Supreme Court has recently clarified that NEPA only requires analysis of areas subject to

<sup>1</sup> March 16, 2023 letter from Terry Schmidtbauer regarding the Delta Conveyance Project Draft Environmental Impact Statement, Public Notice SPK-2019-00899 ("Solano County Letter").

<sup>2</sup> Solano County Letter, p. 2.

agency authority, the Corps authority under the Clean Water Act and Rivers and Harbors Act extends to operations of the Delta Tunnel, as explained below. (*Seven Cnty. Infrastructure Coal. v. Eagle Cnty.*, (2025) 605 U.S. 168, 188; 33 U.S.C. § 1344; 33 U.S.C. § 408.) Corps guidance governing issuance of authorizations under section 14 of the Rivers & Harbors Act indicates the potential for operational effects to implicate issues subject to regulation pursuant to section 14.<sup>3</sup> Operational effects also fall within the scope of indirect effects on wetlands and waters subject to Corps Authority. (C.F.R. § 230.11(h) [secondary effects subject to review for purposes of 33 U.S.C. § 1344].) The failure to analyze operational effects pursuant to the Corps duty to satisfy NEPA thus is inconsistent with the requirements of NEPA. (42 U.S.C. § 4321 et seq.)

### **When the Corps Revises the DEIS to Include Operations, the Full Extent of Impacts on Fisheries Must Be Disclosed**

The County's previous comment letter on the FEIS explained why the DEIS's analysis of impacts to fisheries from operation of two or three large new diversions on the Sacramento River failed to "provide a realistic assessment based on available scientific information regarding the impacts the project would have on fish."<sup>4</sup> This letter was supported by expert opinion.<sup>5</sup> The Corps response flatly states that fish screens "are a proven technology" and references the Final Environmental Impact Report ("FEIR"). (FEIS, p. 3-84.) The response to the relevant comment in the FEIR simply states that existing conclusions regarding fish screen efficacy are correct and does not give appropriate weight to the comment. (FEIR, Table 4-3, pp. 1388 to 1389.) Supplemental NEPA analysis of this issue is required before the Corps may issue permits. (33 C.F.R. § 325, Appendix B, § 14 [EIS Supplement].)

### **THE FEIS FAILS TO TAKE A HARD LOOK AT PROJECT IMPACTS**

In reviewing project impacts, an agency must take a "hard look at the environmental impacts of a proposed action." (*Nat'l Parks*, *supra*, 606 F.3d at 1072.)

### **Indirect Impacts from Compensatory Mitigation Projects Not Disclosed**

The County remains concerned that the various projects undertaken pursuant to the Compensatory Mitigation Plan for Special-Status Species and Aquatic Resources in combination with other completed and planned restoration projects within the County would create or exacerbate environmental consequences that evade proper analysis.

### ***The FEIS Fails to Meaningfully Disclose the Consequences of the Compensatory Mitigation Plan for Special-Status Species and Aquatic Resources***

NEPA requires the Corps to take a hard look at environmental consequences of the project, which includes the indirect effects. (*Robertson*, *supra*, 490 U.S. at 350.) The FEIS simply states that compensatory mitigation projects are not cumulative projects and thus are not included in the cumulative analysis. (FEIS, p. 3-21.) The FEIS also acknowledges that the location of compensatory mitigation is not known "at this time." (FEIS, p. 3-57.) Because the exact location and relevant effects on areas subject to Corps regulation, such as wetlands, waters, levees, and navigation, are not known, a supplemental NEPA document must be prepared when compensatory mitigation project locations are identified. (33 C.F.R. § 325, Appendix B, § 14 [EIS Supplement].)

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<sup>3</sup> United States Army Corps of Engineers. September 10, 2018. Policy and Procedural Guidance for Processing Requests to Alter US Army Corps of Engineers Civil Works Projects Pursuant to 33 USC 408. (See p. G2 [PDF pp. 45, 68].)

<sup>4</sup> Solano County Letter, p. 4.

<sup>5</sup> *Ibid.*

### ***The FEIS's Conclusions Regarding the Likelihood of Harmful Algal Blooms Occurring in Newly Created Habitat are Unsupported***

The County's previous comment letter provided detailed comments regarding cyanobacteria harmful algal blooms ["CHABs"]).<sup>6</sup> The FEIS repeats the errors of the DEIS by first deflecting concerns regarding CHABs by disclaiming authority over operational effects. (FEIS, p. 3-140.) The nexus between operational effects and Corps authority is discussed in detail above. The FEIS then disclaims the potential for restoration or compensatory mitigation to induce CHABs by stating that the North Delta Arc, historically, has not demonstrated a high level of CHABs. (FEIS, p. 3-141.) The County again urges the Corps to consider that compensatory mitigation itself can and will create conditions that favor CHABs formation in Solano County and elsewhere in the Delta.

The FEIS concludes that by ensuring water residence times in tidal habitat created as mitigation, CHABs can be mitigated or avoided. (FEIS, p. 3.21-19.) Recent studies conducted by DWR scientists indicate that hydrologic conditions such as residence times may not be the strongest predictor of CHABs formation.<sup>7</sup> In any case, the HAB Reports Map, managed by the State Water Resources Control Board, shows that there were reported HABs throughout the Delta, including Cache Slough in Solano County in 2021 and 2022. (See attached Exhibits 1 and 2.) It is therefore incorrect for the FEIS to assume that HABs will not form in the North Delta Arc area. Supplemental NEPA analysis of this issue is required prior to permit issuance or creation of compensatory mitigation sites. (33 C.F.R. § 325, Appendix B, § 14 [EIS Supplement].)

### **The FEIS Fails to Discuss Potential Transportation Impacts in Solano County or the Resulting Impacts to Travis Air Force Base**

The previous comments provided by the County raised methodological issues with the transportation impact analysis including the failure to include relevant roadway segments as well as potential conflicts with Travis Air Force Base ("Travis AFB").<sup>8</sup> The response to these comments essentially reiterates the approach of the DEIS and asserts the putative adequacy of the analytical approach. (FEIS, pp. 3-129 to 3-130.) The FEIS asserts that because only roughly 5 percent of all truck traffic would occur near Travis AFB, the potential for conflicts with the base are negligible. (FEIS, p. 3-130.) Given the strategic significance of Travis AFB, a more robust analysis to support this conclusion is required.

### **THE FEIS FAILED TO INCLUDE A REASONABLE RANGE OF ALTERNATIVES**

The County's previous letter described the need to analyze a Through-Delta conveyance alternative.<sup>9</sup> The failure to consider feasible alternatives makes an EIS invalid. (*Idaho Conservation League v. Mumma* (1992) 956 F.2d 1508, 1519 [*Idaho Conservation League*].) The FEIS dismisses the viability of a Through-Delta armored levee alternative for improving supply reliability due to putative seismic and sea level rise risks. (FEIS, p. 3-31.) This conclusion is not based on fact. Materials prepared by Metropolitan Water District show that it is feasible to reinforce Delta levees to a level that would withstand foreseeable seismicity and climate change.<sup>10</sup> In addition, these improvements are

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<sup>6</sup> Solano County Letter, pp. 6-10.

<sup>7</sup> Ellen P. Preece and Rosemary Hartman. 2024. Exploring Factors that Affect Microcystis Abundance in the Sacramento San Joaquin Delta. *Harmful Algae Vol. 138*. Available: <https://www.sciencedirect.com/science/article/pii/S1568988324001161>

<sup>8</sup> Solano County Letter, pp. 10-12.

<sup>9</sup> Solano County Letter, pp. 12-13.

<sup>10</sup> Metropolitan Water District. 2024. Bay-Delta Resources Group, Delta Islands Strategic, Fiscal, and Risk Analysis, PDF p. 103.

estimated to cost \$400 to \$700 million<sup>11</sup> compared to the estimated cost of \$20 billion for the tunnel.<sup>12</sup> The failure to consider alternatives that would be less costly and less impactful to the environment is inconsistent with the duties of the Corps under NEPA. (*Idaho Conservation League, supra*, 956 F.2d at 1519.)

## CONCLUSION

The FEIS is deficient because it failed to analyze the effects associated with the action proposed to be permitted by the Corps, including project operations. The Corps also failed to take the required “hard look” at the project’s impacts. The County expects that the Corps will provide supplemental NEPA analysis as provided for in the regulations governing NEPA review for this project prior to permit issuance. (33 C.F.R. § 325, Appendix B, § 14 [EIS Supplement].)

Sincerely,



James

Director of Department of Resource Management

### Attachments:

Exhibit 1: State of California. 2022. HABS Map, Water Quality Monitoring Council  
Exhibit 2: State of California. 2021. HABS Map, Water Quality Monitoring Council

cc: Solano County Board of Supervisors  
Monica Brown (Dist. 2), Chair, mebrown@solanocounty.gov  
Cassandra R. James (Dist. 1), Vice Chair, crjames@solanocounty.gov  
Wanda Williams (Dist. 3), wlwilliams@solanocounty.gov  
John M. Vasquez (Dist. 4), jmvasquez@solanocounty.gov  
Mitch Mashburn (Dist. 5), mhmashburn@solanocounty.gov  
Ian Goldberg, Solano County Administrator, IMGoldberg@SolanoCounty.gov  
Carrie Blacklock, Solano County Counsel, cblacklock@solanocounty.gov

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<sup>11</sup> *Id.*

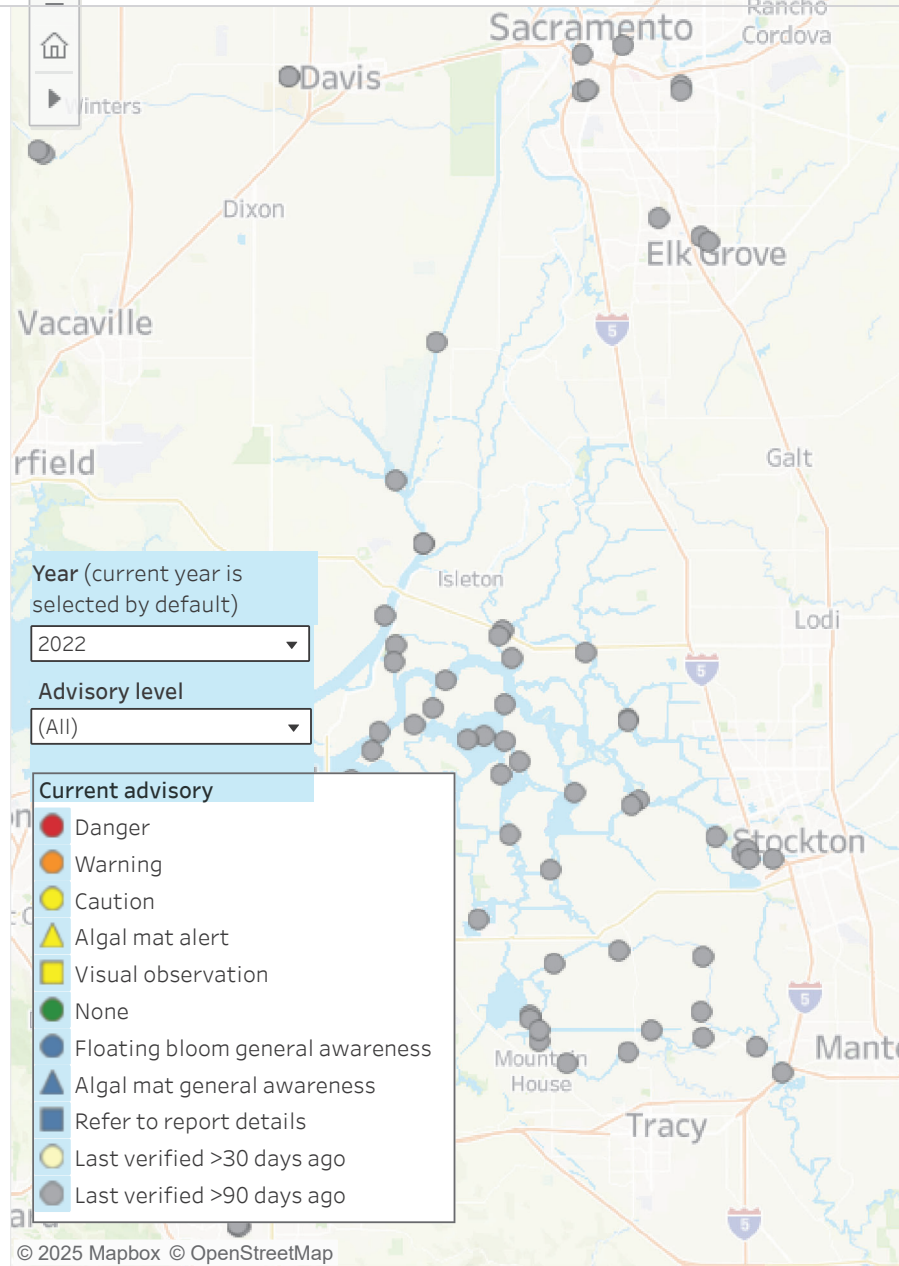
<sup>12</sup> Delta Conveyance Design and Construction Authority, May 2024, Total Project Cost Summary Memorandum.  
<https://www.dcdca.org/wp-content/uploads/2024/05/2023-Bethany-Total-Project-Cost-Estimate.pdf>



# **EXHIBIT 1**



# State of California Water Quality Monitoring Council



Updated 4/23/2025 11:25:44 AM UTC ( 7 hours for PT)

# What is the HAB Reports Map.

The HAB Reports Map, managed by the State Water Resources Control Board (CA Water Boards), shows locations of reported **Harmful Algal Blooms (HABs)** in freshwater, estuarine, or marine environments.

Reports come from:

- Online submissions using the [Report Form](#)
- Partners and other organizations
- Water monitoring data submitted to the CA Water Boards

*Note: Updates for investigations or verified blooms are displayed, but drinking water advisories are **not** shown here.*

## How to Use the Map

The map uses **colored dots** to represent reported HAB locations. Click a dot to see details like:

- [Advisory status](#)
- Date of last verification

Dots fade after **30 days** without updates.

## Need help?

- Email: [CyanoHAB.Reports@waterboards.ca.gov](mailto:CyanoHAB.Reports@waterboards.ca.gov)
- Phone: **1-800-222-1222**

# Recreational Safety and Advisories

The CA Water Boards work with local agencies to investigate reports and issue [recreational advisories and corresponding signage](#) when needed.

- Refer to [California voluntary guidance for recreational waters](#)
- Look for posted [signage](#) at affected locations

## What You Can Do

Practice [Healthy Water Habits](#) when outdoors. If unsure, **avoid contact** with waterbodies that may be affected by HABs.

## Downloading Data

To download the full data set, including reports from all years, go to the [California Open Data Portal](#) [↗](#). The HAB Reports Tracking Map is populated by data in the Freshwater and Estuarine HAB Program's Reports and Monitoring Data System and maintained by the California Water Boards.

## Disclaimer

HAB locations may not reflect real-time conditions as environmental changes occur. Blooms may affect specific areas (like shorelines) or entire waterbodies. Information on this map is updated daily, and should be used for general purposes only.

If you notice a missing HAB location, please report it to the HAB Hotline.

For help identifying HABs, check out our [visual guide](#).

Latest HAB weekly update [list](#)

## Statewide Campaigns

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[Save Our Water](#)

## Related websites

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[State Water Resources Control Board](#)

[CalEPA](#)

## Resources

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[Contact Us](#)

[Monitoring Council Home](#)

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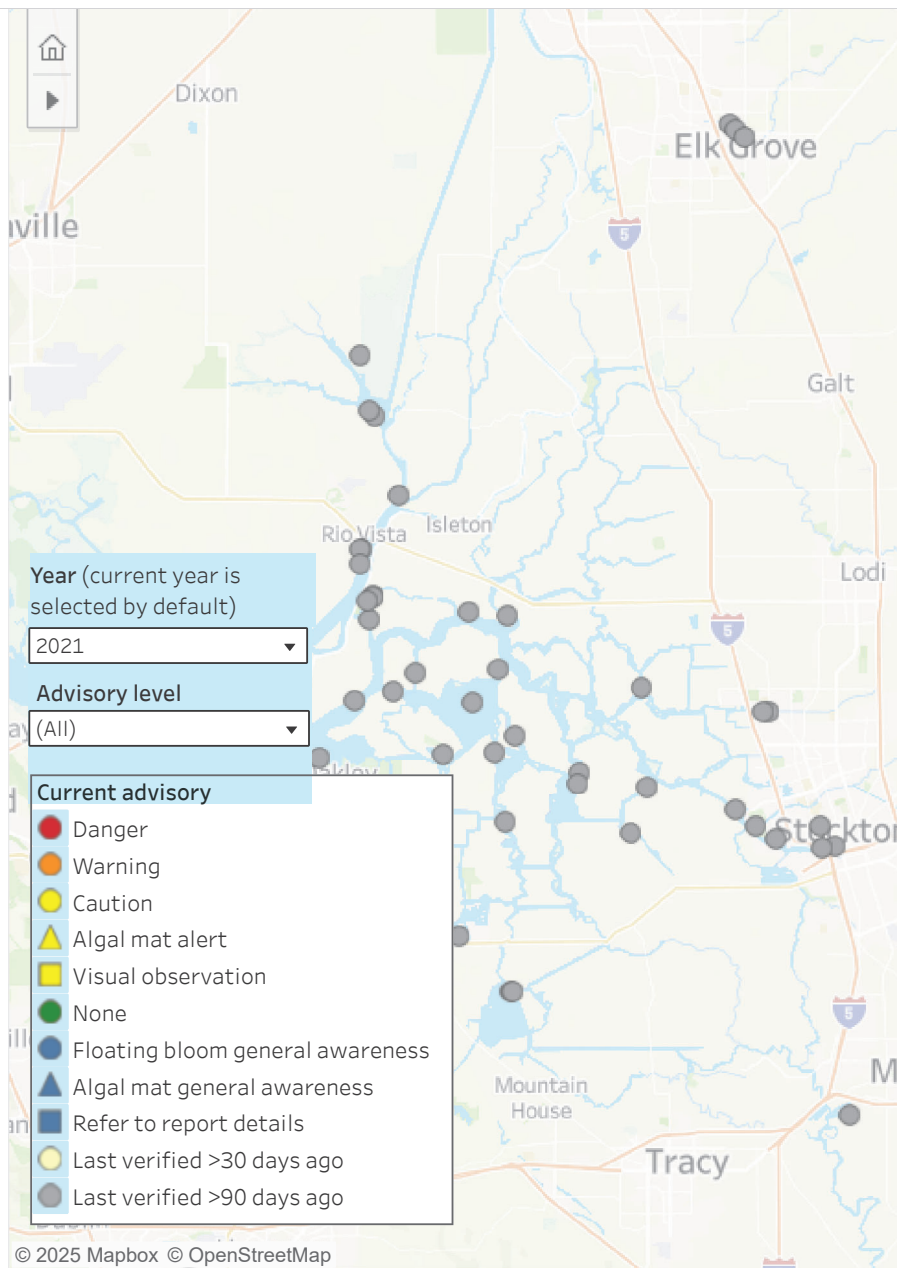
[Accessibility](#)

[Sitemap](#)



# **EXHIBIT 2**





Updated 4/23/2025 11:25:44 AM UTC ( 7 hours for PT)

A

B

C

C

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M

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## Board of Supervisors

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Steven J. Ding, Vice Chair, Fourth District

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Paul Canepa, Second District

Robert Rickman, Fifth District

Rachél DeBord, Clerk of the Board of Supervisors

February 6, 2026

SENT VIA EMAIL: DLL-DCP-EIS@usace.army.mil;  
Leah.M.Fisher@usace.army.mil

US Army Corps of Engineers, Sacramento District  
Attention: Leah Fisher  
Regional Permit Specialist, Regulatory Division  
1325 J Street, Room 1350  
Sacramento, California 95814

**Re: Delta Conveyance Project Final Environmental Impact Statement, ID No. SPK-2019-00899**

Dear Army Corps of Engineers:

These comments are submitted by San Joaquin County ("County") on the November 5, 2025 Delta Conveyance Project Final Environmental Impact Statement ("FEIS") prepared by the United States Army Corps of Engineers ("Corps") pursuant to the National Environmental Policy Act (42 U.S.C. § 4321 et seq. ["NEPA"]).<sup>1</sup>

The County previously submitted a comment letter on the Draft Environmental Impact Statement ("DEIS").<sup>2</sup> The County previously expressed concern regarding the wide array of impacts that the Delta Conveyance Project ("project", "DCP", or "Delta Tunnel") would cause, including impacts on recreation, flood control, transportation, air quality and economic and other community impacts. In addition, the County is particularly concerned about reductions in freshwater flows into the Delta that would occur as a result of the project's new diversions in the north Delta, as well as reduction of water available for Delta users and in-stream benefits.

The County is a member of the Delta Counties Coalition ("DCC"), an alliance comprised of the California Counties of Contra Costa, Sacramento, San Joaquin,

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<sup>1</sup> These comments focus on California Department of Water Resources' ("DWR") Preferred Alternative, labeled as Alternative 5 or DWR's Preferred Alternative in the FEIS, though they may also apply to other alternatives.

<sup>2</sup> San Joaquin County. March 16, 2023. *Letter to United States Army Corps of Engineers, Regarding Delta Conveyance Project Draft Environmental Impact Statement Public Notice SPK-2019-00899* ("SJC Letter").

Solano, and Yolo, which works collaboratively to give one voice on behalf of the Sacramento-San Joaquin River Delta and its four million area-wide residents.

The five counties are unified in their serious concerns with respect to the short- and long-term effects that the Delta Tunnel would have on the environment and the people of the California Delta. In addition to these comments, the County also supports the comments of the other four Delta counties and the DCC.

## **I. THE FEIS FAILS TO ADDRESS THE IMPROPERLY SEGMENTED ANALYSIS OF THE TUNNEL’S OPERATIONS**

The comment letter previously submitted by the County noted the problem of segmentation in the DEIS by failing to consider operational effects.<sup>3</sup> “Segmentation” occurs when a federal agency fails to consider inextricably connected actions or related actions that essentially function as one project. (*Del. Riverkeeper Network v. FERC* (2014) 410 U.S.App.D.C. 137, 140.) The DEIS claims project operations are outside the Corps’ authority under Rivers and Harbors Act sections 10 and 14 as well as Clean Water Act section 404. (DEIS, p. 3.18-1.) The DEIS refers to the DEIR for a more in-depth analysis of operations and associated effects on the environment. (DEIS, p. 3.18-1.) The FEIS repeats this approach. (FEIS, p. 3.0-2.)

The failure to consider operational effects as they relate to the scope of Corps’ authority violates NEPA. The Corps must issue authorizations under section 14 of the Rivers and Harbors Act to ensure that the Delta Tunnel, and its myriad crossings of levees, “will not be injurious to the public interest and will not impair the usefulness of such work.” (FEIS, p. 1-1; 33 U.S.C. § 408.) Corps guidance explicitly states that operations may be relevant to 408 review.<sup>4</sup> The scope of responsibility for the Corps is also broad under section 404 of the Clean Water Act. (FEIS, p. 1-1; 33 U.S.C. § 1344.) The regulations governing Clean Water Act section 404 permits also require consideration of “secondary effects,” such as effects that are not directly related to discharge of fill to waters but are effects of the larger activity. (40 C.F.R. § 230.11(h).) The Corps, in turn, must consider both the effect of regulated discharge of fill, and secondary effects, on a host of resource areas. (40 C.F.R. § 230.20 to 40 C.F.R. §230.54.) This clearly implicates the potential for operation of the Delta Tunnel to affect areas of Corps’

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<sup>3</sup> SJC Letter, p. 3.

<sup>4</sup> United States Army Corps of Engineers. September 10, 2018. *Policy and Procedural Guidance for Processing Requests to Alter US Army Corps of Engineers Civil Works Projects Pursuant to 33 USC 408*. (See p. G2 [PDF pp. 45, 68].)



permit responsibility. Where an effect would not occur but for a project, and the effects are within an agency's authority, NEPA review of those effects is required. (*Seven Cnty. Infrastructure Coal. v. Eagle Cnty.* (2025) 605 U.S. 168, 190 [U.S. Supreme Court affirmed that highly attenuated effects outside agency authority are not subject to review, but effects related to an agency's authority are properly reviewed under NEPA].) Accordingly, the Corps must provide a detailed review in a supplemental NEPA document, of operational effects, as they relate to all of

the areas subject to Corps authority. (40 C.F.R. § 25, Appendix B, § 14; see also *Friends of the Earth, Inc. v. United States Army Corps of Engineers* (2000) 109 F.Supp.2d 30, 36-39 [operational effects of floating casinos required NEPA review by Corps].)

## **II. THE FEIS FAILS TO ADDRESS THE ARBITRARY AND TRUNCATED SCOPE OF ALTERNATIVES ANALYZED**

The County's comments on the DEIR identified the fundamental problem with the selection of alternatives in the DEIS by indicating DWR's project objectives could be met in a variety of ways, some of which do not include construction and operation of isolated conveyance facility around the Delta.<sup>5</sup> However, DWR nor the Corps ever considered those alternatives. The County also described how the purpose and need statement in the DEIS allowed the Corps to arbitrarily constrain the alternatives.<sup>6</sup> The FEIS fails to address these issues and carries forward the same inadequate range of alternatives. (FEIS, p. 3-30.) NEPA requires agencies to rigorously develop and explore alternatives to the proposed action. (42 U.S.C. § 4332(2)(C)(iii).) Where a viable alternative is unexamined, NEPA analysis is inadequate. (*Idaho Conservation league v. Mumma* (1992) 956 F.2d 1508, 1519.)

## **III. THE IMPACT ANALYSES IN THE DEIS IS FLAWED**

The FEIS fails to address many of the deficits previously identified in the DEIS.

### **A. Air Quality Impacts (Chapter 3.3)**

The County previously provided detailed comments on the air quality impact analysis and identified methodological problems based on expert review of the DEIS.<sup>7</sup> This

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<sup>5</sup> SJC Letter, p. 6.

<sup>6</sup> SJC Letter, p. 5.

<sup>7</sup> SJC Letter, pp. 8-9.

expert review identified the potential for significant cancer and non-cancer health related effects.<sup>8</sup> The FEIS reiterates the approach of the DEIS and does not indicate any changes to methods, analysis, or conclusions that were made in response to comments. (FEIS p. 3-77 to 3-79 [“none of the action alternatives would result in significant cancer or non-cancer health hazards from receptor exposure to construction generated DPM”].) NEPA requires review of reasonably foreseeable impacts. (*WildEarth Guardians v. Zinke* (D.D.C. 2019) 368 F.Supp. 41, 75.)

## **B. Noise (Chapter 3.15)**

### **1. *The Noise Threshold Is Misleading and Leads to an Inaccurate Impact Analysis***

The County previously provided comments requesting that the Corps utilize a noise impact threshold that conforms to the County’s General Plan.<sup>9</sup> The FEIS repeats the same approach as the DEIS, using the same thresholds. The FEIS states that it describes areas where noise would exceed general plan standards, but the areas of exceedance and the term “general plan” does not otherwise appear clearly in the noise analysis, in a manner intended to transparently disclose the issue. (FEIS, p. 3.15-3.) This deprives reviewers, including agencies and the public, of the opportunity for informed participation, in violation of NEPA. (*League of Wilderness Defenders/Blue Mts. Biodiversity Project v. Connaghton* (2014) 752 F.3d 755, 761 [“informed participation is essential to NEPA”].)

### **2. *The FEIS Fails to Describe the Indirect Health Impacts from Construction Noise***

The County previously provided comments regarding health effects of noise that are not addressed or mitigated in the DEIS.<sup>10</sup> The FEIS defers wholesale to the EIR prepared by DWR with regard to the various health effects of noise raised in comments by the County. (FEIS, p. 3-119.) The cited section of the FEIS only contains a description of the environmental setting, not an impact analysis.<sup>11</sup>

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<sup>8</sup> SJC Letter, pp. 8-9.

<sup>9</sup> SJC Letter, p. 10.

<sup>10</sup> SJC Letter, pp. 11-12.

<sup>11</sup> California Department of Water Resources. December 2023. *Delta Conveyance Project, Final Environmental Impact Report*, Chapter 24, Noise and Vibration, p. 24-3.

### **3. *The DEIS Fails to Consider Tunnel Boring Vibration Impacts to Levees***

Previous comments from the County identified the potential for tunnel boring machines to result in vibration effects on levees.<sup>12</sup> The FEIS only discusses vibration impacts of pile driving in relation to this response. (FEIS p. 3-122.) The FEIS thus repeats the error of failing to address settlement caused by tunnel boring and consequential damage to levees. This is in direct violation of the Corps' duty to consider effects on infrastructure subject to its authority under section 14 of the Rivers and Harbors Act. (33 U.S.C. § 408.)

#### **C. Socioeconomic Impacts (Chapter 3.17)**

The County previously provided detailed comments identifying deficits in the analysis of socioeconomic effects caused by impacts to recreation in the Delta.<sup>13</sup> The FEIS continues to summarize economic effects associated with impacts to recreation in a very cursory and qualitative manner. (FEIS, pp. 3.17-32 to 3.17-33)

Because these effects are the direct result of physical environmental impacts from the project, such as construction and disruption of recreational opportunities, these impacts fall within the scope of mandatory NEPA analysis. (*Baltimore Gas & Elec. Co. v. Nat. Res. Def. Council, Inc.* (1983) 462 U.S. 87, 106-07).

#### **D. Transportation (Chapter 3.19)**

Previous comments by the County described deficits in the transportation impact analysis, including the failure to consider all affected roadway segments.<sup>14</sup> The FEIS repeats the erroneous impact conclusion of less than significant for *Impact TRANS-2: Increased Construction Vehicle Trips Exacerbating Unacceptable Intersection level of Service*

*Conditions.* (FEIS, p. 3.19-24.) Review of the Transportation chapter reveals no meaningful changes responding to our comments. (FEIS, pp. 3.19-1 to 3.19-29.) A federal agency decision is defective when it fails to consider an important aspect of a problem. (*Motor Vehicle Mfrs. Ass'n v. State Farm Mut. Auto. Ins. Co.* (1983) 463 U.S.

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<sup>12</sup> SCJ Letter, p. 12, citing Attachment A, Exhibit 2, p. 2.

<sup>13</sup> SJC Letter, pp. 12-14.

<sup>14</sup> SJC Letter, p. 14.

29, 43.) The Corps thus duplicates the errors of the DEIS in the FEIS with regard to transportation analysis.

### **E. DWR Claims of “Reusable” Tunnel Material are Incorrect**

The use of tunnel boring machines for the Delta Tunnel would create vast quantities of what DWR terms “reusable tunnel material”. (FEIS, p. 2-31.) The FEIS, however, does not convey an internally consistent description of the impacts or the final disposition of this tunnel muck. In one location, the FEIS implies that over time the muck stockpiles would be reduced. (FEIS, p. 3-66.) In another location, the FEIS states that it assumes the stockpiles are permanent and no plan is considered for re-use. (FEIS, p. 3-33.) As confirmed by engineers familiar with the geology and uses of soils in the Delta, however, most of the muck is unlikely to be reusable and would never be removed from the locations where it would be placed.<sup>15</sup> The Corps must develop a plan to

ensure that muck generated by the project does not create a permanent blight on the Delta landscape caused by muck disposal.

## **IV. CONCLUSION**

The FEIS fails to provide meaningful information, or to present information in a manner that properly informs the public of the Delta Tunnel’s significant impacts. The FEIS’s failure to provide an adequate analysis of impacts and to provide support for its findings deprives the public and decisionmakers the ability to understand the environmental consequences of this massive infrastructure project. To correct these information gaps, the FEIS must be significantly updated to address deficiencies in both its information and analyses and then recirculated for public review.

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<sup>15</sup> See Exhibit 1, LAND-1, Testimony of Gilbert Cosio, 2025, submitted for *Hearing in the Matter of California Department of Water Resources’ Petitions for Change of Water Right Permits 16478, 16479, 16481, and 16482*, pp. 6-7; see also Exhibit 2, LAND-5, Testimony of Josef Tootle, November 29, 2017, submitted for *Hearing in the Matter of California Department of Water Resources’ and United States Bureau of Reclamation’s Request for a Change in Point of Diversion for California Water Fix*, pp. 3-5.

Sincerely,



Sukhminder S. Dhaliwal, Chair  
San Joaquin County Board of Supervisors

Exhibit 1, LAND-1, Testimony of Gilbert Cosio  
Exhibit 2, LAND-5, Testimony of Josef Tootle

# **EXHIBIT 1**



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**BEFORE THE  
CALIFORNIA STATE WATER RESOURCES CONTROL BOARD**

Hearing in the Matter of  
California Department of Water Resources'  
Petitions for Change of Water Right Permits  
16478, 16479, 16481, and 16482  
(Applications 5630, 14443, 14445A, and  
17512, respectively)

**TESTIMONY OF GILBERT COSIO**  
  
**Jointly Presented by  
Local Agencies of the North Delta,  
County of San Joaquin, and  
County of Sacramento**

**INTRODUCTION**

1. This testimony is based on my subject matter expertise as a consulting engineer, with 41 years of experience working on levee maintenance and upgrade engineering in the Sacramento-San Joaquin Delta and the references cited herein. My curriculum vitae is Exhibit LAND-3.

**STATUS OF DELTA LEVEES NOW, FEASIBILITY OF IMPROVEMENTS AND RISK REDUCTION**

2. The Delta Conveyance Project (DCP) and associated public relations propaganda continue to cite crumbling Delta levees as a reason to build a tunnel. However, the fact is that based on the operational criteria of the DCP, improvement of Delta levees can significantly reduce overall water supply risk and provide more risk reduction than construction of the DCP under the project operating conditions. This fact was integral to the planning processes of Delta Vision and the Bay Delta Conservation Plan. The scientific knowledge and engineering technology required to make Delta levees resistant to seismic events exists and continues to improve. Seismicity risks in the Delta are potentially overestimated by a factor of four. (LAND-8, p. 3 [Delta Independent Science Board 2016].) By contrast, the California Aqueduct itself faces significant risk due to seismicity. (LAND-16 [DWR, 2022, Seismic Safety Summary Report], PDF p. 6; LAND-2 [Cosio PowerPoint], PowerPoint Slide 3.) The cost to implement levee repairs is much less than building a tunnel, with an estimate of \$700 million (\$0.7 B) to improve the thru-Delta freshwater pathway for conveyance to a level of resilience sufficient for seismicity and sea level rise. (LAND-9 [MWD 2024], PDF p. 103; LAND-2, PowerPoint Slides 4-5.) By contrast the DCP is projected to cost at least \$20 billion. (SOL-18 [DCA 2024 Total Project Cost Summary Memo].) The cost to improve all Delta levees to an adequate standard is only \$3–5 billion. (LAND-9, p. 97; LAND-2, PowerPoint Slide 6.)

3. Since the inception of the State Water Project (SWP) there has been concern Delta levee failures could affect Delta water quality. The Delta Salinity Control Project of the mid-1950's performed geotechnical exploration that included over 900 soil borings. The June 1972 failure of the Brannan Andrus Levee Maintenance District (BALMD) levee along the San

Joaquin River validated fears that levee failures could have a huge impact on water exports. A release of 300,000 acre-feet of stored water was required to keep salt water at bay and protect south Delta exports following the BALMD levee failure. (LAND-6, PDF p. 4 [Rittlemayer].) This led to the 1973 passage of the Way Bill, which provided funding periodically for Delta levee maintenance up until SB 34 was passed in 1988, which increased funding and established the Delta Levees Maintenance Subventions Program (also called the Subventions Program) and Special Projects Program.

4. The Subventions Program is an annual California Department of Water Resources (DWR) cost share program that reimburses eligible costs for annual levee maintenance performed by reclamation districts. (LAND-9, p. 19.) The remaining claims are paid through the annual assessments provided by the owners of the properties to reclamation districts. (LAND-9, p. 19.) DWR also administers the Delta Levees Special Flood Control Projects Program which provides grant funding to local levee maintaining agencies in the Primary Delta and a portion of the Suisun Marsh for levee maintenance and improvement, and for habitat mitigation and enhancement. (LAND-9, p. 22.)

5. During the 1970's, following the BALMD levee failure and flood, the United States Army Corps of Engineers (Corps), DWR, the state legislature, and local reclamation districts worked together develop a Delta levee standard. The intent was that both the state and federal governments would establish an adequate levee standard, and both would use this standard and identify projects and funding sources to achieve these standards. In the end, the federal government determined that there was no federal interest and did not finalize and issue a federal study. In December 1982, DWR issued results of all the years of studying Delta levees in the report known as Bulletin 192-82. (LAND-2, PowerPoint Slide 7.)

6. These programs are still in existence today, and improvements to levee integrity and prevention of failures has been effective. Early in the Subventions Program, the goal was to achieve levee standards known as the Short-Term Hazard Mitigation Plan (HMP) established by FEMA following the federally declared flood disasters of 1983 and 1986. The HMP required levee crowns to be raised to 1-foot above the 100-year design water level along

1 with minimum crown width and side slope dimensions. This was a condition in an agreement  
2 between FEMA and the State of California in an agreement for FEMA's participation in future  
3 flood disasters in the Delta. In some cases, this required raising levees over 3-feet. This  
4 minimum HMP requirement was for the most part achieved in the mid-1990's. As a result,  
5 floods that would have overtopped levees prior to 1990 were prevented from overtopping  
6 during the high-water events of 1993, 1995, 1997, 1998, 2006, 2017 and 2023. Final  
7 improvements to reach HMP standards were achieved utilizing fiscal year 2012 funding for  
8 DWR Special Projects grants. Another condition of the State/Federal agreement was that the  
9 state would fund levee rehabilitation to the long-term HMP, which in turn required that Delta  
10 levees meet the Bulletin 192-82 standard. In 2013, the state determined that it would not  
11 commit to funding Bulletin 192-82 levee rehabilitation and the State/Federal agreement was  
12 dissolved.

13 7. The freshwater pathway, or armored pathway, is created by the Delta levees that  
14 guide fresh water from the Sacramento River to the south Delta and points of diversion for  
15 export. This water enters the central Delta through the Delta Cross Channel, Georgiana  
16 Slough, and Threemile Slough. Rehabilitation and maintenance of these levees was an  
17 essential element of the Delta Vision Strategic Plan. In fact, when the Corps was evaluating its  
18 2014 Delta Islands and Levee Feasibility Study, levee improvements along the "Armored Thru  
19 Conveyance Path" were considered a "without project" condition since it was clear that any  
20 future conveyance scenario as described in Delta Vision and BDCP included levee  
21 improvements along this path. (LAND-7, PDF p. 57 [US Army Corps of Engineers Final  
22 Environmental Impact Statement, Delta Islands and Levees, 2018]; LAND-2, PowerPoint Slide  
23 8.)

24 8. Prior to Metropolitan Water District (MWD) purchasing four Delta islands (Webb  
25 Tract, Bacon Island, Bouldin Island and Holland Tract), MWD was already studying the effect  
26 of potential levee breaches along this path so that emergency operations could be planned  
27 should a multiple island failure occur. These MWD studies also included effects of seismic  
28 activity. Once MWD purchased its Delta islands, MWD continued its studies and incorporated

1 the 2016 USGS study data, including data indicating overestimation of seismic risk in the  
2 Delta.

3 9. MWD then took its studies another step further by working with its consultants  
4 and local engineers to develop a modern levee design, along with the latest estimates of sea  
5 level rise in the Delta, to design a levee with enough height and width to resist earthquake  
6 forces and to prevent the potential for multiple levee breaches discussed in Delta Risk  
7 Management Strategy reports and other prior studies. MWD and its engineers have estimated  
8 a cost of \$3 billion to \$5 billion to improve all levees in the Primary Zone of the Delta. (LAND-9,  
9 PDF p. 104; LAND-2, PowerPoint Slide 9.)

10 10. The DCP operations plan proposed by DWR assumes that the North Delta  
11 Diversion will only be operated when the South Delta Diversions are operating (except in a  
12 catastrophic failure scenario). (DWR-805R, p. 9 [diversion from south Delta facilities would be  
13 prioritized over use of north Delta diversions, thus requiring levee functionality for through-  
14 Delta conveyance].) Thus, SWP water will always follow a through-Delta path; for this reason,  
15 levee protection is required in any conveyance scenario. (LAND-9, PDF p. 12 [acknowledging  
16 that levees are critical to water supply and through-Delta conveyance].) Because Delta levees  
17 are critical to the functionality of the overall SWP, Delta levee protection will enhance overall  
18 supply reliability.

19 11. About \$22 million per year has been invested since the 1980s, resulting in a 50%  
20 decrease in levee failures. Continued local, state, and federal investments to improve the  
21 whole system to at least a baseline Bulletin 192-82 standard with a 24-ft wide crown would  
22 further safeguard against flooding, sea level rise and other risks. (LAND-9, p. 19.) As  
23 investments in levee maintenance and improvement go up, levee reliability increases  
24 proportionally. (LAND-17 [DWR, 2023, Annual Report to the Delta Stewardship Council  
25 Investments in Delta Levees], p. 4; LAND-2, PowerPoint Slides 10-11.) The Delta levees  
26 protect approximately \$74 billion in assets. (LAND-18 [Delta Stewardship Council, Jan. 17,  
27 2024, Letter re: Completion of the Delta Levees Investment Strategy], p. 4; LAND-2, Slide 12.)  
28

**TUNNEL MUCK**

12. DWR aspires to re-use spoils or muck from the tunnel, which DWR refers to as “reusable tunnel material” (RTM). (AHO-1005, p. 3-32 [Delta Conveyance Project Final Environmental Impact Report (FEIR) Project Description].) Based on soils analysis I have seen and knowing the location of the proposed tunnel material stockpiles, it is my opinion that there is a very low likelihood that this material will be reused; instead, it is likely it will remain as a gigantic stockpile at the locations where it is spoiled following excavation. Part of my opinion relies on the information provided by Josef Tootle, GE, which was submitted to the California State Water Resources Control Board during hearings conducted on the California WaterFix project. (LAND-5, pp. 4-5 [Joseph Tootle Cal. Water Fix Testimony].) While the DCP Final EIR (DCP FEIR) emphasizes re-use of RTM, the relevant section of the project description fails to identify a comprehensive plan for re-use or explain how such vast quantities of tunnel muck could be re-used in local infrastructure such as levees. (AHO-1005, pp. 3-32 to 3-34 [discussion of RTM].)

13. Sea level has been rising for over 10,000 years. Some estimates put the amount of sea level rise during this time to be in the order of 350-feet. In other words, at some point in history, the edge of the Pacific Ocean was located near the current location of the Farallon Islands. Therefore, in prehistory, the current Delta was not an estuary, but rather it was an area we would find upstream of estuaries in the riverine portion of the watershed.

14. Soil stratification below the current Delta is much different than soil stratification near the surface of the Delta as we know it today. Instead of sands, silts and peat that make up the current delta soils near the surface and on which levees have been constructed, the deeper soils are less cohesive and more granular. Therefore, this material would likely not be suitable to be reused as levee material. It would be too porous and without enough cohesion. This deeper soil stratification was confirmed during the meetings I attended as a member of the Delta Conveyance Design and Construction Authority’s (DCA) stakeholder engagement group, based on preliminary soil borings described in those meetings.

15. In addition, the location of the spoils sites, the largest of which is proposed along Twin Cities Road, would likely not be conducive for use as a borrow site for levee material. The spoils sites are likely too far away from the central Delta where material is needed for levee rehabilitation. Transporting the material overland for levee maintenance and repair may also cause road damage, due to the number of trips that would be required.

# **GROUND IMPACTS ON THE SURFACE ABOVE TUNNEL ROUTE**

16. Vibration during tunnel construction would cause settlement to occur and result in impacts at the ground surface due to consolidation of soils between the tunnel and surface. I made this point in my comments for San Joaquin County on the draft EIR. (AHO-1236, PDF p. 18) My comments were based on review of similar impacts experienced during other tunneling projects. In addition, Mr. Josef Tootle, GE, came to similar conclusions in his testimony presented in the WaterFix hearings. (LAND-5, pp. 5-8.) In addition, since DWR needs to complete many additional geotechnical exploration borings, it is apparent that DWR believes additional data is required; the spacing of the borings themselves will cause additional impacts. (LAND-13 [DCA, 2021], p. 5.)

17. DWR would like to perform additional geotechnical exploration along the entire tunnel route at 1,000-foot intervals. (LAND-13, p. 5.) This indicates to me that DWR recognizes the fact that Delta soils characteristics can change drastically and that subsidence is a potential impact of the project. In my 41 plus years of experience in the Delta and after reviewing many dozens of geotechnical studies, I have found that the only thing consistent about Delta soils is that they are very inconsistent.

18. Geotechnical investigations that DWR proposes to implement, approximately every 1,000-feet along or near the alignment, could cause additional impacts to farming and therefore impacts to reclamation district ability to raise funds necessary to maintain its levees. In my experience, running heavy equipment over productive farm ground, such as the equipment needed for boring and cone penetration tests (CPTs), would compact the ground and reduce the suitability of the landscape for farming.



19. The proximity of the water table to the ground surface exacerbates this problem. In the 1990's there were a lot of surveys for gas exploration. This required many borings in which seismic testing would be used to describe the deep stratification of the subsurface. Many of these borings were not adequately sealed and the high-water table caused many to leak and add to the drainage costs. The heavy equipment that traveled through farm ground compacted the soil to the point that the crop yields were greatly reduced in these areas, thus demonstrating that DWR's proposed investigations are likely to cause additional and similar impacts.

20. Reclamation District assessments provide funds necessary to drain the farm ground and protect it from floods by maintaining the levee system. Farmers are already strapped for funds due to the struggling farm economy, and reclamation districts are having a hard time making ends meet. The impact to farm productivity is very apparent when previously productive land is compacted and productivity is reduced. It is not unusual to see a corn field with lower corn stocks along the strips of ground compacted by boring equipment.

#### **DECLINING CALIFORNIA AQUEDUCT CONVEYANCE CAPACITY**

21. It is my understanding that due to damage from subsidence, the California Aqueduct may not currently have the capacity to convey up to 6,000 cubic feet per second (CFS) proposed to be diverted from the Sacramento River. (LAND-11, PDF p. 16 [DWR 2025].) The effect of subsidence is already observed with the need for alternating operating procedures. (LAND-11, PDF p. 16-17.) Subsidence near Milepost 165 of the California Aqueduct exceeds 2 feet as of 2025 and is projected to exceed 4 feet as of 2030. (LAND-11, PDF p. 133; LAND-2, PowerPoint Slides 14-15.) To maintain water deliveries, operators must move water more often during on peak hours, which increases operating costs and limits the use of renewable energy sources. During the drought of 2013 to 2016, sections of the California Aqueduct sank nearly three feet. (LAND-15 [DWR, 2023], PDF pp. 40-41.)

22. The "chokepoint" on conveyance capacity through the California Aqueduct may thus interfere with the ability to divert additional water from the Sacramento River through the DCP. According to DWR, the SWP may face up to an 84% reduction in deliveries by 2043.

(LAND-11, p. 18.) Long-term solutions for this damage to the California Aqueduct may cost about \$3 billion according to current estimates, and would likely need to be paid by SWP contractors unless some other source of funds is identified. (LAND-12, p. 7.)

#### **WATER EXPORT WITH DCP TUNNEL MAY BE MORE LIMITED THAN ASSUMED**

23. Public comments have been made by DCA and DWR staff, that “if” the intakes and tunnel were in place today, many thousands of acre-feet of water could have been diverted during the times that pumping out of the south Delta is otherwise limited. (NDWA-4.) These assertions only consider whether flows in the Sacramento River at the intake locations would be adequate to divert 6,000 CFS without regard to other limits on capacity. (DCP Hearing Transcript (Zoom), May 27, 2025, PDF p. 147 [DWR “analysis does not include any effects from south of the Delta”].) Factors that do not appear to have been considered, and which may also affect whether these assumptions are correct, include:

- There is no analysis as to whether there is adequate storage south of the Delta. (DCP Hearing Transcript, May 27, 2025, PDF p. 133 [DWR did not consider issue of adequate storage capacity South of the Delta].) In addition, the question remains whether, if there is adequate storage, diverting flows early would supplant storage that could be used later in the year.
- Due to subsidence, the California Aqueduct does not have the capacity to convey current diversions from the South Delta without making frequent timing adjustments to account for reduced capacity. (LAND-11, PDF p. 16-17.) It is unclear how up to an additional 6,000 CFS would be conveyed through the aqueduct during what DWR has described as high flow periods when new diversions would primarily take place.
- There is no quantitative consideration of how the diversion at the Big Notch Project, which has been permitted for 6,000 CFS and has an adaptive management plan to increase this diversion to 12,000 CFS, would affect flow at the DCP intakes. (LAND-14 [California Water Commission, 2022], p. 5.) Other planned future upstream diversions may also limit DCP diversion capacity.

## CONCLUSION

24. To summarize my testimony, existing science and engineering technology makes improvement of Delta levees for through-Delta conveyance a more cost-effective and viable method of continued conveyance for water exported from the Delta. The DCP is costly, and would not replace the need to upgrade Delta levees and to maintain the capacity of the California Aqueduct and other SWP infrastructure. Because levee maintenance and upgrades must be completed in any scenario, an armored through-Delta conveyance approach is, in my opinion, the best way forward to protect the ability to export water and to ensure the water quality of those exports. The DCP would also result in impacts to agricultural activity and viability in the Delta due to subsidence and compaction from planned geotechnical explorations and tunneling activities. Finally, existing storage and conveyance capacity limitations of the SWP may make claimed water supply benefits of the DCP illusory. In my opinion, therefore, the DCP is not in the public interest.

## REFERENCES

- AHO-1005: DWR, 2023, Delta Conveyance Project Final Environmental Impact Report, Chapter 3, Project Description
- AHO-1236: DWR, 2023, Final Environmental Impact Report Local/Regional Agencies and Elected Officials (Response to Comments)
- DWR-805R: DWR, 2025, Delta Conveyance Project, Operations Plan
- LAND-2: PowerPoint Presentation of Gilbert Cosio
- LAND-3: Curriculum Vitae of Gilbert Cosio
- LAND-5: Josef Tootle, G.E., California WaterFix Testimony
- LAND-6: Rittlemayer, 2020, Sociocultural Perceptions of Flood Risk and Management of a Levee System
- LAND-7: U.S. Army Corps of Engineers, 2018, Delta Islands and Levees Sacramento – San Joaquin River Delta, California Interim Integrated Feasibility Report/Environmental Impact Statement
- LAND-8: Delta Independent Science Board, 2016, Workshop Report – Earthquakes and High Water as Levee Hazards in the Sacramento-San Joaquin Delta, Delta Independent Science Board September 30, 2016

- 1 LAND-9: Metropolitan Water District, 2024, Delta Islands: Strategic, Fiscal, and Risk
- 2 Analysis
- 3 LAND-11: DWR, 2025, The State Water Project Delivery Capability Report 2023
- 4 Addendum: Impacts of Subsidence
- 5 LAND-12: Metropolitan Water District, 2025, Update on California Aqueduct Subsidence
- 6 Special Subcommittee on Imported Water Item 3c, June 23, 2025
- 7 LAND-13: Delta Conveyance Authority, 2021, Potential Future Field Investigations –
- 8 Bethany Reservoir Alternative (Final Draft)
- 9 LAND-14: California Water Commission, September 21, 2022, Agenda Item 8:
- 10 Consideration of Evidence in support of Resolutions of Necessity for the Yolo
- 11 Bypass Salmonid Habitat Restoration and Fish Passage Project (Big Notch
- 12 Project) (Action Items)
- 13 LAND-15: DWR, 2023, The State Water Project Delivery Capability Report 2023
- 14 LAND-16: DWR, 2022, Seismic Safety Summary Report
- 15 LAND-17: DWR, 2023, Annual Report to the Delta Stewardship Council Investments in
- 16 Delta Levees
- 17 LAND-18: Delta Stewardship Council, January 17, 2024, Letter re: Completion of the Delta
- 18 Levees Investment Strategy
- 19 NDWA-1: Contract Between the State of California, Department of Water Resources and
- 20 North Delta Water Agency for the Assurance of a Dependable Water Supply of
- 21 Suitable Quality
- 22 NDWA-4: Delta Conveyance Project: Adapting to Climate Change: Catching and Moving
- 23 Water from Big Storms
- 24 SOL-18: Delta Conveyance Design and Construction Authority, May 2024, Total Project
- 25 Cost Summary Memorandum. [https://www.dcdca.org/wp-](https://www.dcdca.org/wp-content/uploads/2024/05/2023-Bethany-Total-Project-Cost-Estimate.pdf)
- 26 [content/uploads/2024/05/2023-Bethany-Total-Project-Cost-Estimate.pdf](https://www.dcdca.org/wp-content/uploads/2024/05/2023-Bethany-Total-Project-Cost-Estimate.pdf)
- 27
- 28

# **EXHIBIT 2**

THOMAS H. KEELING (SBN 114979)  
FREEMAN FIRM  
1818 Grand Canal Boulevard, Suite 4  
Stockton, CA 95207  
Telephone: (209) 474-1818  
Facsimile: (209) 474-1245  
Email: [tkeeling@freemanfirm.com](mailto:tkeeling@freemanfirm.com)

J. MARK MYLES (SBN 200823)  
Office of the County Counsel  
County of San Joaquin  
44 N. San Joaquin Street, Suite 679  
Stockton, CA 95202-2931  
Telephone: (209) 468-2980  
Facsimile: (209) 468-0315  
Email: [jmyles@sigov.org](mailto:jmyles@sigov.org)

Attorneys for Protestants County of San Joaquin, et al.  
San Joaquin County Flood Control and  
Water Conservation District, and  
Mokelumne River Water and Power Authority

[ADDITIONAL COUNSEL LISTED ON FOLLOWING PAGE]

**BEFORE THE**  
**CALIFORNIA STATE WATER RESOURCES CONTROL BOARD**

HEARING IN THE MATTER OF  
CALIFORNIA DEPARTMENT OF WATER  
RESOURCES AND UNITED STATES  
BUREAU OF RECLAMATION'S  
REQUEST FOR A CHANGE IN POINT OF  
DIVERSION FOR CALIFORNIA WATER  
FIX

**TESTIMONY OF JOSEF TOOTLE, G.E.**  
  
**(PART 2 CASE IN CHIEF)**

JENNIFER SPALETTA (200032)  
SPALETTA LAW  
P.O. Box 2660  
Lodi, CA 95241  
Telephone: (209) 224-5568  
Facsimile: (209) 224-5589  
Email: jennifer@spalettalaw.com

Attorneys for Protestants County of San Joaquin, et al.  
San Joaquin County Flood Control and  
Water Conservation District, and  
Mokelumne River Water and Power Authority

OSHA R. MESERVE (SBN 204240)  
SOLURI MESERVE, A LAW CORPORATION  
1010 F Street, Suite 100  
Sacramento, CA 95814  
Telephone: (916) 455-7300  
Facsimile: (916) 244-7300  
Email: osha@semlawyers.com

Attorneys for Protestants  
Local Agencies of the North Delta  
Bogle Vineyards / Delta Watershed Landowner Coalition  
Diablo Vineyards and Brad Lange / Delta Watershed Landowner Coalition  
Stillwater Orchards / Delta Watershed Landowner Coalition



1 My name is Joe Tootle, I am a Principal Geotechnical Engineer at ENGEO  
2 Incorporated. I am a registered Civil and Geotechnical Engineer in California and have been  
3 practicing as an engineering consultant for over 20 years. My experience includes the lead  
4 geotechnical design for, and management of, multifaceted projects that have collectively  
5 included more than 100 million cubic yards of earth work; hundreds of miles of roadway  
6 improvements; public infrastructure, including bridges, tunnels, levees, detention basins,  
7 highways and light rail transit corridors; commercial, residential, and retail centers; community  
8 centers; and public buildings. (See also Exh. LAND-36.)

9 This Part 2 testimony consists primarily of portions of testimony I offered previously in  
10 this proceeding but which were excluded from Part 1 by ruling of the Hearing Officers.

11 **1. Spoils Disposal**

12 Section 22.0 of the Conceptual Engineering Rpt. ("CER"), Spoils Disposal Sites, states:

13 Significant thicknesses of non-supportive or organic soils must be removed in the  
14 course of forebay, pumping plant, and shaft construction. Large volumes  
15 (approximately 30.7 million cy) of re-usable tunnel material (RTM), consisting of  
16 saturated soils mixed with bio-degradable polymers, are generated by tunneling  
17 operations. Large volumes (approximately 8 million cy) of dredge material are  
also expected to be removed from NCCF and SCCF. Smaller quantities of  
excess excavated materials are expected at other facility sites, including about  
1.9 million cy at IF and approximately 1.6 million cy at each intake site.

18 Organic materials will be stockpiled for placement over completed disposal  
19 areas. Soils that are unsuitable for reuse as restoration material, flood fight  
20 material, and engineered fill need to be disposed. These materials will be  
21 characterized and disposed appropriately. The presence of hazardous materials  
or environmental working conditions in or adjacent to potential spoil disposal  
sites will need to be evaluated. Hazardous materials excavated during  
construction needs to be segregated from other construction spoils and properly  
handled in accordance with state regulatory requirements.

22 (DWR-212, p. 207.)

23 The numbers here are staggering, even for engineers familiar with large tunneling and  
24 excavation projects. The total of 45.4 million cubic yards would be three times that in square  
25 yards if the material was spread out to a depth of 1 foot (which it might need to be for drying  
26 and conditioning, leaving aside the question of how one might dry out such material in winter),  
27 that is 136.2 million square yards or 28,140 acres. Drawings in Volume 2 of the CER shows  
28

possible locations for “disposal areas,” principally on Glanville Tract near the Intermediate Forebay (including locations within the Stone Lakes National Wildlife Refuge boundary), on Bouldin Island, and on Byron Tract near the revised Clifton Court Forebay, but these locations have changed before and may well change again. (LAND-65.) The CER provides a list of rules to be followed in siting these facilities but then simply states: “as more information about the nature and volumes of soil generated becomes available, distances and sizes of disposal areas will be refined and identified.” (DWR-212, p. 207.)

To further put 45,400,000 million cubic yards of spoils into perspective, consider the fact that the Great Pyramid of Giza contains approximately 3,400,672 cubic yards of material. (See [http://www.newworldencyclopedia.org/entry/Great\\_Pyramid\\_of\\_Giza](http://www.newworldencyclopedia.org/entry/Great_Pyramid_of_Giza).) The spoils that Petitioners admit will be generated by construction of the proposed twin tunnels will be the equivalent of 13.35 Great Pyramids of Giza.

I have been unable to locate any detailed design and analysis or credible commitments or assurances in the CWF submissions regarding disposal of spoils. It is plainly inadequate to simply say that “these materials will be characterized and disposed of appropriately.” Mr. Bednarski does make some comments, but these are limited to reusable tunnel material:

The excavated material will be saturated with water and might be plasticized due to the use of biodegradable additives (e.g. foam or soil conditioner). [(Reusable Tunnel Material Testing Report, March 2014). Details on disposal and reuse of tunnel material are described in Section 3B.2.18, Appendix A, Recirculated Draft Environmental Impact Report/Supplemental Draft Environmental Impact Statement (RDEIR/SDEIS)]. (Exhibit SWRCB-3.) Treatment and disposal of the decant liquids from the excavated material will require permitting in accordance with current National Pollutant Discharge Elimination System (NPDES) and Regional Water Quality Control Board regulations.  
(DWR-57, p. 19, lines 2-9.)

However, Section 3B.2.18, Appendix A, of the RDEIR sets forth only obtuse and generic environmental commitments, not actual analysis of impacts or potential injury to public trust resources, Delta communities, or the public interest generally. (SWRCB-3.) It provides no detail on locations for spoils disposal or the proposed design and construction of structures and systems for disposal of the spoils.

Absent this missing detail on the location and design of spoil handling facilities, it is impossible to quantify the likely injury to waters of the State, including groundwater. Unmentioned is the fact that water quality in the Delta peats below the irrigated zone is very poor as a result of the interaction of pyrite (iron sulfide) in the mineral soils and the organic components of the peat. The Petitioners show no awareness of this issue. Any such materials may likely need to be handled separately and safely disposed of. At least some facilities will likely require liners with leak detection systems. Such liners will disrupt normal infiltration of precipitation and hence groundwater flows even more than unlined stockpiles. Unlined stockpiles, on the other hand, will likely cause local mounding of the groundwater. Lined or unlined stockpiles, and final disposal areas, will also disrupt existing patterns of surface drainage and likely disrupt irrigation systems. Unless treatment and disposal of decant and other liquids is flawless, there will be injury to groundwater resources, the waters of the State, and affected Delta businesses and communities. Simply stating an intention to acquire the required permits provides little assurance that these injuries will not occur.

## **2. Loss of Ground as a Result of Tunneling Activities, with Catastrophic Impacts on Levees and Islands**

Loss of ground is the term that is generally used for the development of either general subsidence or sinkholes as a result of entry of overburden into the tunnel during tunneling operations. While various techniques have been developed to mitigate such incidents, failures still occur, even when using advanced tunnel boring machines of the kind that likely would be used to advance the WaterFix tunnels. Example of such incidents are cited by Nick Shirlaw in a discussion regarding a recent failure in Germany on the Tunnel Talk web site [<https://www.tunneltalk.com/feedback.php>]:

*As far as I am aware, this is the fourth incidence of catastrophic segmental lining failure behind a pressurized TBM in the last eighteen years; these being:*

- *Hull wastewater transfer tunnel, UK [1999]*
- *Cairo, Egypt [2009]*
- *Okayama, Japan [2012]*

- *Rastatt, Germany [2017]*

*I know of two other cases of severe, local, distortion of gasketed, concrete segmental tunnel linings, in Singapore and the USA, where total failure was avoided by providing additional support in the tunnel.*

*Given the huge number of segmentally lined tunnels built over the last 18 years, the proportion that has failed is tiny; and in each case the failure has been local, without similar problems on the rest of the drive. However, the consequences of each of the failures have been catastrophic.*

As with other specialties within Civil Engineering, there are at least two kinds of articles on tunneling. One kind consists of the “promotional pieces” that are placed in magazines by owners, designers and contractors, which give the impression that the project went smoothly; the other kind is more honest newspaper reporting or technical discussions regarding the problems that are common on big engineering projects. The feedback section on the Tunnel Talk web site, from which the quote in the opening paragraph is taken, is a good example of the latter. The complete comment by Nick Shirlaw and a number of other relevant comments are included in Exhibit SJC-286. As is evidenced by reading articles like the ones referenced, it is unlikely that all catastrophic problems can be eliminated by simply following applicable codes and best practices.

Potential loss-of-ground incidents are a particular problem relative to the planned WaterFix tunnels under the Delta because, as is well known, many of the Delta islands and tracts are subsided below the normal range of water levels in the rivers and sloughs and are only kept dry by the levee system. (See, for instance, Figure 14, Chapter 5, of the Economic Sustainability Plan of the Delta Protection Commission [SDWA-139].) More than half of the length of the proposed WaterFix tunnels cross islands that are subsided by as much as 10 feet or more below Elevation 0 feet. Any breach of the levees on these islands leads to flooding of that island with resultant catastrophic disruption to affected communities and business activities. This injury would not be restricted to a single island because even a single flooded island puts pressure on adjacent islands and also causes salt water intrusion that impacts all

1 water users in the Delta, including local communities and export water users. The WaterFix  
2 proponents acknowledge the possibility of settlement of the levee foundation and damage as a  
3 result of the proposed tunneling activities. (See, e.g., Bednarski Testimony, DWR-57, p. 26,  
4 lines 15-16.) Petitioners also admit the need for further studies “based on the initial  
5 assessment from field reconnaissance and engineering surveys, geotechnical exploration and  
6 analyses will be performed for levee sections that need further evaluations” (DWR-57, p.26,  
7 lines 21-23), and then they discuss potential measures that might be employed to mitigate the  
8 injury. (See, e.g., DWR-57, p. 27, lines 10-16.)

9 However, this focus on potential mitigation measures, though common in the context of  
10 an EIR/EIS analysis, does not address the question currently before this Board: whether the  
11 proposed project will result in adverse consequences for public trust resources and the public  
12 interest generally. In fact, there can be little assurance (and Petitioners have provided none)  
13 that the ambitious tunneling activities at critical locations, such as under levees, will not result  
14 in serious injury to the integrity of the Delta’s complex levee system and other infrastructure  
15 essential to public safety and economic productivity in Delta communities.

16 Citing potential mitigation measures is not the same as assurances of a reasonable  
17 likelihood of no impairment of Delta levees and related Delta infrastructure. This distinction  
18 may seem academic in some contexts, but the consequences of a levee failure leading to  
19 flooding of one or more islands include not only injury to water users on those islands but also  
20 to water users on adjacent islands. Flooded islands exert pressure on not only adjacent  
21 islands, but, potentially, all water users in the Delta as a result of salinity intrusion, not to  
22 mention economic losses and potential loss of life. In short, this is a classic example of a  
23 potential problem that might have a relatively low probability of occurrence but which has very  
24 large consequences. Arguing that the probability of occurrence could be made smaller and  
25 smaller by the adoption of best practices does not significantly change the risk of significant  
26 injury. While similar tunneling activities in other locations may not have the same  
27 consequences, the consequences in the Delta, where many water users are linked together by  
28

shared use of the same levee system, are many orders of magnitude greater. Under these circumstances, merely outlining potential mitigation strategies does not address the problem.

It should also be noted that of all the locations along the proposed tunnel alignments, the river and slough crossings, where the water table is higher than it is on the surrounding islands and tracts, are likely more vulnerable to loss of ground incidents. Thus, while good faith efforts can be made to mitigate loss of ground incidents at river and slough crossings, the environment of the Delta makes elimination of the risk extremely problematic. Given the potential for catastrophic injury, after-the-fact apologies and explanations will bring little consolation to Delta communities that depend upon the continuing integrity of the levees and other infrastructure essential to economic productivity and public safety in the Delta.

### **3. General Inadequacy of Field Investigations and Engineering to Date**

The Petitioners have themselves admitted that the engineering design of the WaterFix is only at or about 10 percent completion. This should be considered an inadequate basis for the approval of either an EIR/EIS or a Change in the Point of Diversion Petition in a challenging environment like the Delta. Even the geotechnical site investigations to date do not meet the accepted standards for a project of any size, let alone a major project in the Delta. A registered civil engineer in the State of California who proceeded to detailed design using only the presently available data would likely be judged to not be acting in accordance with the generally accepted standard of care. And, without more detailed designs, the Petitioners' assurances on multiple issues appear to be meaningless.

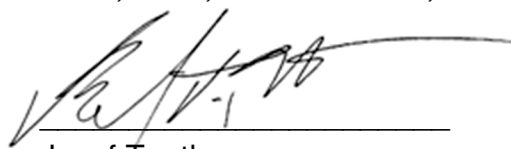
There are many examples of this shortcoming, including the lack of definition of subsurface conditions around excavations which I discussed in my testimony in Part 1 of these proceedings. In that testimony, I noted the variable and tortuous nature of the alluvial deposits that underlie the Delta that render any assurances that adjacent landowners will not be affected problematic, to say the least. The same issue applies to a number of aspects of muck and excavated soils disposal, but the most dramatic example of the significance of the inadequate geotechnical investigations to date is the potential impact on not so much the

1 advancing of the proposed tunnels but the design, and ultimately the performance, of the  
2 tunnel linings, under both static and seismic loads.

3         As a minimum, the Petitioners could and should have carried out the same kind of  
4 investigation along the tunnels alignment that the East Bay Municipal Utility District (EBMUD)  
5 performed along the alignment of their proposed cross-Delta tunnels to house the Mokelumne  
6 Aqueducts. While this project is at an earlier stage of development than the WaterFix, EBMUD  
7 and their engineering consultant engaged the University of Texas to conduct something like a  
8 dozen SASW spreads along the alignment. The results indicated that the sediments  
9 underlying the Delta were both softer and more variable than the engineering consultant had  
10 expected. The sediments were in fact so variable that the University of Texas had difficulty  
11 interpreting the results at depths greater than 100 feet. These findings have great significance  
12 for the evaluations of seismic site response and for the design of tunnel linings. At a minimum,  
13 it would be premature to grant any Change in Point of Diversion Petition until similar studies  
14 are carried out along the proposed WaterFix alignment.

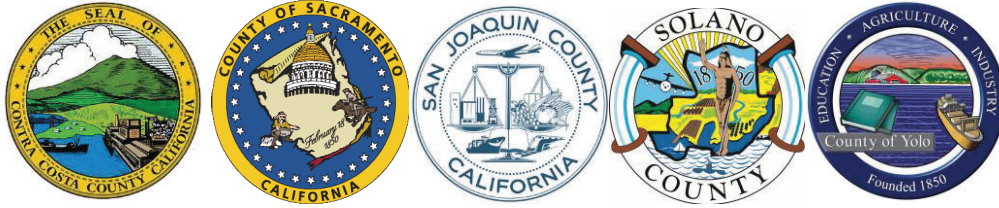
15         I declare under penalty of perjury under the laws of the State of California that the  
16 foregoing statements are true and correct.

17         Executed on the 29th day of November, 2017, at San Ramon, California.

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20 Josef Tootle  
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## **Delta Counties Coalition**

Contra Costa County | Sacramento County | San Joaquin County | Solano County | Yolo County  
"Working together on water and Delta issues."

February 25, 2026

SENT VIA EMAIL: DLL-DCP-EIS@usace.army.mil;  
Leah.M.Fisher@usace.army.mil

U.S. Army Corps of Engineers, Sacramento District  
Attention: Leah Fisher  
Regional Permit Specialist, Regulatory Division  
1325 J Street, Room 1350  
Sacramento, California 95814

### **Re: Delta Conveyance Project Final Environmental Impact Statement**

Dear U.S. Army Corps of Engineers:

This letter provides the Delta Counties Coalition's (DCC) comments on the Delta Conveyance Project Final Environmental Impact Statement (FEIS) prepared by the United States Army Corps of Engineers (Corps) pursuant to the National Environmental Policy Act (42 U.S.C. § 4321 et seq. [NEPA]). The DCC is an alliance consisting of the California counties of Contra Costa, Sacramento, San Joaquin, Solano, and Yolo. These counties work collaboratively to give one voice on behalf of the Sacramento-San Joaquin River Delta and its four million area-wide residents. The DCC advocates to protect and enhance Delta communities and existing land uses, improve the Delta ecosystem, and provide a more reliable water supply for the State.<sup>0F<sup>1</sup></sup>

Upon review of the FEIS, the DCC concludes that the FEIS does not address our original comments submitted on March 16, 2023 (DCC Letter), and fails to meet basic requirements of NEPA, including taking a "hard look at the environmental impacts" of the Delta Conveyance Project (Delta Tunnel). (*Nat'l Parks & Conservation Ass'n v. Bureau of Land Mgmt.* (2010) 606 F.3d 1058, 1072.) A hard look under NEPA requires consideration of both foreseeable direct and indirect impacts. (*Idaho Sporting Congress, Inc. v. Rittenhouse* (2002) 305 F.3d 957, 973.)

Corps permit regulations state that in determining the proper scope of review for NEPA purposes, the Corps must consider those areas of the project that are within its permit jurisdiction and "those portions of the entire project over which the district engineer has

sufficient control and responsibility to warrant Federal review” 33 CFR Pt. 325, App. B Sec.7(b)(1). Therefore, while it is the development’s impact on a jurisdictional area that may determine the scope of the Corps’ permitting authority, it is the impact of the permits on the environment at large that determines the Corps’ NEPA responsibility. Given the numerous levees and water features subject to Corps jurisdiction and the extensive control the Corps asserts over the placement, location, and ultimate approval of the upland activities associated with these levees and water features, the Corps must consider the whole of the project. (*Save Our Sonoran, Inc. v. Flowers* (2005) 408 F.3d 1113, 1122 [due to multiple points of permit authority and associated upland areas of project, Corps failed to satisfy NEPA when it constrained its review to only permit areas].) The Corps’ FEIS is deficient in this respect. It fails to consider the full impacts of the project’s construction and explicitly states that operational effects and water delivery issues are not analyzed. (FEIS, p. A-7.)

The Delta Conveyance Project requires multiple authorizations from the Corps, including permits under Section 404 of the Clean Water Act (for discharges of dredged or fill material into waters of the United States), Section 10 of the Rivers and Harbors Appropriations Act of 1899 (for activities that alter the capacity of navigable waters), and Section 14 of the Rivers and Harbors Appropriations Act of 1899 (commonly referred to as “Section 408”).<sup>2</sup> These statutes mandate important environmental protections and public interest considerations for each permit decision. For example, Section 404 requires a determination of compliance with the 404 (b)(1) guidelines. (40 C.F.R. § 230 et seq.) This involves identification of the Least Environmentally Damaging Practicable Alternative (LEDPA). Section 408 requires a determination that the proposed alteration will not impair the usefulness of the Federal facility and that the alteration is in the public interest. (33 U.S.C. § 408.) When the total number of permits required for this project is considered along with the proper scope of review required for each permit, it is clear that the Government exercises substantial control and authority over the entire project and therefore NEPA review should encompass the whole project.

### **Engagement with Delta Entities Is Still Deficient**

The original DCC letter provides a detailed accounting of the lack of meaningful engagement with Delta entities.<sup>3</sup> The FEIS fails to address this deficit. The FEIS, in fact, defers engagement to California Department of Water Resources (“DWR”), and to *future* activities by DWR. The FEIS goes so far as to say:

As described in the Delta Conveyance Project Final EIR, Volume 2, Chapter 3, Common Responses, Common Response, Implementation Considerations, DWR plans to conduct a variety of public outreach, communication, and engagement efforts to incorporate community input into the final design of the Delta Conveyance Project.

(FEIS, p. 3-99.)

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<sup>2</sup> This is because Section 14 is codified at 33 United States Code section 408.

<sup>3</sup> Delta Counties Coalition. March 16, 2023. Delta Conveyance Project Draft Environmental Impact Statement, p. 2 (DCC Letter).

In fact, however, only four public meetings were provided. (FEIS, p. A-16.) The cumulative quantity of meeting time indicated is 7.5 hours. Given the magnitude of the project and its impacts, this cannot satisfy the fundamental purposes of NEPA, which are to ensure that the federal agency has adequate information, and that this information is communicated to the public and other affected parties that may participate in or support decision making. (*City of Oxford v. FAA* (2005) 428 F.3d 1346, 1353.)

### **Specific Comments on the FEIS**

#### ***The FEIS Fails to Credibly Describe the Project and Its Operations***

DCC previously flagged the Corps' failure to consider the operational effects of the Delta Tunnel in the DEIS as a major concern.<sup>4</sup> Rather than address this concern, the FEIS defers entirely to the analysis conducted by DWR pursuant to state law regarding operations, stating that "The analyses in the Delta Conveyance Project EIR Chapter 5, Surface Water, and Chapter 6, Water 2 Supply" are adequate for describing operational effects. (FEIS, pp. 3-41 to 3-43.) The FEIS also states that, for NEPA purposes, operational effects are not analyzed. (FEIS, p. A-7.) The operation and maintenance of a massive new water diversion facilities on the Sacramento River, with a tunnel and pumping system spanning three counties, has the potential to foreseeably affect cultural, biological, and aesthetic and visual, and other resources. The failure to consider operational effects on the full suite of potential resource topics fails to satisfy NEPA.

#### ***The FEIS Range of Project Alternatives Is Too Narrow***

The DCC Letter provided comments stating that the range of alternatives in the DEIS was too narrow.<sup>5</sup> The FEIS repeats the errors of the DEIS and explicitly states that the FEIS only analyzes the applicant's alternatives. (FEIS, p. A-2.) The FEIS also repeats the general approach of improperly constricting the scope of analysis and the alternatives to the features proposed by the applicant that are within the limited geographic areas subject to Corps permitting jurisdiction. (FEIS, p. 3-23.) The FEIS states, consistent with the new Corps' NEPA regulations, that the Delta Tunnel EIS is governed by 33 Code of Federal Regulations part 325, Appendix B. (FEIS, p. A-17; 90 Fed.Reg. 29471 (July 3, 2025) [permit applications governed by regulation in effect at time submitted].) The relevant regulations state that alternatives that may not be available to the applicant should be considered relevant, and that applications must support related permitting processes such as permits issued under section 404 of the Clean Water Act. (33 C.F.R. § 325, Appendix B [section 9 "Organization and Content of Draft EISs"].) Given the substantial control and authority that the Corps exercises over the entire project under the applicable permitting authorities, the Secretary should have broadened its alternative analysis and considered whether the existing Delta levees could be strengthened and improved to ensure water supply reliability, taking seismicity and climate change considerations into account.

The Corps makes the specific finding that "Through-Delta Conveyance without New Diversion Facility" (i.e., reinforcing Delta levees) is not a viable alternative to ensure supply reliability due to seismicity and climate change induced sea level rise. (FEIS, p. 3-31.) This

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<sup>4</sup> *Id.*, p. 4.

<sup>5</sup> *Id.*, p. 4.

is contrary to materials prepared by one of California's largest water agencies, Metropolitan Water District, which concluded it is feasible to reinforce Delta levees along the freshwater pathway to the existing pumps in the South Delta to a level that would withstand foreseeable seismicity and climate change.<sup>6</sup> In addition, these repairs are estimated to only cost \$400 to \$700 million<sup>7</sup> compared to an estimated \$20 billion for the Delta Tunnel.<sup>8</sup>

***Project Impacts are Not Fully Disclosed and the Effectiveness of Mitigation Is Not Disclosed***

The FEIS repeats the errors of the DEIS and does not address concerns regarding specific impacts the DCC Letter:

- With regard to the issue of fish screen efficacy raised in the original DCC Letter, the Corps defers to DWR and fails to conduct its own analysis. (FEIS, p. 3-84.)
- The FEIS responds to the issue of inadequate agricultural mitigation by providing a high-level conclusory response that defers to the applicant's mitigation approach and states that agricultural effects are outside the "scope of USACE" (i.e., the Corps). (FEIS, p. 3-72.)
- The FEIS disregards groundwater impact comments, and simply states that the Corps has no responsibility, authority, or control over groundwater generally, or issues related to the Sustainable Groundwater Management Act (SGMA). (FEIS, p. 3-104, Wat. Code § 10720 et seq. [SGMA].)
- The FEIS fails to address comments related to recreation, such as the potential for negative impacts on the Sacramento-San Joaquin Delta National Heritage Area (NHA). The FEIS states that the DEIS included "consideration" of the NHA. Upon inspection, the cited document merely references the NHA in passing. (FEIS, p. DEIS, p. 3.17-1.) The regulations governing Corps' issuance of permits under section 404 of the Clean Water Act, however, require consideration of "Parks, national and historical monuments, national seashores, wilderness areas, research sites, and *similar* preserves." (33 U.S.C. § 1344; 40 C.F.R. § 230.54 [emphasis added].) The regulation specifically states that loss of values may "include aesthetic, educational, historical, recreational and/or scientific qualities thereby reducing or eliminating the uses for which such sites are set aside and managed." (33 C.F.R. § 230.54.) Given the absence of any meaningful consideration of the NHA, the Corps appears to have no basis for permit issuance under section 404 of the Clean Water Act.
- The Corps addresses comments on air quality, health, and transportation by summarizing the DEIS analysis. (FEIS, p. 3-72 to 3-78 [air quality]; FEIS, p. 3-129 to 3-131 [transportation].) These summaries are not an adequate response to the DCC's comments.

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<sup>6</sup> Metropolitan Water District. 2024. *Bay-Delta Resources Group, Delta Islands Strategic, Fiscal, and Risk Analysis*, PDF p. 103.

<sup>7</sup> *Ibid.*

<sup>8</sup> Delta Conveyance Design and Construction Authority, May 2024, Total Project Cost Summary Memorandum. <https://www.dcdca.org/wp-content/uploads/2024/05/2023-Bethany-Total-Project-Cost-Estimate.pdf>

- The FEIS does not convey an internally consistent description of the impacts or the final disposition of “reusable tunnel material”. In one location, the FEIS implies that over time the muck stockpiles would be reduced. (FEIS, p. 3-66.) In another location, the FEIS states that it assumes the stockpiles are permanent and no plan is considered for re-use. (FEIS, p. 3-33.) Most of the tunnel muck is unlikely to be reusable and would never be removed from the locations where it would be placed. The Corps must develop a plan to ensure that tunnel muck generated by the project does not create a permanent blight on the Delta landscape caused by muck disposal.

### ***The FEIS Cannot Support the Corps’ Permitting for the Project***

The FEIS, by its own terms, fails to provide adequate information to support issuance of permits subject to Corps authority. (FEIS, p. A-1 [document is programmatic and more detailed design is necessary to support permitting].) As explained above, the document also fails to respond to comments and fails to address myriad resource topics by stating those topics are outside Corps authority.

The relevant Corps permits for the project require a showing that the permit is in the public interest. (33 U.S.C. § 408 [408 permit may not injure public interest].) Also note that the regulations governing Clean Water Act section 404 permits require consideration of “secondary effects”, such as effects that are not directly related to discharge of fill to waters but are effects of the larger activity. (40 C.F.R. § 230.11(h).) Contrary to the Corps response that it has no responsibility for groundwater, the regulations governing 404 permits require consideration of impacts on surface waters or groundwaters. (40 C.F.R. § 230.50.) Because secondary effects of the larger activity, separate from the discharge of fill to waters, as well as the direct impacts of fill on surface and groundwater must be considered. The Corps response regarding groundwater impacts appears to be mistaken. (FEIS, 3-104, 40 C.F.R. § 230.11(h) [secondary effects]; 40 C.F.R. § 230.50 [impacts on ground and surface water].) Indeed, the wholesale failure to consider operational effects on any of these resources, let alone direct effects of construction, appears to omit critical analysis needed for NEPA and permitting. Thus, supplemental NEPA analysis will be required before permits may be issued to cover information gaps that were not previously analyzed under NEPA.

The Corps must also determine compliance with the Section 404(b)(1) guidelines for any discharge of dredged or fill material, in coordination with EPA oversight. (40 C.F.R. § 230 et seq.) This determination involves identifying the LEDPA, complying with the mitigation sequence (avoidance of impacts where practicable, minimization of unavoidable impacts, and compensation for remaining impacts), and ensuring the discharge will not have unacceptable adverse impacts to water supplies, aquatic ecosystems, or wildlife.

### **Conclusion**

The DCC continues to support real improvements to the state’s water supply system that also protect the Delta environment and communities. Given the information deficits in the

DEIS and FEIS, the DCC hopes to see the Corps satisfy its NEPA and permit authorities by preparing and circulating an adequate EIS before taking any action on the project.

Sincerely,



Patrick Hume, Supervisor  
Sacramento County



Oscar Villegas,  
Supervisor  
Yolo County



Shanelle Scales-Preston, Supervisor  
Contra Costa County



Mitch Mashburn, Supervisor  
Solano County



Steven Ding, Supervisor  
San Joaquin County

cc: Senator Padilla  
Congressman DeSaulnier  
Congressman Garamendi  
Congressman Harder  
Congressman Huffman  
Congresswoman Matsui  
Congressman Thompson  
Wade Crowfoot, Secretary, Cal. Natural Resources Agency  
Karla Nemeth, Director, Cal. Department of Water Resources  
Meghan Hertel, Director, Cal. Department of Fish and Wildlife  
(meghan.hertel@wildlife.ca.gov)  
Joaquin Esquivel, Chair, Cal. State Water Resources Control Board





tel: 916.455.7300 • fax: 916.244.7300  
510 8th Street • Sacramento, CA 95814

March 27, 2026

SENT VIA EMAIL: DLL-DCP-EIS@usace.army.mil;  
Leah.M.Fisher@usace.army.mil

U.S. Army Corps of Engineers, Sacramento District  
Attention: Leah Fisher  
Regional Permit Specialist, Regulatory Division  
1325 J Street, Room 1350  
Sacramento, California 95814

**Re: Comments on Delta Conveyance Project Final Environmental Impact Statement, U.S. Army Corps of Engineers ID SPK-2019-00899**

Dear U.S. Army Corps of Engineers:

These comments are submitted on behalf of Local Agencies of the North Delta (“LAND”)<sup>1</sup> on the November 5, 2025 Delta Conveyance Project (“project”, “DCP”, or “Delta Tunnel”) Final Environmental Impact Statement (“FEIS”) prepared by the United States Army Corps of Engineers (“Corps”) pursuant to the National Environmental Policy Act (42 U.S.C. § 4321 et seq. [“NEPA”]).<sup>2</sup> LAND continues to be concerned about the many potentially significant impacts on the environment associated with the project. Additionally, the FEIS fails to meet basic NEPA requirements.

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<sup>1</sup> LAND is a coalition comprised of reclamation, water and levee maintenance districts covering nearly 75,000 acres in the northern geographic area of the Delta. Some of these agencies provide both water delivery and drainage services, while others only provide drainage services. These districts also assist in the maintenance of the levees that provide flood protection to homes and farms.

<sup>2</sup> These comments focus on California Department of Water Resources’ (“DWR”) Preferred Alternative, labeled as Alternative 3 in the FEIS, though they may also apply to other alternatives.



**A. THE DEFICITS IN ANALYSIS OF OPERATIONAL EFFECTS CANNOT SUPPORT PERMITTING**

**1. The Corps Has Jurisdiction Over Operations Under Section 14 of the Rivers and Harbors Act and Section 404 of the Clean Water Act**

The FEIS concedes that the Corps must issue permits under section 14 of the Rivers and Harbors Act. (FEIS, Chapter 1, p. 1-1; 33 U.S.C. § 408.) LAND previously provided comments regarding the need to address operational effects and their interaction with regulated activities under section 14 of the Rivers and Harbors Act. (33 U.S.C. § 408.)<sup>3</sup> In the FEIS, the Corps relies entirely on analysis conducted by DWR in its Environmental Impact Report (“EIR”). (FEIS, Appendix 3, p. 3-42.) Furthermore, the Corps focuses this incorporation by reference on water supplies and diversions only.

The Corps summarizes the conclusions of DWR’s EIR by stating, “[t]herefore, it is not expected that project operations will substantially affect water supplies for other users of water or surface water flows and elevations needed for existing water supply diversions.” (FEIS, Appendix 3, p. 3-42.) This summary analysis fails to account for the Corps’ independent duty to analyze the potential for impacts on its facilities such as levees, and ensure that the alterations proposed by DWR “will not be injurious to the public interest and will not impair the usefulness of such work.” (33 U.S.C. § 408.) Corps guidance explicitly states that operations may be relevant to review pursuant to section 408 of title 33 of the United States Code (“408”).<sup>4</sup> The paucity of information regarding myriad ways that the operation of the Delta Tunnel could affect the facilities subject to 408 authorization, and thus the deficit in NEPA analysis, is unaddressed.

The Corps must also issue a permit pursuant to section 404 of the Clean Water Act. (FEIS, Chapter 1, p. 1-1; 33 U.S.C. § 1344.) The regulations governing Clean Water Act section 404 permits (“404 permit”) require consideration of “secondary effects,” such as effects that are not directly related to discharge of fill to waters but are effects of the larger activity. (40 C.F.R. § 230.11(h).) The Corps, in turn, must consider both the effect of regulated discharge of fill, and secondary effects, on a host of resource areas. (40 C.F.R. §§ 230.20 to 230.54.) To the extent operation of the Delta Tunnel would include

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<sup>3</sup> Local Agencies of the North Delta. March 16, 2023. Delta Conveyance Project Draft Environmental Impact Statement, U.S. Army Corps Public Notice SPK-2019-00899, p. 2 (“LAND Letter”).

<sup>4</sup> United States Army Corps of Engineers. September 10, 2018. Policy and Procedural Guidance for Processing Requests to Alter U.S. Army Corps of Engineers Civil Works Projects Pursuant to 33 USC § 408. (See p. G2 [PDF pp. 45, 68].)

secondary effects on topics for which the Corps must make findings, these are also effects subject to Corps authority and analysis for NEPA. This includes, for example, the findings required for effects on water circulation and salinity gradients. (40 C.F.R. § 230.23 [water circulation]; 40 C.F.R. § 230.25 [salinity gradients].)

The courts have affirmed the duty of the Corps to consider operational effects of projects subject to a Corps permit. In *Friends of the Earth, Inc. v. United States Army Corps of Engineers* (2000) 109 F.Supp.2d 30, 36-39, the court found that the Corps failed to properly analyze environmental impacts associated with the permitting of three floating casinos on the Mississippi coast. In that case, the court found that the environmental assessment prepared to analyze the effects of issuance of permits under section 404 of the Clean Water Act was inadequate. There, operation of the casinos would act as a sump and draw in and affect aquatic species that breed in the wetlands. (*Id.* at 38-39.)

## **2. The FEIS Does Not Adequately Address Impacts to Navigation, and Nutrient and Sediment Movement**

LAND previously provided comments on the potential for complex interactions between sediment transport and navigation caused by the project.<sup>5</sup> In response, the Corps provided essentially pro forma and empty responses. The FEIS summary response regarding navigation only examines construction effects on water levels and construction-related boat traffic. (FEIS, Appendix 3, pp. 3-117 to 3-118.) Similarly, the Corps relies on stormwater runoff mitigation to address comments regarding sediment effects and thus focusing on sediment originating in uplands. (FEIS, Appendix 3, p. 3-98.) The previous comments by LAND focused on changes in sedimentation caused by changes in flow quantities and the failure to address obstacles to navigation.<sup>6</sup> The Corps has not addressed these comments nor has the Corps satisfied NEPA with regard to these issues.

## **3. Secondary and Indirect Impacts from the Potential Issuance of a Fill Permit for Waters of the United States are Not Disclosed**

LAND also provided comments regarding secondary and indirect effects on wetlands and other waters that were not addressed in the FEIS.<sup>7</sup> The Corps asserts that impacts on wetlands and waters were adequately analyzed. (FEIS, Appendix 3, pp. 3-85 to 3-86.) Upon review of changes in the FEIS, however, only minor changes to impact

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<sup>5</sup> LAND Letter, p. 3.

<sup>6</sup> *Id.* at pp. 4-5.

<sup>7</sup> *Id.* at pp. 6-7.

BIO-51 are provided, which are related to mitigation for terrestrial and avian wildlife. (FEIS, Chapter 3, pp. 3.5-98 to 3.5-101.) LAND's comments described a range of potential secondary impacts to waters and wetlands that meet the definition of regulated effects that the Corps still has not addressed, including changes in hydrology and inadvertent filling of water features.<sup>8</sup> (40 C.F.R. § 230.11(h) [secondary effects must be considered].)

**B. THE APPLICANT'S DRAFT 404(b)(1) ALTERNATIVES SCREENING CANNOT SUPPORT PERMIT ISSUANCE BECAUSE IT IS INADEQUATE**

Previous LAND comments stated that the Corps may not have analyzed the least environmentally damaging practicable alternative ("LEDPA") in the DEIS.<sup>9</sup> (40 C.F.R. § 230.10(a) [Corps may only issue a permit under Clean Water Act section 404 for the LEDPA].) The Corps acknowledges that it may only permit the LEDPA. (FEIS, p. 3-23 to 3-24.) Despite these comments, the Corps has arbitrarily constrained its consideration of alternatives under section 404 of the Clean Water Act, and thus NEPA. (33 U.S.C. § 1344; 42 U.S.C. § 4332(2)(C)(iii).) NEPA requires agencies to rigorously develop and explore alternatives to the proposed action. (42 U.S.C. § 4332(2)(C)(iii).) Where available alternative is unexamined, NEPA analysis is inadequate. (*Idaho Conservation league v. Mumma* (1992) 956 F.2d 1508, 1519 [*Idaho Conservation League*].)

Because the Delta Tunnel would require a permit to discharge fill to waters of the United States, the permit must also satisfy the screening of alternatives for the LEDPA. (40 C.F.R. § 230.10(a).) Federal courts require that an agency provide a rational basis for its decision under applicable law. (*Warm Springs Dam Task Force v. Gribble* (9th Cir. 1980) 621 F.2d 1017, 1027 [*Warm Springs*].) Reviewing courts also demand that agency decisions are reasonably explained, and that they engage with important aspects of the problem. (*FCC v. Prometheus Radio Project* (2021) 592 U.S. 414; 423 [reasonably explained requirement] *Alzokari v. Pompeo* (2d Cir. 2020) 973 F.3d 65, 70 [must engage important aspects of the problem].) As explained below, the arbitrary and unlawful selection of alternatives used to identify the LEDPA has a ripple effect of also avoiding consideration of appropriate alternatives under NEPA.

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<sup>8</sup> *Id.* at pp. 6-7.

<sup>9</sup> *Id.* at pp. 8-9.

A review of the document used for screening of alternatives for the LEDPA (“404(b)(1) Analysis”)<sup>10</sup> obtained by Public Records Act request, shows that the applicant has arbitrarily constrained the consideration of alternatives. The 404(b)(1) Analysis includes a statement of the overall project purpose. (404(b)(1) Analysis, PDF pp. 9-10 [“2.3 Project Purpose and Need and Overall Project Purpose”].) The overall project purpose continues for many pages, with a very general litany of various goals and issues but fails to demonstrate why any alternative would or would not meet those goals. (404(b)(1) Analysis, PDF pp. 9-21.)

The justification of the alternatives carried forward for consideration of the LEDPA, however, states that only alternatives that would provide 6,000 cubic feet per second capacity are considered without reference to the overall project purpose itself. The “overall project purpose” is a term of art under regulations implementing the Clean Water Act. (40 C.F.R. § 230.10(a)(2).) The Corps must select the LEDPA from among the practicable alternatives, considering the overall project purpose. (40 C.F.R. § 230.10(a)(1); (a)(2).) Practicable alternatives, in turn, are alternatives that are practicable considering cost, logistics, and technology, in light of that overall project purpose. (40 C.F.R. § 230.3(l).) Thus, the Corps *must justify the decision to not carry forward alternatives based on practicability considering the overall project purpose.* (40 C.F.R. §§ 230.10(a)(1) & (a)(2).) The 404(b)(1) Analysis fails to provide any discussion or justification as to why alternatives that were eliminated are not practicable in light of the overall project purpose. (40 C.F.R. §§ 230.10(a)(1) & (a)(2).) DWR instead relies upon its own discretion, without reference to concrete criteria mirrored in the Corps’ overall project purpose, in a section entitled “Alternatives Not Considered for Further Analysis.” (404(b)(1) Analysis, PDF pp. 33-35.)

This arbitrary constriction of the alternatives considered for the LEDPA is contrary to law. An applicant may not arbitrarily define a project to constrain the alternatives used to find the LEDPA. (*Sylvester v. U.S. Army Corps of Engineers* (9th Cir. 1989) 882 F.2d 407, 409 [court discussing background law related to the Clean Water Act in reviewing an appeal seeking an injunction for a permit for a golf course].)

Here, because the applicant fails to even reference the overall project purpose to justify its range of alternatives used to find the LEDPA, the 404(b)(1) Analysis lacks any rational methods under applicable law. (*Warm Springs, supra*, 621 F.2d at 1027 [courts look for rationality in decision-making]; 40 C.F.R. § 230.10 [LEDPA required].)

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<sup>10</sup> California Department of Water Resources. September 2025. Delta Conveyance Project Clean Water Act Section 404(b)(1) Alternatives Analysis DRAFT - September 2025.

In addition, alternatives that meet the *basic purpose* of the project must be selected to avoid impacts to waters where other alternatives would be more impactful due to features that are ancillary to that *basic purpose*. (*Shoreline Associates v. Marsh* (D.Md. 1983) 555 F. Supp. 169, 179, *aff'd*, 725 F.2d 677 (4th Cir. 1984) [Corps properly denied a permit for a residential development scheme with a boat facility when upland sites for residential development were available].) Here, the only thing that is clear from the disorganized and conclusory discussion in the 404(b)(1) Analysis is that the *basic purpose* is to convey some quantity of water. As such, the Corps must consider all alternatives that would convey reasonable amounts of water to identify the LEDPA.

A potential recipient of water from the Delta Tunnel, the Metropolitan Water District (“MWD”), has investigated the feasibility of modernizing Delta levees to a level that would withstand foreseeable seismicity and climate change, thus creating a through-Delta conveyance option.<sup>11</sup> This action is estimated to cost \$400 to \$700 million,<sup>12</sup> not \$20 billion or more required for a Delta Tunnel.<sup>13</sup> This demonstrates the practicability of a through-Delta armored levee alternative for purposes of a fill permit issued under the Clean Water Act and for purposes of NEPA. (40 C.F.R. § 230.10(a)(1).) Nonetheless, the FEIS states the document analyzes only the applicant’s alternatives. (FEIS, p. 1-1.) However, Corps’ regulations state that practicable alternatives may include areas not subject to the applicant’s control. (40 C.F.R. § 230.10(a)(2).) In the FEIS, the Corps makes the specific finding that an alternative based on reinforcing Delta levees is not a viable alternative to ensure supply reliability due to putative risks from seismicity and climate change induced sea level rise. (FEIS, p. 3-31.) This finding is directly contradicted by the findings of the MWD Delta Islands Report, and is therefore not based on fact.

Modernizing existing levees would likely also be less impactful on the environment, but the Corps has failed to gather evidence to conduct this analysis by arbitrarily eliminating through-Delta levee alternatives that are in fact, practicable, in violation of the Clean Water Act. (40 C.F.R. § 230.10.) The failure to consider

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<sup>11</sup> Metropolitan Water District. February 2024. Delta Islands Strategic, Fiscal and Risk Analysis (“MWD Delta Islands Report”), PDF, pp. 100-104, available at: <https://mwdh2o.legistar.com/View.ashx?M=F&ID=12643424&GUID=4564B343-8513-4C05-882A-51476E50B969>.

<sup>12</sup> MWD Delta Islands Report, PDF p. 104.

<sup>13</sup> Delta Conveyance Design and Construction Authority, May 2024, Total Project Cost Summary Memorandum, available at: <https://www.dcdca.org/wp-content/uploads/2024/05/2023-Bethany-Total-Project-Cost-Estimate.pdf>



practicable alternatives that may reduce impacts on waters or other important environmental resources is also contrary to the duty to consider appropriate alternatives under NEPA. (*Idaho Conservation League, supra*, 956 F.2d at 1519.)

The Draft 404(b)(1) analysis also fails to remedy the information gap caused by the lack of complete information regarding affected cultural resources. The document purports to compare impacts to cultural resources in support of the identification of the LEDPA.<sup>14</sup> The Corps is relying on a programmatic agreement<sup>15</sup> (“PA”) to manage cultural resources subject to section 106 of the National Historic Preservation Act, for the project because, as the PA acknowledges, limited access and low levels of design deprive the Corps of the ability to identify most of the affected resources and adverse effects. (54 U.S.C. § 306108 [Section 106 of the National Historic Preservation Act].) The Corps has not, and cannot, fully identify affected cultural resources in a manner that would support compliance with the duty to weigh the *relative* environmental effects, including effects on cultural resources, for the different conveyance alternatives to identify the LEDPA. (40 C.F.R. § 230.10(a).)

## **C. THE FEIS IMPACT ANALYSIS IS INADEQUATE**

### **1. Impacts on Funding for Flood Control**

LAND previously commented that the project may affect funding for special districts and flood control. (LAND, p. 9.) The FEIS provides no information regarding this issue. The FEIS and Record of Decision should provide appropriate commitments to ensure funding for flood control given the legal requirement that the United States and the State of California must pay special benefit assessments, including assessment supporting flood control, unless a showing is made that a benefit is not received. (Cal. Const., art. XIII D, § 4.)

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<sup>14</sup> California Department of Water Resources. September 2025. Delta Conveyance Project Clean Water Act Section 404(b)(1) Alternatives Analysis DRAFT - September 2025, PDF pp. 96-97.

<sup>15</sup> United States Army Corps of Engineers. 2025. Programmatic Agreement Between the United States Army Corps of Engineers, Sacramento District, and the California State Historic Preservation officer, Regarding the Delta Conveyance Project, Sacramento-San Joaquin Delta, California, PDF p. 1.

## **2. Hydrology Impacts of Operations (Chapter 3.18)**

The DEIS stated that impacts to surface water are only discussed qualitatively and refers readers to the Draft Environmental Impact Report prepared by DWR for further analysis. (FEIS, p. 3.18-1.) The DEIS claimed project operations are outside the Corps' authority stating, "This Draft EIS focuses only on those actions under Corps authority" [*sic*]. (DEIS, Chapter 3 p. 3.18-1.) The FEIS reiterates the qualitative approach to surface water impacts, and remains inadequate. (FEIS, Chapter 3, p. 3.18-1.)

LAND's comment letter on the DEIS identified the absence of analysis related to *operational* reduction in water elevations and associated impacts on navigation.<sup>16</sup> The FEIS provides information regarding navigation impacts only in relation to putative construction-phase increases in water elevation. (FEIS, Chapter 3, p. 3.14-7.) The original comments provided by LAND regarding navigation remain unaddressed.

## **3. Water Supply Impacts (Chapter 3.22)**

The comment letter previously submitted by LAND raised the issue of water supply impacts.<sup>17</sup> The Corps concedes it is aware of comments regarding potential water supply impacts on local users, such as water supply impacts in the Delta region. (FEIS, Appendix 3, p. 3-142.) The Corps then, without justification, absolves itself of analyzing these effects because it does not and will not operate the Delta Tunnel's water delivery facilities. (FEIS, Appendix 3, p. 3-142.) This contradicts the regulatory duty to analyze the secondary or indirect effects of the facility on water supplies in order to issue a permit under section 404 of the Clean Water Act. (40 C.F.R. § 230.50; 33 U.S.C. § 1344.)

## **D. A SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT IS REQUIRED DUE TO NEW INFORMATION REGARDING CONSTRUCTION WATER DEMAND**

The Corps is conducting NEPA review consistent with the NEPA regulations in place at the time it initiated the NEPA process. (FEIS, Chapter 3, p. 3.0-1, citing 33 C.F.R. § 230.13 [adopted Feb. 3, 1988, 53 Fed. Reg. 3127,]; 33 C.F.R. § 325, Appendix B.) The Corps regulations governing NEPA cite the rescinded regulations of the Council on Environmental Quality as the regulation governing situations that trigger the need for a supplemental EIS. (33 C.F.R. § 230.13(b) citing 40 C.F.R. § 1502.09(c).) The current Corps regulations state that a supplemental EIS will be prepared when there is still a

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<sup>16</sup> LAND Letter at p. 10.

<sup>17</sup> LAND Letter at pp. 11-12.



federal action pending new and significant information arises regarding the “adverse effects” of the action. The courts have stated that all a plaintiff need to show in seeking to force a federal agency to conduct supplemental analysis is “a risk that serious environmental impacts will be overlooked.” (*Ondrusek v. United States Army Corps of Engineers* (5th Cir. 2024) 123 F.4th 720, 731 [trial court was in error dismissing claims that a supplemental EIS was required when updated climate and flood risk information was relevant to an ongoing flood control project] [*Ondrusek*].) This is especially true, as explained below, when the Corps fails to consider secondary effects regulated under its own regulations. (40 C.F.R. § 230.11(h).)

The Corps must make determinations regarding the effects of any permit issued under section 404 of the Clean Water Act consistent with subparts C through F of Part 230 of Title 40 of the Code of Federal Regulations. (40 C.F.R. § 230.11.) These effects include secondary effects, i.e., effects associated with the project itself, that do not arise directly from the placement of fill. (40 C.F.R. § 230.11(h).) Note that subpart F specifically tasks the Corps with considering effects, including secondary effects, on surface or groundwaters that are private or municipal water supplies. (40 C.F.R. § 230.50(a).) This mandate encompasses effects that change the quantity of water available. (40 C.F.R. § 230.50(b).)

As described above, the Corps focused primarily on the potential effect of dewatering areas for construction access in the FEIS, and also chose to discuss surface water impacts only at a qualitative level. (FEIS, Chapter 3, pp. 3.11-6 to 3.11-11 [groundwater]; FEIS, Appendix 3, p. 3.18-1 [qualitative surface water analysis].) None of the information provided demonstrates a robust discussion of construction water demand on groundwaters that would be pumped or surface waters that would be diverted to provide water consumed during construction. DWR has only disclosed a very general discussion of potential water sources for construction in its environmental document; similar language is not included in the FEIS. According to the FEIS, “Construction activities may require various amounts of water depending on the activity and location. The water supply needed for construction will be satisfied through a combination of the following: import from local sources, exchanges, use of existing riparian diversions, new temporary appropriations, or existing State Water Project appropriations.”<sup>18</sup> Moreover, the environmental effects of this water demand is not analyzed in the FEIS.

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<sup>18</sup> California Department of Water Resources. December 2023. Delta Conveyance Project, Final Environmental Impact Report, Chapter 3, Description of the Proposed Project and Alternatives, p. 3-66.

In the proceedings regarding DWR's petition<sup>19</sup> to the State Water Resources Control Board to add new points of diversion to the State Water Project, Dr. Tyler Hatch, a consultant to DWR, admitted that construction-phase water demand for the Delta Tunnel was not considered, and he did not know what that demand was. (DWR Hearing Transcript, Vol. 47, February 23, 2026, pp. 117:6-10 & 122:15-19.)

The Eastern San Joaquin Subbasin, which is within the project area for the Delta Tunnel, is a high-priority groundwater basin for purposes of groundwater overdraft regulated under the Sustainable Groundwater Management Act.<sup>20</sup> (Wat. Code, § 10720.7, subds. (a)(1) & (b)(1) [high and medium priority basins must be managed under groundwater sustainability plans].) The South American and Tracy subbasin, also within the footprint of the proposed Delta Tunnel, are medium priority basins.<sup>21</sup> Any extraction of groundwater or surface water would have the potential to negatively affect groundwater levels in these subbasins.

Concrete used to construct the project would consume water. The Delta Tunnel would require massive quantities of concrete for intakes, sediment basins and access shafts, which would require six new concrete batch plants in the Delta.<sup>22</sup> Construction phase mitigation measures and environmental commitments would also be water intensive. (FEIS, Appendix C1, p. C1-51 [dust control]; p. C1-51 [water application at batch plants for dust control].)

The FEIS indicates that the concrete tunnel segments would be delivered by road, from undisclosed locations. (FEIS, Chapter 2, p. 2-29.) However, recent documents prepared by DWR suggest that it is likely that the tunnel segments themselves would be cast locally in the immediate region such as Antioch or Lathrop, thus increasing total water demand for the project.<sup>23</sup>

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<sup>19</sup> State Water Resources Control Board. February 29, 2024. Notice of Petition Requesting Changes in Water Rights of the Department of Water Resources for the Delta Conveyance Project.

<sup>20</sup> California Department of Water Resources. December 2023. Final Environmental Impact Report, Chapter 8, Groundwater, PDF p. 8.

<sup>21</sup> *Ibid.*

<sup>22</sup> California Department of Water Resources. December 2023. Final Environmental Impact Report, Chapter 3, Description of the Proposed and Alternatives, PDF p. 14.

<sup>23</sup> Delta Conveyance Design and Construction Authority. 2024. Concept Engineering Report, Appendix E5, Preliminary Precast Yard Study (Final Draft), PDF pp. 5-11 ("Preliminary Precast Yard Study"), available at: <https://dcdca.org/wp->

Table 1 below provides a very preliminary estimate of the total water demand required for the Delta Tunnel during the construction phase. Most of the factors that contribute to total water demand are not estimated because the FEIS provides no information from which water demand can be approximated, and thus quantities remain unknown.

**Table 1. Delta Tunnel Water Demand for Concrete**

| <b>Delta Tunnel Project Elements Contributing to Water Demand</b>                                                                        | <b>Estimated Water Demand (Acre Feet)</b>    |
|------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
| 674,982 Total Cubic Yards of Concrete Acknowledged in Cost Estimates for Non-Tunnel Elements <sup>24</sup>                               | 68.36                                        |
| 1,554,300 Cubic Yards of Additional Concrete Demand for the Tunnel Segments <sup>25</sup>                                                | 157.41                                       |
| Water for Mitigation (dust control, management of invasive species, etc.)                                                                | unknown                                      |
| Water Consumed for Cooling Concrete While Casting <sup>26</sup>                                                                          | unknown                                      |
| Water for Fire Suppression                                                                                                               | unknown                                      |
| Provision of temporary water supply to farmers that sustain reduced supplies due to construction (Mitigation Measure GW-1) <sup>27</sup> | unknown                                      |
| <b>Total Water Demand</b>                                                                                                                | <b>225.77 Acre Feet + Unknown Quantities</b> |

content/uploads/2024/10/DCP\_CER\_AppendixE5\_Prel-Precast-Yard-Study\_FinalDraft.pdf.

<sup>24</sup> Delta Conveyance Design and Construction Authority. May 14, 2024. Total Project Cost Summary Memorandum (concrete extracted from Attachment 2 Estimate Bid Item Summary Cost Table).

<sup>25</sup> Delta Conveyance Design and Construction Authority. 2025. Reducing Impacts Through Engineering (gross concrete volumes for the tunnel estimated based on a 45-mile, 36-foot diameter, 1.5-foot-thick tunnel).

<sup>26</sup> Barbara Klemczak Aneta Smolana. July 26, 2024. *Multi-Step Procedure for Predicting Early-Age Thermal Cracking Risk in Mass Concrete Structures*. Materials. Available at:

<https://pmc.ncbi.nlm.nih.gov/articles/PMC11313579/#:~:text=Abstract,straains%20experienced%20by%20the%20structure>

<sup>27</sup> United States Army Corps of Engineers. December 2025. Delta Conveyance Project, Final Environmental Impact Statement, Appendix C2, Mitigation Measures, pp. C2-208 to C2-209.

Any groundwater extraction for construction from the Eastern San Joaquin Subbasin would add to the existing overdraft condition subject to management.<sup>28</sup> Diversion of surface waters to meet construction water demand would also reduce the availability of water contributing to recharge, and may also reduce supplies available for other users of water. Water extracted for construction demand from the Tracy and South American subbasins would constitute water demand that is not accounted for in current basin planning. (Wat. Code, § 10720.7, subds. (a)(1) & (b)(1) [medium priority basins are subject to planning and management].)

The testimony of Dr. Hatch, the study of casting yard locations, and the revelation that there are not readily available water supplies to meet the project's construction demands constitute new information that is relevant to the significant effects of the action, and thus triggering the need for a supplemental FEIS.<sup>29</sup> (*Ondrusek, supra*, 123 F.4th at 731.) These significant effects could occur with respect to various resources, including biological resources, groundwater, surface water and others.

Regardless of the need for supplemental NEPA analysis, the FEIS also does not provide any analysis of construction water demand that corresponds to the factual determinations it must make regarding secondary effects on municipal and private water supplies. (40 C.F.R § 230.50(a) & (b).) Federal courts have unequivocally stated that “[t]he Corps’ responsibility under NEPA to consider the environmental consequences of a permit extends even to environmental effects with no impact on jurisdictional waters at all. (*Save Our Sonoran, Inc. v. Flowers* (9th Cir. 2005) 408 F.3d 1113, 1122 [Corps’ reliance on a finding of no significant impact was improper for a development project when it failed to consider impacts beyond fill of waters].) Here, where the relevant NEPA analysis does not consider the effect of construction water demand on waters in a manner that is consistent with the regulations for a fill permit, additional analysis is clearly required. (40 C.F.R § 230.50(a) & (b).)

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<sup>28</sup> Eastern San Joaquin Groundwater Authority. June 2022. Groundwater Sustainability Plan: Executive Summary, p. ES-1.

<sup>29</sup> Preliminary Precast Yard Study, PDF pp. 5-11.

**E. A SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT IS REQUIRED DUE TO NEW INFORMATION REGARDING GOLDEN MUSSEL**

Golden mussel (*Limnoperna fortunei*) was discovered in the Delta in October of 2024.<sup>30</sup> DWR proposes to create approximately 9.5 million square feet of concrete surfaces that would provide habitat for golden mussel (the new substrate area was estimated based on the tunnel length and internal diameter and concrete required for intakes, sedimentation basins, and associated structures).<sup>31</sup> The FEIS contains a discussion of invasive plants in Impact BIO-52, but has no discussion whatsoever of golden mussel. (FEIS, Chapter 3, p. 3.5-102.) The mitigation approach provided in BIO-52 is not applicable to nor does it address the impacts of golden mussel.

Available science on golden mussel demonstrates that “[d]ense attachment of adult mussels on natural or artificial substrates leads to significant biofouling issues, resulting in substantial socio-economic losses and ecological risks.”<sup>32</sup> The issuance of a fill permit under section 404 of the Clean Water Act requires consideration of secondary effects on the aquatic environment. (40 C.F.R. § 230.11.) The issuance of a 404 permit for the Delta Tunnel would undeniably cause secondary effects associated with the creation of vast new areas of habitat for golden mussel, and thus a supplemental EIS is required. (*Ondrusek, supra*, 123 F.4th at 731; 40 C.F.R. § 230.11.) In addition, the factual determinations required for a Clean Water Act section 404 permit require consideration of the secondary effects of golden mussel habitat creation. (40 C.F.R. § 230.11.) The proliferation of golden mussel already affects water supply facilities,<sup>33</sup> and as a result, the

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<sup>30</sup> Rachel Becker, CalMatters, July 15, 2025. “*A new invader threatens California water supplies. Can the state stop its spread?*” (“July 2025 Becker article”), available at: <https://calmatters.org/environment/water/2025/07/golden-mussel-california-water-supplies-spread-inspections/>.

<sup>31</sup> California Department of Water Resources. December 2023. Delta Conveyance Project, Final Environmental Impact Report, Chapter 3, Project Description, p. 3-15; see also California Department of Water Resources. December 2023. Delta Conveyance Project, Final Environmental Impact Report, Bethany Reservoir Alignment Alternative 5 Mapbook, pp. 2-3.

<sup>32</sup> Yang et al. *Establishment risk of invasive golden mussel in a water diversion project: An assessment framework. Environmental Science and Ecotechnology*, 17 (2024) 100305, p. 1. Available at: <https://www.sciencedirect.com/science/article/pii/S2666498423000704>

<sup>33</sup> July 2025 Becker article.

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Sacramento Division  
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Corps must consider impacts of golden mussel habitat creation on water supply. (40 CFR § 230.50.)

**F. CONCLUSION**

The FEIS, much like the DEIS, does not take the requisite “hard look” at the effects of the Delta Tunnel. Accordingly, the FEIS is not adequate to support permit issuance.

Very truly yours,

**SOLURI MESERVE**  
A Law Corporation

By:   
Osha R. Meserve

cc: Katherine Marquez, Program Manager III, California Department of Water Resources, Katherine.Marquez@water.ca.gov

# **Attachment B**

Biological Opinions

(USFWS & NMFS)

(2026)



# **BIOLOGICAL AND CONFERENCE OPINION for the Delta Conveyance Project**

**Service File No. 2024-0029957-S7-001**



**March 9, 2026**

**U.S. Fish and Wildlife Service  
San Francisco Bay-Delta Fish and Wildlife Office  
Sacramento, California**

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## ACRONYM LIST

|             |                                                                               |
|-------------|-------------------------------------------------------------------------------|
| Act         | Federal Endangered Species Act                                                |
| BA          | Biological Assessment                                                         |
| BiOp        | Biological Opinion                                                            |
| Caltrans    | California Department of Transportation                                       |
| CDFW        | California Department of Fish and Wildlife                                    |
| CEQA        | California Environmental Quality Act                                          |
| cfs         | Cubic Feet per Second                                                         |
| CLSM        | Controlled Low-strength Backfill Material                                     |
| CMP         | Compensatory Mitigation Plan                                                  |
| CNDDDB      | California Natural Diversity Database                                         |
| Corps       | U.S. Army Corps of Engineers                                                  |
| CPT         | Cone Penetration Test                                                         |
| CVP         | Central Valley Project                                                        |
| dBA         | A-weighted Decibel                                                            |
| DCP         | Delta Conveyance Project                                                      |
| DMM         | Deep Mechanical Mixing                                                        |
| DWR         | California Department of Water Resources                                      |
| ESA         | Federal Endangered Species Act                                                |
| ERT         | Electrical Resistivity Tomography                                             |
| GIS         | Geographic Information System                                                 |
| GPS         | Global Positioning System                                                     |
| H:V         | Horizontal to Vertical                                                        |
| I           | Interstate                                                                    |
| IEP         | Interagency Ecological Program                                                |
| Leq         | equivalent continuous sound level                                             |
| LTO BiOp    | Biological & Conference Opinion for the Long-Term Operations of the CVP & SWP |
| NAVD88      | North American Vertical Datum of 1988                                         |
| NEPA        | National Environmental Policy Act                                             |
| NWS         | National Weather Service                                                      |
| O&M         | Operations and Maintenance                                                    |
| PA          | Proposed Action                                                               |
| Reclamation | U.S. Bureau of Reclamation                                                    |
| RMS         | Root Mean Square                                                              |
| RTM         | Reusable Tunnel Material                                                      |
| SCADA       | Supervisory Control and Data Acquisition                                      |
| SEL         | Cumulative sound exposure level                                               |
| Service     | U.S. Fish and Wildlife Service                                                |
| SPL         | Peak sound pressure level                                                     |
| SR          | State Route                                                                   |
| SWP         | State Water Project                                                           |
| TBM         | Tunnel Boring Machine                                                         |



## 1. INTRODUCTION

This Biological and Conference Opinion (BiOp/consultation) is in response to the U.S. Army Corps of Engineers (Corps) August 22, 2025, request for initiation of formal consultation and conference with the U.S. Fish and Wildlife Service (Service) on their issuance of a Department of the Army permit application, Section 408 permission request, and real estate easement for the California Department of Water Resources' (DWR) proposed Delta Conveyance Project (DCP/Proposed Action [PA]). As described below and in Section 5. Consultation Approach, this consultation addresses the effects of construction DCP facilities and their maintenance activities on federally-listed species, their designated critical habitat, and federally-proposed species, while DCP operation and programmatic aspects related to operation will be addressed in a future consultation. Pursuant to 50 CFR 402.12(j), DWR and the Corps submitted a Biological Assessment (BA) to support the Corps' determinations (Table 1-0-1) and this consultation. This response is provided under the authority of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (ESA or Act), and in accordance with the implementing regulations pertaining to interagency cooperation (50 CFR 402).

DWR is proposing the construction and operation of new facilities, including new points of diversion. These proposed new facilities would work in conjunction with and modify the existing State Water Project (SWP). The modifications to and operation of the SWP would continue to be coordinated with the Central Valley Project (CVP) and are not within Corps jurisdiction. On November 8, 2024, the Service issued a Biological and Conference Opinion for the Long-Term Operations of the CVP and SWP (2024 LTO BiOp) (Service File No. 08FBDT00-2022-0059509) to the U.S. Bureau of Reclamation (Reclamation). The 2024 LTO BiOp included a framework programmatic consultation to evaluate the potential impacts of the proposed future operations of the DCP on federally listed species and designated critical habitat. As part of this framework, Reclamation committed to initiating additional consultations in the future to address both near-field and far-field effects of the DCP operations, providing detailed information at that time for site-specific analyses. This current consultation by the Service focuses specifically on these non-operational components, which were previously reviewed in the 2024 LTO BiOp under the broader programmatic approach.

**Table 1-0-1. Federally Listed and Proposed Species and Critical Habitat Corps Determinations**

| Common Name                                                                       | Scientific Name                 | Federal Status | Determination                              |
|-----------------------------------------------------------------------------------|---------------------------------|----------------|--------------------------------------------|
| California Least Tern                                                             | <i>Sterna antillarum browni</i> | E              | May Affect, Not Likely to Adversely Affect |
| Least Bell's Vireo                                                                | <i>Vireo bellii pusillus</i>    | E              | May Affect, Likely to Adversely Affect     |
| California Red-legged Frog & Critical Habitat                                     | <i>Rana draytonii</i>           | T              | May Affect, Likely to Adversely Affect     |
| Central California Distinct Population Segment of the California Tiger Salamander | <i>Ambystoma californiense</i>  | T              | May Affect, Likely to Adversely Affect     |

|                                                                          |                                          |    |                                        |
|--------------------------------------------------------------------------|------------------------------------------|----|----------------------------------------|
| Delta Smelt & Critical Habitat                                           | <i>Hypomesus transpacificus</i>          | T  | May Affect, Likely to Adversely Affect |
| Giant Garter Snake                                                       | <i>Thamnophis gigas</i>                  | T  | May Affect, Likely to Adversely Affect |
| San Francisco Bay-Delta Distinct Population Segment of the Longfin Smelt | <i>Spirinchus thaleichthys</i>           | E  | May Affect, Likely to Adversely Affect |
| San Joaquin Kit Fox                                                      | <i>Vulpes macrotis mutica</i>            | E  | May Affect, Likely to Adversely Affect |
| Valley Elderberry Longhorn Beetle                                        | <i>Desmocerus californicus dimorphus</i> | T  | May Affect, Likely to Adversely Affect |
| Vernal Pool Fairy Shrimp & Critical Habitat                              | <i>Branchinecta lynchi</i>               | T  | May Affect, Likely to Adversely Affect |
| Vernal Pool Tadpole Shrimp                                               | <i>Lepidurus packardii</i>               | E  | May Affect, Likely to Adversely Affect |
| Western Distinct Population Segment of the Yellow-billed Cuckoo          | <i>Coccyzus americanus</i>               | T  | May Affect, Likely to Adversely Affect |
| Monarch Butterfly                                                        | <i>Danaus plexippus</i>                  | PT | May Affect, Likely to Adversely Affect |
| Northwestern Pond Turtle                                                 | <i>Emys marmorata</i>                    | PT | May Affect, Likely to Adversely Affect |
| Northern Distinct Population Segment of the Western Spadefoot            | <i>Spea hammondi</i>                     | PT | May Affect, Likely to Adversely Affect |

In reviewing the PA, the Service has relied upon: (1) the Corps' letter requesting consultation, dated August 22, 2025; (2) the August 2025 BA for the PA; (3) multi-agency meetings spanning 2020 to present; and (4) other information available to the Service.

## 2. SPECIES LIKELY TO BE ADVERSELY AFFECTED

The Service concurs with the Corps' determinations that the PA is likely to adversely affect certain listed and proposed species. Specifically, this consultation evaluates whether the PA is likely to jeopardize the continued existence of the federally endangered vernal pool tadpole shrimp (*Lepidurus packardii*), San Francisco Bay-Delta distinct population segment (DPS) of the longfin smelt (*Spirinchus thaleichthys*) (longfin smelt DPS), least Bell's vireo (*Vireo bellii pusillus*), and San Joaquin kit fox (*Vulpes macrotis mutica*); the federally threatened valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), vernal pool fairy shrimp (*Branchinecta lynchi*) and its critical habitat, delta smelt (*Hypomesus transpacificus*) and its critical habitat, giant garter snake (*Thamnophis gigas*), California red-legged frog (*Rana draytonii*) and its critical habitat, Central California DPS of the California tiger salamander (*Ambystoma californiense*) (California tiger salamander), Western DPS of the yellow-billed cuckoo (*Coccyzus americanus*) (yellow-billed cuckoo); and the federally proposed as threatened northwestern pond turtle (*Emys marmorata*), northern DPS of the western spadefoot (*Spea hammondi*), and monarch butterfly (*Danaus plexippus*).

### 3. SPECIES NOT LIKELY TO BE ADVERSELY AFFECTED

The Service concurs with the Corps' determination that the PA is not likely to adversely affect the California least tern. DWR has mapped foraging habitat throughout the Action Area and although some foraging habitat will be affected through construction of the DCP, foraging habitat is not a limited resource for the least tern and effects to foraging habitat are anticipated to be discountable. The closest distance between a known nesting location is approximately one mile from the DCP footprint. This occurs between the Bufferlands nesting site (Sacramento Wastewater Treatment Plant) and the supervisory control and data acquisition facilities northeast of the north Delta intakes. This nesting site will be avoided and construction activities are not anticipated to interfere with least tern nesting. Least tern will likely avoid areas of construction and have ample space to fly away from construction areas to where they would not likely be adversely affected by project activities. In the unlikely event foraging or nesting terns are in the vicinity of the DCP, DWR has proposed avoidance and minimization measures articulated below in 6.4.2.2 *California Least Tern Avoidance and Minimization Measures*.

### 4. CONSULTATION HISTORY

This consultation is the most recent in a series of efforts related to iterations of the Delta Conveyance Project. The Service completed a consultation on the California WaterFix Project (Service File No. 08FBDT00-2016-F-0247), a previous iteration of the Delta Conveyance Project, on June 23, 2017, which was withdrawn on May 6, 2019, per a May 2, 2019, request from Reclamation and DWR. More recently, on November 8, 2024, the Service issued a BiOp for the Long-Term Operations of the CVP and SWP and an amended incidental take statement on November 14, 2025 (Service File No. 08FBDT00-2022-0059509), which also evaluated the proposed future operations of the DCP using a framework programmatic consultation approach to assess potential effects on listed and proposed species and critical habitat. From January 2020 to the issuance of this consultation, DWR and the Corps convened a series of weekly and monthly multi-agency coordination and technical meetings to develop the final BA and National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA) documents. Those meetings are incorporated by reference and will not be individually identified below. The following section outlines key milestones in the consultation history for the DCP.

- September 27, 2023: The Service participated in a multi-agency Delta tour of the DCP footprint.
- October 23, 2023: DWR transmitted the October 2023 draft DCP BA.
- December 8, 2023: The Service provided courtesy review comments on the draft DCP BA to DWR.
- May 15, 2024: The Corps requested formal consultation and conference for the effects associated with the PA and submitted the 2024 BA.
- June 14, 2024: The Service responded to the Corps' May 15, 2024, letter with a request to discuss a mutually agreeable extension of the consultation period with the Corps and DWR in order allow for the framework for the DCP operations be completed under the LTO BiOp first where operations can be referred to in this consultation on the construction of DCP.
- November 8, 2024: The Service issued the LTO BiOp to Reclamation (Service File No. 08FBDT00-2022-0059509).

- November 14, 2024: In response to the Service's June 14 request to discuss a mutually agreeable extension of the consultation period, the Corps sent a letter determining an extension of the consultation period is now warranted and requested a draft biological opinion by March 2, 2025. Subsequent meetings in December 2024 and January 2025 occurred regarding schedule for sufficiency review.
- February 25, 2025: The Service transmitted comments to the Corps and requested additional clarifying and additional information based on the sufficiency review of the BA.
- March 28, 2025: DWR provided responses to the Service's February 25, 2025, letter in a spreadsheet tracker.
- April 11, 2025: DWR provided supplemental material in response to sufficiency review requests and discussions.
- May 21, 2025: DWR provided updated responses to the Service's February 25, 2025, letter in a sufficiency review tracker spreadsheet.
- June 10, 2025: DWR and the Corps provided updated responses to the Service's February 25, 2025, letter in a spreadsheet tracker.
- August 5, 2025: In a meeting, the Service agreed the outstanding issues were addressed and requested a final revised BA and initiation letter.
- August 22, 2025: The Service received the Corps' revised request for consultation and August 2025 BA.
- January 14, 2026: The Service provided a draft biological opinion with cover letter to the Corps for review.
- January 23, 2026: The Corps and DWR provided edits and comments on the draft biological opinion.
- January 30, 2026: The Service provided responses to comments and edits within the draft biological opinion.
- February 2, 2026: The Corps responded to the Service stating they had completed review and had no further comments on the draft biological opinion. DWR responded to the Service stating they have a few outstanding items to discuss at the next meeting.
- February 3, 2026: The Service, Corps, and DWR met to discuss DWR's outstanding items.
- February 12, 2026: DWR provided additional information, comments, and suggested edits on the draft biological opinion.
- February 24, 2026: The Service responded to DWR's February 12, 2026, email.
- March 3, 2026: The Service, Corps, and DWR met to discuss DWR's outstanding item.
- March 4, 2026: DWR provided suggested edits to resolve their outstanding item per the March 3, 2026, meeting. The Corps and Service responded accepting the suggested edits.

## 5. CONSULTATION APPROACH

Endangered Species Act regulations require that all effects of the action including "all consequences to listed species or critical habitat that are caused by the PA, including the consequences of other activities that are caused by the PA but that are not part of the action" (50 CFR 402.02) are addressed in consultation. After reviewing the action as proposed by the Corps, the Service has determined that the PA presents a mixed programmatic action, as defined in 50 CFR 402.02. The Service's consultation includes a mix of standard consultation and refers to the

programmatic framework in the 2024 LTO BiOp. The 2024 LTO BiOp stated that the Corps would initiate a subsequent section 7 consultation for the construction of DCP. Actions related to DCP operations were addressed under a framework programmatic approach in the 2024 LTO BiOp and will not be addressed in this consultation. Those activities under the framework programmatic approach will be subject to a subsequent consultation in order to proceed.

The BA contains various levels of detail regarding facility and construction components and the effects on listed and proposed species and their habitats. Some PA elements and their effects may change as the Corps and DWR continue to develop the PA and may require reinitiation. Additionally, reinitiation of this consultation may be required when additional information becomes available for any PA elements that lack the necessary specificity at this time but do not require future Federal approvals. This approach is consistent with the requirement for the Action Agency to reinitiate consultation under certain circumstances. 50 CFR 402.16 outlines the circumstances that require reinitiation of consultation, which apply to the PA. Refer to the *Reinitiation - Closing Statement* for additional specific conditions under which consultation will need to be reinitiated.

## **5.1 Defining Consultation Types**

The following consultation types were used for accounting how elements of the DCP are binned and referred to throughout this BiOp (Table 5-0-1) as noted in BA Table 1.7-1, Table 1.7-2, and Table 1.7-3.

### **5.1.1 Standard Consultation**

For standard consultation activities, there is enough information available in the BA or elsewhere to address the specific effects without the need for subsequent or tiered consultations in the future. These activities do not require future Federal approvals and could be implemented at any point after the Federal action occurs. These activities pertain to the construction of the DCP and include pre-construction investigations, construction, maintenance during construction, and mitigation for terrestrial construction impacts.

### **5.1.2 LTO Programmatic Consultation**

For framework programmatic actions, an ITS is not required at the program (framework) level for those actions falling within the definition of framework programmatic action (50 CFR 402.02). Framework programmatic actions establish a framework for the development of future actions that are authorized, funded, or carried out at a later time, and any take of a listed species would not occur unless and until those future actions are authorized, funded or carried out and subject to further section 7 consultation.

Future long-term operations of the DCP were addressed programmatically in the 2024 LTO BiOp, which include: (1) north Delta intake diversions, including resulting operating criteria and diversion criteria; (2) integration of the north Delta Intakes with the existing SWP south Delta intakes; (3) continued SWP coordination with CVP through the Coordinated Operations Agreement; (4) adaptive management and monitoring; and (5) conservation measures including compensatory mitigation. The LTO Effects Tracking Table provides additional detail regarding the 2024 LTO BiOp consultation approach and can be found in that document's Appendix 1 of



the 2024 LTO BiOp. In their 2024 LTO proposed action, Reclamation committed to initiating future consultations to address the near-field and far-field effects of operations of the DCP and at that time, would provide sufficient information to support the site-specific analysis of operations. More information, including the proposed framework for DCP, can also be found in Appendix 2 of the 2024 LTO BiOp. The Service anticipates the subsequent consultations will be initiated by Reclamation or where subject to Corps jurisdiction, the Corps could be the Federal agency with sufficient information provided as outlined in 50 CFR 402.12(f) and those components will not be addressed in this consultation.

Operations, maintenance, long-term aquatic studies, and adaptive management of the DCP will be fully analyzed in a subsequent consultation per the 2024 LTO BiOp framework but were included to a degree in the BA and appendices.

Near-term baseline studies are generally described in BA Appendix 5B with additional studies described in California Department of Fish and Wildlife's (CDFW) Incidental Take Permit. The general description of these studies appears to utilize existing monitoring studies/surveys or are augmentations of existing monitoring studies/surveys and are considered in the Environmental Baseline.

**Table 5-0-1. Components of the Mixed Programmatic Approach**

| <b>Activity</b>                                                                                                                                                                                                                                                                                                      | <b>DCP Standard Consultation</b> | <b>No Effect or Environmental Baseline</b> | <b>LTO Framework Programmatic Consultation</b> | <b>Federal Action Agency</b> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|--------------------------------------------|------------------------------------------------|------------------------------|
| Preconstruction (field investigations)                                                                                                                                                                                                                                                                               | X                                |                                            |                                                | Corps                        |
| Construction (north Delta intakes, tunnels, tunnel shaft sites, RTM sites, Bethany Complex, access roads, electrical facilities, SCADA facilities, fencing and lighting, park-and-ride lots, land reclamation, Contra Costa Water District settlement related facilities, and other construction support facilities) | X                                |                                            |                                                | Corps                        |
| Construction monitoring and on-site, post-construction mitigation and restoration under the PA                                                                                                                                                                                                                       | X                                |                                            |                                                | Corps                        |
| Maintenance activities anticipated to occur during the construction phase of the PA                                                                                                                                                                                                                                  | X                                |                                            |                                                | Corps                        |
| Creation and enhancement at initial mitigation sites Bouldin Island and the Interstate 5 ponds and post-construction activities                                                                                                                                                                                      | X                                |                                            |                                                | Corps                        |
| New near-term baseline studies                                                                                                                                                                                                                                                                                       |                                  | X                                          |                                                | Multiple *                   |
| Project operations: Real-time operational decision making and                                                                                                                                                                                                                                                        |                                  |                                            |                                                | Reclamation                  |

| Activity                                                                                                                                                                                        | DCP Standard Consultation | No Effect or Environmental Baseline | LTO Framework Programmatic Consultation | Federal Action Agency |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-------------------------------------|-----------------------------------------|-----------------------|
| adaptive management related to new facilities constructed under the PA                                                                                                                          |                           |                                     | X                                       |                       |
| Tidal restoration and channel margin enhancement mitigation sites: monitoring, mitigation, and restoration associated with construction and operations of new facilities developed under the PA |                           |                                     | X                                       | Reclamation/ Corps*   |
| Long-term studies and monitoring associated with construction, mitigation, and operations activities                                                                                            |                           |                                     | X                                       | Reclamation/ Corps*   |
| Maintenance activities anticipated to occur post-construction, during the operations phase of the PA                                                                                            |                           |                                     | X                                       | Reclamation/ Corps*   |

\* Where subject to Corps jurisdiction, the Corps could be the Federal Action Agency

## 6. DESCRIPTION OF THE PROPOSED ACTION

This section summarizes the description of the DCP from the BA, including routine maintenance activities and long-term operational elements of the DCP by reference. In the 2024 LTO BiOp, Reclamation committed to initiating subsequent consultations to address the near-field and far-field effects of operations and mitigation of the DCP and at that time, would provide sufficient information to support the site-specific analysis of operations. Those elements included by reference are part of the BA but will be subject to subsequent consultations and will not be included in Section 12. Effects of the Proposed Action and the Incidental Take Statement of this document. Please refer to the BA for further details.

### 6.1 Summary of the Proposed Action

The DCP involves the construction and operation of new SWP water conveyance facilities in the Delta. However, the Corps PA involves the construction (not operation) and routine maintenance of Intakes B and C to convey up to a total of 6,000 cfs of water from the north Delta. From Intakes B and C, the alignment of the tunnel conveying water would then follow a route to Twin Cities Complex double launch shaft, New Hope Tract maintenance shaft, Canal Ranch Tract maintenance shaft, Terminous Tract reception shaft, King Island maintenance shaft, tunnel under Rindge Tract, Lower Roberts Island double launch shaft, Upper Jones Tract maintenance shaft, tunnel under Lower Jones Tract, tunnel under Victoria Island, Union Island maintenance shaft, tunnel under Coney Island, and Clifton Court Tract to the Bethany Complex's Surge Basin reception shaft. See Figures 7-1 and 7-2 in the *Description of the Action Area* section for the general footprint of the PA.

The PA includes constructing a new Bethany Reservoir Pumping Plant and Surge Basin located to the south of Clifton Court Forebay, and a new Bethany Reservoir Aqueduct that conveys



flows to a new Bethany Reservoir Discharge Structure on the shore of Bethany Reservoir. The aqueduct would consist of four pipelines including tunneled segments under the existing CVP C. W. “Bill” Jones Pumping Plant (Jones Pumping Plant) discharge pipelines and existing conservation easements adjacent to Bethany Reservoir. Collectively, these facilities are called the Bethany Complex.

The tunnel from the intakes to the Bethany Complex would have an inside diameter of 36 feet and outside diameter of 39 feet and extend approximately 45 miles from the intakes to the surge basin at the Bethany Reservoir Pumping Plant. The Twin Cities double shaft is used to bore one tunnel north to the intake shafts and one south to the Terminus Tract reception shaft. Lower Roberts Island would have a double launch shaft, which would allow one tunnel boring machine (TBM) to bore north to the Terminus Tract reception shaft and one to bore south toward the final reception shaft at the Bethany Reservoir Surge Basin. New shaft pads would be constructed of soil excavated from either the shaft site or nearby shaft sites. As examples, excess soil from excavation at the Twin Cities Complex would provide soil for the Twin Cities tunnel launch shaft pad and shaft pads at New Hope Tract, Canal Ranch Tract, Terminus Tract, and King Island. Similarly, soil from Lower Roberts Island would be used to construct Upper Jones Tract and Union Island shaft pads.

Delivery of tunnel segments, TBM machinery, other soil materials, and equipment would be by road. Rail would also be used to deliver tunnel segments to the Lower Roberts Island tunnel launch shaft site. For example, all deliveries to the Twin Cities Complex would be by road. Access roads would be modified to accommodate large construction vehicles.

The double launch shaft at Lower Roberts Island would require a shaft site to accommodate a double launch shaft with a figure eight configuration, reusable tunnel material (RTM) storage area, and corresponding access roads. Material excavated on-site would be used to construct the shaft pad. The RTM site would also house a rail-served materials depot. Rail access to Lower Roberts Island would be provided from existing Union Pacific Railroad or Burlington Northern and Santa Fe Railway tracks located on the Port of Stockton. Rail lines would be extended from one of the existing rail facilities in the Port of Stockton. Rail access would be extended over a new bridge over Burns Cutoff and continue to the tunnel segment storage area near the RTM storage area.

Construction would also include interconnection facilities for Contra Costa Water District (CCWD). The facilities would consist of an interconnection pump station with water intake from the Union Island maintenance shaft on the main tunnel, and a new 1.6-mile conveyance pipeline that would extend from the pump station and connect to the existing CCWD Victoria Island Pipeline just downstream of the CCWD’s existing Middle River Intake and Pumping Plant. The interconnection pipeline would be installed in a trench with open cut and cover construction along existing roadways and within agricultural fields. The pipeline construction easement would be 100 feet wide for the entire length of the trench, including a 30-foot temporary construction easement around the 70-foot permanent easement. Dewatering may occur along the open trench, with flows collected, treated, and reused on-site. The portion of the interconnection pipeline that crosses Victoria Canal would be microtunneled.

Launch and retrieval pits, approximately 35 feet wide by 50 feet long, would be placed within the 100-foot open trench construction easement on Union Island and Victoria Island to launch and receive microtunneling equipment. A permanent 70-foot wide easement would be maintained along the length of the pipeline in Union Island and Victoria Island. Air valves, blow offs, and access manways would be placed along the pipeline within the permanent easement. Pumped flow from the new Interconnection Pump Station would convey raw water from the Union Island shaft to CCWD's existing Transfer Pumping Station through the new conveyance pipeline and subsequently through CCWD's existing Victoria Island and Old River Pipelines. During periods when CCWD's existing Middle River and Old River Pumping Plants are in simultaneous operation with the Interconnection Pump Station, a maximum combined pumped flow of up to 250 cfs could be conveyed through the Victoria Island Pipeline and a maximum combined flow of up to 320 cfs could be conveyed through the Old River Pipeline.

Compensatory mitigation for construction of the DCP is proposed as restoration and enhancement on Bouldin Island and DWR's I-5 Ponds, credits from approved conservation banks, and site protection instruments. Future to-be-determined tidal restoration and channel margin enhancement mitigation is proposed for DCP construction and operational effects to listed fish per the 2024 LTO BiOp. As mentioned above, operational effects will not be analyzed in this specific consultation.

## **6.2 Conveyance Facility Construction**

### **6.2.1 Field Investigations**

Field investigations refer to data collection efforts to inform more detailed design and construction methods. Field investigations will occur during the preconstruction and construction periods and are related to geotechnical, hydrogeologic, agronomic testing, and construction test projects (geotechnical investigations). Geotechnical investigations and the installation of monitoring equipment would begin following completion of all required permits. These activities and installations are expected to be completed within approximately 2 years depending on availability of access to the project sites. Groundwater and other monitoring activities would be performed prior, during, and after intake construction completion and the tunneled undercrossing of the Stockton Deep Water Ship Channel.

Boat operations for geotechnical investigations would likely be conducted from a shallow-draft barge or ship, outfitted with the necessary equipment for the tasks. There would be two barge trips for the test-pile program (i.e., to and from a single intake site), two to six barge trips for the geotechnical investigations at the intakes (i.e., to and from each intake site), and up to 20 barge trips for the geotechnical investigations at bridges and tunnel crossings (i.e., to and from 10 sites).

#### ***6.2.1.1 Investigations to Support Section 408 Permitting***

##### ***Soil Boring and Cone Penetration Tests***

Soil borings and cone penetration tests (CPTs) would be conducted within the construction boundaries at the intakes and within the Stockton Deep Water Ship Channel and adjacent non-project levees at the location of the proposed tunnel undercrossing. Drilling techniques would generate an approximately 4- to 8-inch-diameter boring. For CPTs, a cone-tipped rod with a

diameter of 1 to 2 inches would be pushed through the ground. All CPT holes would be filled with grout following completion and prior to abandonment, and all soil borings not planned to function as a groundwater monitoring well would be completely grouted following boring. Groundwater monitoring wells would be constructed with casings, in accordance with state and local laws.

#### *Groundwater Testing and Monitoring*

At each intake, 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. At each intake, a surface water gauge would be installed to track the elevation of the adjacent river for use in analysis of the results.

Pumping tests would be conducted in the test wells. Water levels before, during, and following the various tests would be monitored using automated data loggers, which would also record barometric pressure and the level of the river. It is assumed that the groundwater monitoring program would be conducted partially using remotely monitored instrumentation and partially by on-site personnel.

#### ***6.2.1.2 Investigations Prior to Construction Phase***

Explorations would occur at the intakes, tunnel shafts, tunnel alignments, power lines, access roads and bridges, railroads, levees, and at the terminal facilities.

#### *Soil Boring and Cone Penetration Tests*

Land-based soil borings, overwater soil borings, and CPTs would be conducted within the construction boundaries of the intakes, tunnel shafts, tunnel alignments, power lines, access roads and bridges, railroads, and levees. Tests would be conducted at the Bethany Reservoir Pumping Plant and Surge Basin, Bethany Reservoir Aqueducts, and the Bethany Reservoir Discharge Structure.

#### *Bethany Fault Study*

Electrical resistivity tomography (ERT) would be used to characterize subsurface soil characteristics above the Bethany Reservoir Aqueduct tunnels. ERT involves “a linear array of removable small steel electrodes (approximately 0.5 inch in diameter by 8 inches long) driven into the ground approximately every 10 feet over several hundred feet to induce a low current in the ground, while a small readout unit provides the measurements” (California Department of Water Resources 2020b:17 as cited in the BA).

### *Groundwater Testing and Monitoring*

A test well for pumping tests would be installed at each tunnel shaft and at each intake. At each intake, a surface water gauge would be installed to track the elevation of the adjacent river for use in analysis of the results. For the tunnel alignment, it is assumed that vibrating wire piezometers would be installed in boreholes drilled along the tunnel alignment at a frequency of on average every third borehole, or approximately every 3,000 feet. Two test wells would be installed at the Bethany Reservoir Pumping Plant and Surge Basin, and at each of the two planned tunneled sections of the Bethany Reservoir Aqueduct.

Pumping tests would be conducted in the test wells. Water levels before, during, and following the various tests would be monitored using automated data loggers, which would also record barometric pressure and the level of the river. 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. It is assumed that management of the groundwater monitoring program would be conducted partially using remotely monitored instrumentation and partially by on-site personnel.

### *Test Trenches*

Test trenches approximately 30 feet long, 3 feet wide, and 10 feet deep would be implemented at all the facilities to confirm near-surface soils and to investigate potential buried magnetic anomalies. Trenches would be immediately backfilled following observations of the soil conditions encountered in the trench.

### *Monument Installation*

Metal survey monuments would be installed at all construction sites and approximately every mile along the tunnel alignments to allow the remote monitoring of surface elevations prior to the start of construction, during construction, and during operations. Monuments would be approximately 10 feet by 10 feet base and 3 feet high to be of adequate size to be visible from satellite-based Interferometric Synthetic Aperture Radar used for remote monitoring. Concrete foundations would be installed for the monuments and the monuments would be left in place for the duration of construction. It is assumed that periodic monitoring of survey monuments would be conducted by security and on-site personnel.

### *Geotechnical Pilot Studies for Settlement*

Site-specific pilot studies would be conducted to test the geotechnical response to placement of fill at tunnel shaft sites, especially at Delta islands. Pilot studies are proposed at New Hope Tract, Canal Ranch Tract, Terminous Tract, King Island, Lower Roberts Island, Upper Jones Tract, and Union Island.

Test fills would be within the construction boundaries of the project and, where feasible, within or adjacent to the shaft pad sites. The test fills would be approximately 10 feet high and roughly

1,000 square feet in base area. The material would be purchased from a commercial enterprise that provides soil. The studies would include the installation of inclinometers, piezometers, and borehole extensometers within soil borings, as well as settlement plates buried within the fill, to verify estimates of consolidation and lateral spreading of pad fills in peat and soft soils.

Additional soil borings and CPTs would be completed within and adjacent to the test fill areas prior to their placement. Inclinometers and extensometers would be installed in holes drilled within and adjacent to the test fills. It is assumed that management of the pilot studies would be conducted by on-site personnel.

#### *Validation of Ground Improvement Methods*

Ground improvement would likely consist of a combination of excavation of unsuitable soils and replacement with compacted suitable fill material, surcharging to induce consolidation before final construction, and in situ techniques such as deep mechanical mixing (DMM) method to mix amendments (such as cement) into the foundation to add strength and resistance to liquefaction, including the installation of a grid of DMM soil shear walls with cement under the footprints of large structures. Final site-specific methods would be determined through geotechnical investigations and test installations, especially on land with substantial deposits of peat and loose or soft soils. These investigations would include trial mix and DMM construction programs to confirm appropriate area and volume replacement ratios, desired cement content, and testing to confirm in situ strength and lateral extent. These activities are proposed at New Hope Tract, Canal Ranch Tract, Terminous Tract, King Island, Lower Roberts Island, Upper Jones Tract, and Union Island.

#### *Pile Installation Methods at the Intake Location*

The intake locations would include the construction of in-river cofferdams. These cofferdams would be in place for up to 5.5 years (Figure 3.5-12. Construction Schedule of the BA). The cofferdams would employ the use of interlocking steel sheet piles. Pilot studies would be conducted to test pile installation and possible acoustic mitigation measures in the river at one intake site along the Sacramento River. The studies would include use of equipment to monitor vibrations in air and water and noise while test driving a variety of pile types using vibratory and driving methods to validate rates and penetration depths. Noise associated with vibratory pile driving is considerably lower than noise associated with impact hammer pile driving. Additionally, CPTs would be performed in the river from a barge to determine the in situ density of the soils prior to, during, and after test pile installation.

#### *Vibratory Testing of Dynamic Properties*

Vibratory testing of dynamic properties of peat would be conducted in the Delta for validation of peat soil response during earthquakes. This would include continuation of previous studies in the Delta, including those on Sherman Island (Reinert *et al.* 2014 as cited in the BA), or additional peat studies at up to two sites at Lower Roberts Island, Upper Jones Tract, or Union Island.

### *Location of Buried Groundwater and Natural Gas Wells*

A field test program would be used to evaluate the suitability of various geophysical techniques to detect buried and abandoned wells. To identify and/or confirm the location of well casings, including wells that have not been identified in the published database, the use of wide-area airborne methods (drone, helicopter, and/or fixed-wing aircraft) to conduct magnetic surveys followed by more site-specific walk- or tow-over ground-based magnetic surveys is assumed. These surveys would be conducted at intake and tunnel shaft locations, along tunnel alignments, and at the Bethany Complex to identify buried groundwater and natural gas and oil wells. Surface geophysical surveys would also be used at these locations. The locations of identified wells would be evaluated to determine methods to abandon, relocate, or avoid the wells.

### *West Tracy Fault Studies*

Up to six test trenches (up to approximately 1,000 feet long, 3 feet wide, and 20 feet deep) would be excavated along a line running from the southeast of Byron to the southeast of Clifton Court Forebay to further investigate the nature and location of the West Tracy Fault between the town of Byron and the area southeast of the forebay. The trenches would remain open for up to 6 weeks, depending on the findings, and would be backfilled completely upon the completion of observation of soil conditions within the trench.

In addition to the test trenches, two arrays of surface geophysical surveys would be completed before, and along the alignment of, the excavation of the test trenches. Geophysical surveys would consist of noninvasive techniques that could be used to provide information on subsurface geologic conditions and anomalies, such as buried casings or abandoned wells. Seismic refraction/reflection techniques would be used at each of the two linear sites, referred to as geophysical arrays.

CPTs and soil borings would also be conducted. Select soil samples from the test borings would be subjected to age-dating laboratory testing.

### *Agronomic Testing*

If field investigations described above indicate it is warranted, additional agronomic testing would be conducted. Agronomic testing would include investigations and testing of compacted soil rehabilitation methods and rehabilitation treatments for establishing agricultural crop or native grass species. Agronomic testing would validate the reuse assumptions prior to reclamation of disturbed areas based on representative samples and likely tunneling conditioners. This pilot-scale testing would be used to refine program-level approaches and strategies for RTM stockpiling and reuse.

### *Utility Potholing*

Utility potholing, utilizing either a vacuum excavator or a backhoe, would be conducted to confirm locations of existing utilities such as public and residential utilities, surface water diversions, and agricultural drainage features. Utility potholing would be conducted at locations



near the intakes, underground supervisory control and data acquisition (SCADA) and power corridors, road and bridge modifications including intersections, tunnel shaft sites, and along the tunnel alignment. Utility potholing would also be conducted at Union Island, Bethany Reservoir Pumping Plant and Surge Basin, the Bethany Reservoir Aqueduct, the Bethany Reservoir Discharge Structure, the raw water feed from Skinner Fish Facility, and at new road and road widening locations. The investigations would be conducted within the construction footprint. The investigations would include vacuum or backhoe excavations, followed by noninvasive surface field surveys. Some features would not require utility potholing and would be located using only noninvasive surface field surveys.

#### ***6.2.1.3 Investigations during Construction Phase***

These activities are primarily related to the installation of monitoring equipment, such as inclinometers, confirmatory sampling for areas of ground improvement, and investigations related to evaluation of changes in anticipated conditions or alternative contractor means and methods.

##### *Soil Boring and Cone Penetration Tests*

Soil boring and CPT investigations during construction would occur in the same locations as described in Section 6.2.1.2, Investigations Prior to Construction Phase, under Investigation at Facility Locations. These geotechnical investigations would generally be conducted within the first 2 years of the construction period, including during the period when ground improvement activities would be conducted, although they could extend throughout the duration of construction and commissioning to account for delayed starts and to resolve disputes. These investigations could be conducted at any location within the construction boundaries and would also be used to confirm the suitability of construction means and methods planned by the contractor.

#### ***6.2.1.4 Construction Monitoring***

##### *Monitoring for Ground Movement during Construction*

Inclinometers and extensometers would be installed in vertical borings along levees at the intakes, along the tunnel alignment and at tunnel shafts. They would also be installed at King Island, Lower Roberts Island, Upper Jones Tract, and Union Island; and along levees near bridge improvements along Hood-Franklin Road over Snodgrass Slough, the access road to Lower Roberts Island over Burns Cutoff and Turner Cut, and at Bethany Complex.

No instrumentation is assumed at the new levees, while inclinometers are planned at 1000-foot centers along areas of levee improvements. Tilt meters, settlement plates, and survey monuments would be installed at all construction sites and approximately every mile along the tunnel alignment.



### *Groundwater Monitoring*

Groundwater monitoring wells installed before construction could continue to be used during and following construction. Additional groundwater monitoring wells would be installed during construction if permanent easements or land ownership were not acquired before construction, or if initial monitoring results indicated the need for more detailed information related to groundwater elevation or water quality. It is anticipated that the groundwater monitoring locations would be located at the intakes, tunnel shafts, and access roads. Monitors would also be located at Bethany Complex. Monitoring wells would be located at approximately every 2 miles along the tunnel alignment between shafts. It is assumed that management of the groundwater monitoring program would be conducted partially using remotely monitored instrumentation and partially by on-site personnel.

### *Location of Buried Groundwater and Natural Gas Wells*

Land surveys, drilling, and trenching would be used at all intake and tunnel shaft locations, along tunnel alignments, and at the Bethany Complex to identify and abandon buried groundwater and natural gas and oil wells before and during construction.

## **6.2.2 North Delta Intakes**

New intakes on the Sacramento River in the north Delta would be constructed (Table 6.2-0-1). The two intakes (alone or in combination) on the east bank of the Sacramento River would divert water and convey it through a single main tunnel. Intake B would be just north of Hood, and Intake C would be between Hood and Courtland. Intakes 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. During construction, the intake footprints would contain areas for standby engine generators, staging and management of construction equipment and materials, and ground improvement and slurry cutoff wall material preparation areas. Standby engine generators would be permanently installed at the intakes. Construction access to the intake sites would be by means of new access/haul roads and barge/tugboat. Intake construction will also include dredging, installation of log booms, and riprap placement. Permanent intake footprints when construction is complete would be smaller once certain construction-related features are removed.

**Table 6.2-0-1. Summary of Intake Characteristics**

| <b>Feature</b>                              | <b>Intake B</b> | <b>Intake C</b> |
|---------------------------------------------|-----------------|-----------------|
| Maximum capacity (cubic feet per second)    | 3,000           | 3,000           |
| Total size of construction site (up to)     | 242 acres       | 239 acres       |
| Total size of postconstruction site (up to) | 123 acres       | 109 acres       |

| Feature                                                                                                                         | Intake B                                                                                                                                                                                                                              | Intake C                                                                                                                                                                                                                            |
|---------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Intake structure length                                                                                                         | 1,574 feet along river including training walls<br>964 feet along river for concrete structure only                                                                                                                                   | 1,528 feet along river including training walls<br>964 feet along river for concrete structure only                                                                                                                                 |
| Cylindrical tee screen assembly                                                                                                 | 30 fish screen units                                                                                                                                                                                                                  | 30 fish screen units                                                                                                                                                                                                                |
| Area of cylindrical tee screen (including fish screen and manifold assembly, and mounted on the face of the structure)          | Each unit: 8 feet in diameter and 30 feet long                                                                                                                                                                                        | Each unit: 8 feet in diameter and 30 feet long                                                                                                                                                                                      |
| Sedimentation basin dimensions (basin would be divided into two cells by a turbidity curtain)                                   | Each cell = 1,300 feet long and 650 feet wide at top of the embankment<br>Each cell = 990 feet long and 500 feet wide at bottom of the embankment<br>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<br>Each cell = 990 feet long and 495 feet wide at bottom of the embankment<br>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<br>One small radial gate: 15 feet wide and 8 feet tall<br>Top elevation of flow control structure = 30.3 feet<br>Bottom elevation of flow control structure = - 8.8 feet | Four large radial gates: 30 feet wide and 40 feet tall, each<br>One small radial gate: 15 feet wide and 8 feet tall<br>Top elevation of flow control structure = 29.3 feet<br>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<br>Each approximately 15 to 18 feet deep, containing an average of 10 to 12 feet of water when in use                                              | Each approximately 146 feet wide and 350 feet long at the bottom of the embankment<br>Each approximately 15 to 18 feet deep, containing an average of 10 to 12 feet of water when in use                                            |
| 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<br>Top elevation at the top of lagoon embankment<br>Bottom elevation 20 to 25 feet below top elevation                                                      | Each lagoon outlet structure = approximately 15 feet wide by 15 feet tall<br>Top elevation at the top of lagoon embankment<br>Bottom elevation 20 to 25 feet below top elevation                                                    |
| Intake outlet channel from flow control structure to intake outlet shaft                                                        | Bottom and inside of embankment: 750 feet long and 146 feet wide                                                                                                                                                                      | Bottom and inside of embankment: 750 feet long and 146 feet wide                                                                                                                                                                    |
| Length of temporary State Route 160 levee                                                                                       | 4,250 feet along the centerline                                                                                                                                                                                                       | 4,200 feet along the centerline                                                                                                                                                                                                     |
| 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 to 23 feet above toe of temporary levee fill)                                                                                                                                                                           | 29.3 feet (20 to 23 feet above toe of temporary levee fill)                                                                                                                                                                         |
| Ground improvement under the levees and facilities embankments                                                                  | Approximately 1.5 to 2.0 million cubic yards of DMM wall sections and approximately 250,000 to 350,000 tons of cement                                                                                                                 | Approximately 1.5 to 2.0 million cubic yards of DMM wall sections and approximately 250,000 to 350,000 tons of cement                                                                                                               |

| Feature                                                                                          | Intake B                                                                                                                                                                                                                                                                  | Intake C                                                                                                                                                                                                                                                                  |
|--------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cofferdam                                                                                        | Length = 2,942 feet (including sheet piles and DMM wall)<br>Elevation at the top of cofferdam = about 25 feet                                                                                                                                                             | Length = 2,897 feet (including sheet piles and DMM wall)<br>Elevation at the top of cofferdam = about 25 feet                                                                                                                                                             |
| Cofferdam impact pile driving duration (total hours) (vibratory pile driving hours not included) | 15                                                                                                                                                                                                                                                                        | 14                                                                                                                                                                                                                                                                        |
| Onsite electrical substations facilities footprint                                               | Facilities contained within a 75-foot-wide by 125-foot-long enclosure with a separate safety and security fence<br><br>Smaller transformers less than 10 feet wide by 10 feet long would be positioned at several locations around the site                               | Facilities contained within a 75-foot-wide by 125-foot-long enclosure with a separate safety and security fence<br><br>Smaller transformers less than 10 feet wide by 10 feet long would be positioned at several locations around the site                               |
| Standby engine generator/fuel tank—during construction and operation phases                      | 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                                                                 | 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                                                                 |
| Appurtenant Structures Dimensions—during Construction Phase                                      | Office trailers, showers/ washrooms, canteen and common area, and bus shelter<br><br>Most of these buildings would be 15-feet tall or less (one story)<br><br>Other buildings for warehousing for materials and temporary work enclosures would be less than 20 feet tall | Office trailers, showers/ washrooms, canteen and common area, and bus shelter<br><br>Most of these buildings would be 15-feet tall or less (one story)<br><br>Other buildings for warehousing for materials and temporary work enclosures would be less than 20 feet tall |
| Appurtenant structures dimensions—during operations phase                                        | One of the construction buildings would be converted for indoor storage of portable equipment and vehicles used for maintenance of all intakes.                                                                                                                           | One of the construction buildings would be converted for indoor storage of portable equipment and vehicles used for maintenance of all intakes.                                                                                                                           |
| Land reclamation                                                                                 | Approximately 119 acres                                                                                                                                                                                                                                                   | Approximately 130 acres                                                                                                                                                                                                                                                   |

### 6.2.2.1 Cylindrical Tee Fish 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 into 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.

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 area. 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 by which the pile is vibrated into the soil beneath the site as opposed to being hammered in, as occurs in impact pile driving. Noise associated with 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 (where supported by additional geotechnical information). All pile driving would occur between 7:00 a.m. and 7:00 p.m. and would not occur outside of this timeframe. It is estimated that the longest installation period (at Intake C) would be no more than 255 hours over a 5- or 6- week period, including time for handling and preliminary vibratory pile driving. Assuming 2 minutes of driving time for each sheet pile pair, impact drive time would range from a total of 14 hours at Intake C with 3,000-cfs capacity, occurring over roughly 5 or 6 weeks. Each intake sheet pile construction period would be staggered by about 1 year.

#### ***6.2.2.2 Sediment Basins and Drying Lagoon***

Diverted water would contain sediment suspended in the river water, a portion of which 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 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. 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.

#### ***6.2.2.3 Temporary and Permanent Flood Control Levees and State Route 160***

Constructing the intakes along the riverbank would require relocating the Federal project levee and State Route (SR) 160 prior to building the intake structure and fish screens. The Federal (“jurisdictional” or “project”) levee was constructed as part of the Sacramento River Flood Control Project Levee Program established by the Corps to provide flood management for surrounding lands. Altering a jurisdictional levee requires approval by the Corps 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 (California Department of Transportation [Caltrans] jurisdiction) and maintain continuous flood protection during construction of the new intake facilities.

The temporary levee would also facilitate construction sequencing of the permanent jurisdictional levee around the perimeter of the intake shaft and sedimentation basin. The level of flood control afforded by the existing levee would be maintained during and after construction.

Between the temporary jurisdictional levee and the Sacramento River, a cofferdam would be constructed along the water side of the Sacramento riverbank adjacent to the existing SR 160 to provide a dry workspace for intake structure construction. Following construction of the intake structure and the permanent levee system on the land side of the temporary levee, 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 and sea level rise in the Sacramento River as defined in the Preliminary Flood Water Surface Elevations memorandum (DWR 2020a as cited in the BA). 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 the year 2100 and 3 feet of freeboard during operations.

### *On-Site Roads at the Intakes*

Permanent paved roads and gravel-surfaced roads and work areas would be constructed at intakes for use during construction and later operations. At Intake B, approximately 8,900 feet of 20-foot-wide paved permanent roads would be installed on the intake site toward the end of construction. Several 24-foot-wide paved internal roads would be constructed around the base of the intake outlet shaft area, along the top of the embankments, and on ramps up the side of the embankments. About 6,500 feet of 20-foot-wide gravel roads with chip seal would be constructed around the sediment drying lagoons, along the length of the sedimentation basin parallel to SR 160, and to provide access along the sediment loading areas. All construction access and the primary maintenance access to the intake site would be from the intake access road.

Intake C would also have approximately 6,500 feet of 20-foot-wide gravel roads with chip seal around the same facilities as at Intake B. About 8,300 feet of paved permanent roads would be installed at Intake C near the end of construction, along with 24-foot paved internal access roads around the base of the intake outlet shaft area, along the top of the embankments, and on ramps up the side of the embankments. All construction access and the primary maintenance access to the intake site would be from the intake access road.

## **6.2.3 Tunnels**

The tunnel from the intakes to the Bethany Complex would have an inside diameter of 36 feet and outside diameter of 39 feet and extend 45 miles from the intakes to the surge basin at the Bethany Reservoir Pumping Plant. The bottom elevations of the tunnel from the intakes to the tunnel reception shaft at the Bethany Complex Surge Basin would range from -139 feet to -164 feet (North American Vertical Datum of 1988 [NAVD88]), with a top elevation near sea level.

## **6.2.4 Tunnel Shafts**

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 Bethany Complex. The TBM would be lowered into a launch shaft and bore horizontally toward a reception shaft. Because the TBM cutterhead would need inspection and maintenance, maintenance shafts would be located approximately every 4 to 6 miles between launch and reception shafts to provide access for TBM maintenance, repair, access or evacuation, and logistic support in a free-air (not pressurized) environment. The northernmost intake shaft would serve as the reception shaft

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. Reception shafts would be used to remove the TBM from the tunnel at the end of each drive. All tunnel shafts would be maintained during operations to provide access, as needed.

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 the tunnel and construction personnel from localized flooding but lower than the top of the shaft postconstruction to reduce the need for imported fill. The final postconstruction shaft at the intakes would be raised above the shaft pad to an elevation above the maximum water surface in the tunnel for hydraulic surge events or the Sacramento River 200-year flood event with sea level rise and climate change hydrology for Year 2100, whichever is higher, including freeboard criteria. 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 large equipment. A scaffold will be erected to allow personnel into and out of the tunnel during operations.

#### ***6.2.4.1 Tunnel Launch Shafts***

Tunnel launch shafts would generally have a finished inside diameter ranging from 110 to 120 feet 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 RTM. Tunnel launch shaft sites would also include areas for tunnel liner segment storage, aggregate storage, slurry/grout mixing 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.

#### ***Double Launch Shaft at Twin Cities Complex***

Construction would include the double launch shaft at the Twin Cities Complex. The double launch shaft would be constructed in a figure eight configuration with an inside diameter of 115 feet 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 off Twin Cities Road approximately 0.5 mile northeast of the interchange with Interstate (I-) 5. Its northern boundary would fall between Dierssen and Lambert Roads, its eastern boundary along Franklin Boulevard, its western boundary offset from the I-5 embankment, and a majority of the southern boundary at Twin Cities Road. During construction, the Twin Cities Complex would occupy up to 586 acres. The permanent site size would be up to 222 acres. The construction site 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 flood elevation with 2:1 [horizontal to vertical; H:V] exterior slopes and 3H:1V interior slopes).



The Twin Cities Complex during construction would contain the double launch shaft, tunnel segment storage, a grout 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. Tunnel segments, TBM machinery, and other equipment would be delivered to the Twin Cities Complex by road.

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, Canal Ranch Tract, Terminous Tract, and King Island.

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. Any long-term RTM storage stockpile would be planted with erosion-control seed mix to stabilize the stockpile and avoid dust generation.

#### *Double Launch Shaft at Lower Roberts Island*

Construction would include a double launch shaft at Lower Roberts Island. The double launch shaft would be constructed in a figure eight configuration with an inside diameter of 115 feet to allow TBMs to excavate in both north and south directions (like the double launch shaft at Twin Cities Complex). Unlike the double launch shaft at Twin Cities Complex, Lower Roberts double launch shaft would not be part of a larger complex.

The double launch shaft at Lower Roberts Island would be located off SR 4 approximately 1.8 miles northeast of the interchange with I-5. It would make use of the existing levee roads but would also need new road developments. During construction, the double launch shaft at Lower Roberts Island would occupy up to 610 acres. The permanent site size would be up to 300 acres. The construction site 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 flood elevation with 2H:1V exterior slopes and 3H:1V interior slopes).

No ground improvement would be expected for construction at the double launch shaft at Lower Roberts Island because underlying soils appear to have low compressibility and are not anticipated to be subject to liquefaction. Any long-term RTM storage stockpile would be planted with erosion-control seed mix to stabilize the stockpile and avoid dust generation.

#### **6.2.4.2 Reception and Maintenance Shafts**

Reception and maintenance shafts would have finished inside diameters of 70 feet. Tunnel reception and maintenance shaft sites would include areas for the tunnel shaft with adjacent areas for equipment to excavate the shaft, and cranes and appurtenant items to move equipment into and out of the tunnel shaft. 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. Because they would not be used to supply tunnel segments or remove RTM, reception and maintenance shaft sites would not require areas for storing tunnel liner segments or RTM handling. Shafts will have ready-mix concrete hauled in. These shafts would be powered by new power lines extending from existing, local distribution networks and would not need an electrical substation.

#### ***6.2.4.3 Tunnel Shaft Maintenance***

Tunnel shafts would be used for tunnel access postconstruction so that periodic inspections, repair, and maintenance activities could be performed. Design features of the gravity tunnel system should preclude the need for planned maintenance; necessary maintenance activities would be the result of inspection findings. However, it is anticipated that at some point during the service life of the system, some maintenance would be required. The maintenance work could range from cleaning out the tunnel invert with a loader or possibly patching or repairing the tunnel lining. Areas to perform inspection and maintenance activities would be provided adjacent to and on top of the shaft pads at each shaft location. Inspection and maintenance activities would comply with the confined space regulations in accordance with Occupational Safety and Health Administration requirements.

There would be daily inspection and security checks at shaft sites. Grounds maintenance would occur twice a year. All vegetation maintenance would be mechanical (e.g., with mower or other hand tools). At this time, the use of herbicides specifically, or pesticides in general, is speculative; because the location, timing, frequency, and methods of application are not known, thus, the use of chemicals to remove vegetation is not proposed. Repaving would occur every 15 years.

#### **6.2.5 Reusable Tunnel Material**

RTM would be generated at launch shafts as the TBMs bore the tunnel. RTM is the soil removed by the TBM boring the tunnel, 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 then be tested for hazardous materials, managed on-site to dry naturally, then stockpiled and transported for reuse or permanently stored.

RTM removed from the tunnel through the launch shafts would be transported by conveyor to handling and storage facilities near launch shaft sites. RTM excavation, testing, drying, and movement from the tunnel launch shaft sites during tunneling operations would occur year-round, 20 hours per day Monday through Friday and 10 hours on Saturdays, allowing time for equipment maintenance. RTM movement from temporary storage to dry stockpile areas would occur 5 days per week from sunrise to sunset. Permanent RTM stockpiles would be elevated above the surrounding grades, covered with excavated topsoil, and planted with native seed mixes primarily for erosion control. Recommended treatments for permanent RTM stockpiles would include spreading topsoil, cross disking, and planting native grasses. The planted vegetation would be managed by mechanical means (e.g., with mower or other hand tools) twice a year. The use of chemicals to remove vegetation is not proposed. An access road would also be constructed from the existing paved road nearest to the stockpile.

#### ***6.2.5.1 Disposal of Reusable Tunnel Material***

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. The contractor(s) would conduct chemical characterization of RTM and associated decant liquid prior to reuse or discharge, respectively, to determine whether it will meet requirements of the National Pollutant Discharge Elimination System and the Central Valley Regional Water Quality Control Board. All decant liquid would be collected and treated for direct on-site reuse or on-site storage to reduce water supply needs. If the amount of treated water from RTM decant, dewatering flows, and site runoff exceeds the on-site water demands and on-site storage, the treated flows would be discharged to adjacent water bodies in accordance with the stormwater pollution prevention plan. While additives used to facilitate tunneling would be nontoxic and biodegradable, it is possible that some quantity of RTM would be deemed unsuitable for reuse and would be disposed of at a site approved for disposal of such material. This is expected to apply to approximately 1% to 5% of the total volume of excavated material.

It is anticipated that 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 of RTM for presence of contaminated or hazardous materials and suitability for reuse before stockpiling on-site or transporting off-site. Each stockpile area would be lined with impermeable lining material. Additional features of the long-term material storage areas would include berms and erosion protection measures to contain storm runoff as necessary and provisions to allow for truck traffic during construction.

RTM would require drying for long-term stockpiling and storage. Natural drying (evaporation) is the proposed method. The dried RTM would be piled and moved by bulldozers and motor scrapers, and then deposited in the dry stockpile areas near the tunnel launch shaft sites. RTM permanently stored at launch sites would be graded and planted with erosion-control seed mix to avoid dust generation and the need for future handling. For natural drying, 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. If portions of the 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. If the RTM meets the criteria for reuse, the material would be moved by conveyor to a long-term on-site storage site.

A portion of the dried RTM generated at the Twin Cities Complex and Lower Roberts Island would be used to refill the areas excavated at the launch site where soil is removed to construct tunnel shaft pads and levee modifications. The remaining dried RTM would ultimately be moved to a single on-site long-term storage area at each launch shaft work area and planted with erosion-control seed mix to stabilize the stockpile and avoid dust generation.

#### **6.2.6 Bethany Complex**

The Bethany Complex would be constructed southeast of Clifton Court Forebay (Table 6.2-0-2). 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. The Bethany Reservoir Aqueduct would extend approximately 2.8 miles from the pumping plant to a new discharge structure on the banks of the Bethany Reservoir. The Bethany Complex 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, as defined by DWR.

**Table 6.2-0-2. Bethany Complex Feature Ground Footprint Summary**

| Feature                                         | Item                                        | Quantities                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------------------------|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Bethany Reservoir Pumping Plant and Surge Basin | Total size of construction site (up to)     | 213 acres                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                                 | Total size of postconstruction site (up to) | 184 acres                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                                 | Land reclamation (up to)                    | 29 acres                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                                                 | Pumping plant pad site                      | 1,166-foot-wide x 1,260 feet long                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                 | Surge basin site                            | Surge basin size: 815 feet wide x 815 feet long<br>Overflow shaft diameter: 120 feet<br>Overflow weir wall diameter: 180 feet<br>Six 5 feet by 5 feet vertical sluice gates within the perimeter of the overflow weir will allow stored water from a surge event to drain into the overflow shaft                                                                                                                                                                                                    |
|                                                 | Diaphragm walls                             | Pumping plant: Approximately 6 foot wide by 252 foot deep by 1,438 feet long; 5-foot wide by 100-foot deep by 1,750 feet long; and 5 foot wide by 252 foot deep by 630 feet long diaphragm walls<br><br>Wet well inlet conduit: Approximately 6 feet wide by 252 feet deep by 800 feet long; and 5-foot-wide by 100-foot-deep by 160-foot-long diaphragm wall columns below foundation<br><br>Surge Basin: Approximately 3 feet wide by 137 feet deep by 3,260 feet long with two levels of tiebacks |
|                                                 | Foundational piles                          | Pumping plant: Approximately 53 drilled piers would be installed 50 feet deep below the pump discharge isolation gate valve gallery<br>Surge Basin: Approximately 2,530 drilled piers would be installed 60 feet deep below the surge basin base slab                                                                                                                                                                                                                                                |
|                                                 | Pumping plant structure                     | Area of structure: 412 feet wide by 503 feet long<br>Top of slab of wet well, wet well inlet conduit and pumping plant dry pit pump bays: 47 feet<br>Top of canopy structures on the north end of each pumping plant dry pit above pad: 74.5 feet                                                                                                                                                                                                                                                    |

| Feature                               | Item                                                              | Quantities                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------------------------------|-------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                       | Pumps                                                             | Pumping plant: 14 pumps at 500 cfs, each, includes two standby pumps<br>Surge Basin: four rail-mounted pumps at 100 cfs, each, for dewatering surge basin<br>two vertical submersible pumps at 60 cfs each, for dewatering main tunnel                                                                                                                                                                                                                                                                       |
|                                       | Surge tanks for aqueduct to Bethany Reservoir Discharge Structure | Area of tank: 75-foot diameter by 20 feet high<br>Total number of tanks: four                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                       | Bethany Reservoir Surge Basin tunnel reception shaft              | Shaft depth during construction: 209 feet (depth from existing ground surface prior to excavation or fill)<br>Shaft depth during operations: 199 feet                                                                                                                                                                                                                                                                                                                                                        |
|                                       | Concrete batch plants                                             | Two batch plants in an area approximately 11.5 acres in size                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Bethany Reservoir Aqueduct            | Total size of construction site (approximately)                   | 128 acres                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                       | Total size of postconstruction site (approximately)               | 68 acres                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                       | Land reclamation (approximately)                                  | 60 acres                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                       | Aqueduct trench (excludes tunneled portions of aqueduct)          | Aqueduct trench from the Bethany Reservoir Pumping Plant to the tunnel under Jones Penstock: 7,900 feet long<br>Aqueduct trench from the tunnel under Jones Penstock to the tunnel under the conservation easement: 3,700 feet long<br>Each aqueduct trench is approximately 115 feet wide at the bottom, to accommodate four pipes 180 inches in diameter and 30 feet on center<br>A 24-foot-wide permanent gravel-surfaced patrol road would be placed on the completed fill in the center of the aqueduct |
|                                       | Tunneled portions of aqueduct                                     | Tunnel under Jones Penstock: Four 200-foot-long and 20-foot-diameter parallel tunnels (one per pipeline); tunnels separated by 40 feet between the center of each tunnel<br>Tunnel under conservation easement: Four 3,064 foot long and 20 foot diameter parallel tunnels (one per pipeline) separated by 40 feet between the center of each tunnel at the entrance portal end to about 70 feet at the shaft end                                                                                            |
|                                       | CLSM processing area                                              | 2 batch plants, each 100 feet wide by 100 feet long by 50 to 75 feet in height                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Bethany Reservoir Discharge Structure | Total size of construction site (approximately)                   | 15 acres                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                       | Total size of postconstruction site (approximately)               | 13 acres                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                       | Land reclamation (approximately)                                  | None anticipated                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

| Feature | Item                                                                 | Quantities                                                                                                                                                                                                                                                              |
|---------|----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|         | Tunnel shaft connection to the Bethany Reservoir Discharge Structure | Each of the four tunnels would extend upward vertically through shafts to discharge water into the Bethany Reservoir Discharge Structure. There would not be any tunnel shafts between the tunnel portal and the discharge structure (within the Conservation Easement) |
|         | Discharge structure channels                                         | Four channels extend from the vertical shaft to the bank of the Bethany Reservoir. The channels range in width from 55 feet at the vertical shaft to approximately 27.5 feet at the bank of the Bethany Reservoir                                                       |

#### ***6.2.6.1 Bethany Reservoir Pumping Plant***

The Bethany Reservoir Pumping Plant would be needed to lift the water from the tunnel to Bethany Reservoir. The main tunnel from the intakes would terminate at a reception shaft within the surge basin on the north side of the Bethany Reservoir Pumping Plant. Water would enter the Bethany Reservoir Pumping Plant and be conveyed directly to Bethany Reservoir in a cement-mortar-lined, welded steel aqueduct system.

The Bethany Reservoir Pumping Plant would be a multilevel underground structure with its roof at grade. Flow capacity would range from a minimum of 300 cfs to a maximum of 6,000 cfs. The pumping plant would have twelve 500-cfs pumps to achieve the flow of 6,000 cfs and two standby pumps. In addition to the below-ground pumping plant and wet well, the site would include aboveground water storage tanks for hydraulic transient-surge protection of the discharge pipelines, electrical building with variable speed drives and switchgear, heating and air conditioning mechanical equipment yard, transformer yard, electrical substation adjacent to the electrical building, standby engine generator building with an isolated and fully contained fuel tank, equipment storage building with drive-through access, offices, welding shop, machine shop, storage area for spare aqueduct pipe sections and accessories, and a walled enclosure/storage facility for bulkhead panel gates that would be used to isolate portions of the Bethany Reservoir Pumping Plant during maintenance procedures. The pumping plant would include two separate dry-pit pump bays adjacent to the wet well.

Electrical, generator, and maintenance buildings, an electrical substation, surge tanks, and protective canopies on the site would be aboveground structures. The finished site pad elevation of 46.5 feet above mean sea level, at about existing grade, would be substantially above the elevation required to protect the facilities from surge events and the 200-year flood event including sea level rise in 2100, which is calculated to be a water surface elevation of 27.3 feet within the surge basin.

#### ***6.2.6.2 Bethany Reservoir Surge Basin***

The surge basin would normally be empty when the Bethany Reservoir Pumping Plant is in operation. The top of the surge basin would be at existing grade and the bottom would be about 35 feet below the ground surface. The tunnel shaft within the surge basin would accommodate

portable submersible pumps for dewatering the tunnel, if necessary. The top of the tunnel shaft would be at the floor of the surge basin and would be surrounded by an overflow weir wall inside the basin. A shaft pad would not be required at the surge basin reception shaft since natural ground elevations at this site are considerably above the potential flood stage, and groundwater intrusion is unlikely based on available information.

#### ***6.2.6.3 Bethany Reservoir Aqueduct***

The aqueduct system would consist of four 15-foot-diameter parallel pipelines that would convey water from the Bethany Reservoir Pumping Plant to the Bethany Reservoir Discharge Structure, a distance of approximately 2.8 miles each. Each pipeline would have a maximum capacity of 1,500 cfs. The aqueduct system permanent footprint would be about 200 feet wide. Two separate aqueduct reaches would require parallel tunnels to carry each pipeline under existing features. The first reach would be under the Jones Pumping Plant discharge pipelines (about halfway from the Bethany Reservoir Pumping Plant to the discharge structure); at this location pipelines would run about 50 feet below ground surface for about 200 feet. Tunnels would also be needed under the existing conservation easements adjacent to Bethany Reservoir (at the last downstream reach of the aqueduct for about 3,064 feet, ranging from 45 to 180 feet below ground surface).

The aqueduct pipelines would be laid mostly in open trenches, constructed by open cut and backfill methods. The tops of the pipes would extend above the existing ground surface and be covered by a minimum of 6 feet of soil that would form a single mound of earth above the four pipelines. Excavated material from the Bethany Reservoir Aqueduct trenches and tunnels would be used for backfill of the trenches and also used to make controlled low-strength backfill material (CLSM) for pipe bedding and zone material.

The aqueduct pipelines would terminate near the bottom of four 55-foot-inside-diameter below-ground vertical shafts at the Bethany Reservoir Discharge Structure. The pipelines would make a 90-degree bend upward inside the shafts, ending at the floor of the discharge structure and flowing through a concrete channel into Bethany Reservoir.

#### ***Staging Areas, Controlled Low-Strength Backfill Material Batch Plants, and Ancillary Facilities***

In addition to pipelines and tunnels, the aqueduct construction site would include contractor staging areas, CLSM batch plants, and ancillary facilities. The CLSM would be used to improve the strength of soil placed under the aqueduct pipes installed in the trenches, and possibly to fill the space between the inside wall of the tunnel and the outside of the pipeline wall for the tunnels that carry the pipelines below the Jones discharge pipelines and the conservation easements adjacent to Bethany Reservoir.

A CLSM processing area at the tunnel portion of the aqueduct would include two side-by-side CLSM batch plants for trench work, each 100 feet wide by 100 feet long and 50 to 75 feet tall. CLSM production would also require 2.75 acres for soil storage of up to 30,000 cubic yards of soil up to 7 feet deep; two 30-foot-diameter, 10-foot-tall water storage tanks mounted on 8-foot-tall platforms and holding a total of 100,000 gallons of water; and cement storage silos 50 to 75 feet tall on a site 50 feet wide by 100 feet long.

#### ***Aqueduct Tunnels***



The aqueduct tunnels to carry the pipelines under the Jones discharge pipelines and the conservation easements would be constructed using a different method than used for the main tunnel between the intakes and the Bethany Reservoir Pumping Plant. Because of the shorter length of these tunnels compared to the main tunnel, a TBM would not be used during construction. For the Jones pipeline crossing a digger shield outfitted with an excavator arm could be used for the anticipated ground conditions. To avoid extensive disturbance of sensitive habitat areas within the conservation easement crossing, several excavation methods have been identified including a roadheader. Soil material would be moved out of the tunnels at the entry portals. The excavation would be supported with rock reinforcement and/or steel ribs or lattice girders and shotcrete depending on-the-ground conditions. Construction of the aqueduct tunnels under the conservation easement would avoid surface disturbance within the conservation easement.

The excavated material from the aqueduct tunnels would be removed by different methods and would be in different geologic formations compared to the main tunnel bore; therefore, the excavated material characteristics would be different from the RTM from the main tunnel. The Bethany Reservoir Aqueduct tunneling machines also would not need additives; therefore, the excavated soil would not need to undergo the extensive drying that would be required for RTM from the TBMs on the main tunnel. Materials excavated from the aqueduct tunnels that are too wet or otherwise unsuitable for CLSM or backfill would be transported to the permanent excavation stockpile adjacent to the Bethany Reservoir Pumping Plant and dried as part of final disposal.

Tunneling under the Jones discharge pipelines would require excavation of a large cut to establish entry and exit portals. The entry portal would be located on the east side of the Jones discharge pipeline crossings. Excavation of these tunnels would end at the exit portal about 200 feet away on the west side of the Jones pipelines. Major facilities at the site would include mobile cranes, construction shops and offices, parking, material laydown and erection area, equipment staging, tunnel ventilation system housing, temporary electrical substation, and storage for topsoil stripping. Construction activities would include clearing and grubbing, water quality protection, ground improvement, and other activities as needed.

Tunneling under the conservation easement also would require tunnel entry portals on the east side and tunnel exit portals on the west side of the 3,064-foot crossing. The entry portals would be located on the east side of the conservation easement and west of the existing high-voltage power lines, outside of the conservation easement boundary. Excavation of these tunnels would end at the vertical shafts on the east side of the Bethany Reservoir Discharge Structure.

#### ***6.2.6.4 Bethany Reservoir Discharge Structure***

The Bethany Reservoir Discharge Structure on the bank of the Bethany Reservoir comprises the aqueduct conservation easement tunnel vertical exit shafts, contractor staging areas, and ancillary facilities. The discharge structure site is on a narrow strip of land between the conservation easement and Bethany Reservoir; a 10-foot-wide buffer would separate the disturbance area from the conservation easement. Significant grading would be required to build the structure on the site, above reservoir surface water level, which varies considerably in elevation. Constructing a temporary cofferdam within the water near the shore in the reservoir would allow excavation,



concrete, and backfill work to be completed on the reservoir bank within an area of dry ground excavated as much as 25 feet below the reservoir water surface.

The discharge structure would occupy 13 acres postconstruction. It would be divided into four separate channels, with a total width of approximately 327 feet encompassing the four 55-foot-wide aqueduct shafts with required approximately 81.5-foot center-to-center spacing. Each channel of the discharge structure would range from about 81 feet wide at the top of the aqueduct shafts to approximately half of that width at the bank of the Bethany Reservoir. The concrete floor of the discharge structure at elevation 227 feet above mean sea level would end near the reservoir bank, and a layer of riprap would be placed between the structure and the temporary cofferdam to help stabilize and protect the bank and bed of the reservoir from the energy of the water being discharged, which is expected to be minor, given the relatively low discharge velocity. The top of the discharge would be approximately at the same elevation as the existing California Aqueduct Bikeway that will traverse through and over the structure.

The Bethany Reservoir Discharge Structure would cross the existing California Aqueduct Bikeway, which is also used as a maintenance road. A 32-foot-wide bridge would span the four channels to maintain access for bikes and maintenance vehicles. Each of the four Bethany Reservoir Discharge Structure channels would be divided into two 21-foot-wide bays with radial gates and stop logs to prevent backflow in an emergency and double isolate the aqueduct system from Bethany Reservoir. A 16-foot-wide service deck would be installed on the opposite (reservoir) side of the gate and stop log area to facilitate operations and maintenance of the gates and installation and removal of stop logs. The bridge would include applicable openings for stop log installation and removal through traffic-rated hatches. Similarly, stop logs would be installed in open stop log grooves adjacent to the service deck. The radial gates would automatically close under pressure loss conditions in the aqueduct pipelines to prevent water from Bethany Reservoir from flowing into the aqueduct pipelines during the unlikely event of a pipeline break or valve malfunction. Due to the critical control nature of this facility, a standby engine generator would be provided for backup power in case of a power outage. A storage yard for isolation bulkhead gates is also included at the site.

### **6.2.7 Access Sites**

Construction would require substantial transportation facility improvements. This would be to serve the construction and material delivery processes and 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, and the Bethany Complex. Pavement conditions on existing county and local roads are predominantly classified as marginal to unacceptable. State routes are generally in good condition although pavement condition data were not available for all State routes at the time of the needs assessment.

DWR will conduct preconstruction pavement and roadway analyses of access roadway segments on local and county roads to determine whether they need improving. Road improvement activities would include pavement remediation (e.g., fill potholes, asphalt cracking, and slurry seals), widening to a minimum of 12 feet, roadway design to serve construction traffic with new roads, and constructing new bridges or widening existing bridges. Where road and bridge

improvements are undertaken, wider shoulders would be considered to meet bicycle lane standards; design standards for each state or local entity that operates roads and bridges would be followed for all improvements on the existing respective roadways. Some project-area bridges rated as structurally deficient or functionally obsolete are scheduled to be replaced or rehabilitated by their respective jurisdictions.

Modifications to existing roadways during project construction would be completed in accordance with Caltrans or county criteria, depending upon the owner of the roadway. Future roadway projects under consideration by local or state agencies were reviewed to potentially coordinate road improvements. The preconstruction pavement and roadway analysis will be included as part of the Geometric Approval Drawings submittal for review, comment, and refinement, in consultation with the applicable transportation entities, including Caltrans for state highways and intersection facilities and local agencies for local roadway and intersection facilities. Improvements to State Routes would be designed and constructed in collaboration with Caltrans. Project roadway improvements to existing State Routes, local roadways, and bridges would remain after construction.

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) or paved roadways constructed from existing roads to construction sites, and new roads within facility construction sites. Truck routes were evaluated for existing and project truck volumes and will be improved where project truck traffic warrants improvement, based on the duration of work and expected commodities to be carried. Minimum requirements for truck routes are 12-foot-wide lanes and 4-foot-wide shoulders. Interstate, State, and local roads would also provide direct access to project work sites. Construction access roads would remain postconstruction for maintenance access to the facilities.

SR 160 near the north Delta intakes would be temporarily rerouted east of its existing alignment during the intake construction process and then relocated through the intake facility in the vicinity of the current SR 160 alignment. Lambert Road would be widened from Franklin Boulevard to the eastern side of the bridge over Snodgrass Slough.

A new 3.8-mile paved intake access/haul road would be constructed along the west side of the abandoned railroad embankment, to a new dedicated haul road east of the intakes.

Approximately 180 feet of the existing bridge over Snodgrass Slough at Hood-Franklin Road would be widened. The haul road would eliminate the need for construction traffic to travel through the main portion of the Town of Hood and on SR 160; it would not be a public road. All access for construction, plus most operations-phase access, would use the haul road to enter the intake sites.

A new 0.3-mile access road to the shaft site on New Hope Tract maintenance shaft would be constructed from Blossom Road. To access the Terminous Tract maintenance shaft site, a new uncontrolled interchange with longer acceleration and deceleration lanes along SR 12 would be built and 2.3 miles of SR 12 from I-5 to the tunnel shaft site would be improved. Access to the Lower Roberts Island double launch shaft would involve building a new 1.2-mile access road

from West Fyffe Street to a new bridge; a new road and railroad bridges over Burns Cutoff from Port of Stockton; new 3.2-mile access road and rail lines along West House Road from the new bridge; and a new 1.6-mile access road on Lower Roberts Island. One mile of Dierssen Road between Franklin Boulevard and I-5 would be widened, and 0.48 mile of Franklin Boulevard would be widened between locations 0.22 mile north of Dierssen Road and 0.25 mile south of Dierssen Road. Twin Cities Road would be widened for 1 mile from a location 0.83 miles west of Franklin Boulevard to a location 0.17 mile east of Franklin Boulevard. Access to the Lower Roberts Island double launch shaft site would involve 1.2 miles of new paved road on Rough and Ready Road on Port of Stockton, a new bridge over Burns Cutoff from Port of Stockton, 2 miles of new paved road to West House Road with widening 1.2 miles of West House Road, and 1.3 miles of new paved road from West House Road to North Holt Road with a new bridge over Black Slough.

Construction would start with clearing, grubbing, and moving utilities. Existing drainage facilities either within the construction site or adjacent to construction sites would be rerouted to not affect overland drainage flows or groundwater seepage flows prior to construction. After completion of construction at a project site, the condition of the pavement of access roads would be analyzed and remediation would be completed as necessary to return the facility to the condition that DWR constructed.

### **6.2.8 Rail-Served Material Depots**

Rail access to serve major construction sites would reduce truck use of local roads and highways. Rail-served materials depots with rail sidings would be constructed and used to transport certain large volumes of construction materials. The rail siding would be designed to allow the train to leave or pick up rail cars, hold the rail cars, and off-load or load the rail cars. The depot would include areas where trains would move off the main line to deposit the rail cars and areas to transfer the materials to trucks.

A rail-served materials depot at Lower Roberts Island would be constructed. Rail access to Lower Roberts Island would be provided from an extension of an existing short haul line at the Port of Stockton. Rail access would be extended over a new bridge over Burns Cutoff and continue to the launch shaft site and RTM storage area.

### **6.2.9 Construction Schedule**

Construction 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 launch shafts, plus power and SCADA installed to facilities sites, then concurrent tunnel and facility construction, and finally proceeding to commissioning, site reclamation, and road overlays in the final years.

### **6.10 Soil Balance**

Project construction would require large amounts of fill material at many facility sites and would also generate extensive amounts of excavated soils and RTM. Roads and compensatory

mitigation would require imported materials from commercial sources. It is expected that soils excavated on-site at intakes would balance on-site soil needs and no significant import or export of structural fill would be necessary. However, some imported fine-grained levee embankment core material may be required if on-site soils do not meet regulatory requirements for construction. RTM generated at launch shafts at the Twin Cities Complex and Lower Roberts Island would be used for backfilling borrow areas on-site. Soil excavated at the Twin Cities Complex would be used for shaft pads on New Hope Tract, Canal Ranch Tract, Terminous Tract, and King Island. Soils excavated at the Lower Roberts Island double launch shaft site would be used for the shaft pads on Lower Roberts Island, Union Island, and Upper Jones Tract, and RTM generated on-site would be used to backfill borrow areas on Lower Roberts Island.

### **6.11 Electrical Facilities**

Power supplies would be needed at construction sites for the intakes, tunnel shafts, Bethany Complex facilities, concrete batch plants, and park-and-ride lots. Power supplies would also be needed during operations of the intakes, Bethany Reservoir Pumping Plant and Surge Basin, and Bethany Reservoir Discharge Structure, plus lights, security, and minor operations and maintenance (O&M) loads at all permanent locations.

Power demand during construction would include support for large equipment, such as cranes and ground improvement machines, TBM and associated equipment including ventilation, conveyors and pumps, small tools, and construction-support facilities. Support facilities would include, but not be limited to, construction trailers, temporary lighting, and electric vehicle charging stations. Some of this equipment could be powered by on-site generators or internal combustion engines; however, electrical grid service to the sites, if available, would be more efficient, use less diesel fuels, and produce fewer emissions. DWR will also consider use of electric or hybrid-electric off-road equipment (including generators) over diesel counterparts to the extent that they become commercially available and earn a track record for reliability in real-world construction conditions and become cost-effective.

Power for construction and operation of the conveyance facilities would be delivered on existing power lines to the extent possible, but the location or required load of some facilities would require either new aboveground power towers with lines or underground conduit to serve those specific areas. Some existing lines would require adding new towers to extend service to conveyance facilities. Some existing lines would require adding new towers to extend service to conveyance facilities. Some power will also be abandoned or relocated, and some overhead lines, such as those crossing the intake haul road, will be moved underground to address overhead height constraints. For any aboveground power towers or lines that are new, non-specular materials would be used.

DWR is coordinating electric power transmission modifications with electricity providers Sacramento Municipal Utility District, Western Area Power Administration, and Pacific Gas and Electric Company.

## **6.12 SCADA Facilities**

SCADA systems and associated data communication systems are common features of water infrastructure that enable remote monitoring and control of the performance and operation of the system, including video security cameras. The new DCP facilities would need to be integrated into SWP's existing SCADA system to allow for coordinated operations (Delta Conveyance Design and Construction Authority 2022d, 2023b as cited in the BA). The communications network would connect three major data centers, two intakes, and four remote data sites for the Bethany Complex. The major data centers would be at the existing DWR Project Control Center, DWR Operations and Maintenance Area Control Center at the Delta Field Division, and Bethany Reservoir Pumping Plant. SCADA would provide real-time performance data at intakes, tunnel launch shafts and some maintenance and reception shafts, and the Bethany Complex facilities. The communications aspects of the SCADA system would be used during construction to facilitate internet applications at the launch shaft sites, the intakes, and the Bethany Reservoir Pumping Plant.

The SCADA system would consist of SCADA equipment and communications links based upon fiber-optic cables that would be installed within and connecting to new structures. Whenever possible, the construction of fiber-optic based communications systems would use existing telecommunications infrastructure, dedicated conduits within project road modifications, and termination panels installed inside or on the buildings or structures. Wherever possible, underground routes would be located along existing roads and project access. SCADA fiber-optic cables serving the Bethany Reservoir Discharge Structure would be installed within the tunneled portion of the Bethany Reservoir Aqueduct; all construction and maintenance would take place from within the tunnels accessed from outside of the Bethany West Easement (Delta Conveyance Design and Construction Authority 2022d as cited in the BA).

## **6.2.13 Fencing and Lighting**

Construction site security for major work sites would include security guards stationed at the main entry and exit gates for 24-hour site access management and surveillance. Security personnel would be on-site with regular inspection rounds. Cameras would also be used at key locations. Once construction is complete, permanent security fencing would be in place, and cameras would be installed with either local recording devices or transmission capabilities. These cameras would be located at sites where permanent power and SCADA facilities are located. Security personnel would monitor the sites periodically.

During construction, park-and-ride lots would use downcast lighting. Permanent lighting at facility sites would be downcast, cut-off type fixtures with non-glare finishes and controlled by photocells and motion sensors, depending on the location. Construction and maintenance lighting would be similar except for a few necessary nighttime work activities that would require higher-illumination safety lighting of the work sites. Lights would provide good color with natural light qualities and minimum intensity with adequate strength for security, safety, and personnel access. The lights would comply with the Illuminating Engineering Society industry standards for light source and luminaire measurements and testing methods.



During construction, night lighting at park-and-ride lots would be controlled by motion detectors. During operations, the lights at the intakes, tunnel shafts, and Bethany Complex would be motion activated to minimize light and glare to adjacent properties.

There will be no permanently mounted lighting on the north Delta intake structures or associated buildings that would produce light in the direction of the Sacramento River. Permanent lighting would be positioned such that no light can intersect the river channel at any angle regardless of vertical angle of the light source. Temporary lighting on the north Delta intake structures or associated buildings may be used for approved construction. To the extent possible, temporary lighting for worker safety would be positioned such that no light can intersect the river channel. All lights along the river channel would comply with U.S. Coast Guard criteria and regulations.

#### **6.2.14 Park and Ride Lots**

Park-and-ride lots would be established near major commute routes, where workers could park and ride shuttle buses or vans to construction sites. The employee shuttles would be electric-powered, and the park-and-ride lots would be equipped with electric vehicle charging stations. Trucks arriving late at night could also use these lots to park overnight to minimize nighttime deliveries to construction sites. Lots would be lighted with nighttime security lighting with motion detectors. Park-and-ride lots would be removed after construction unless local communities are interested in maintaining these lots in the future through the Community Benefits Program. Lots would be established at the following sites.

- Hood-Franklin Park-and-Ride Lot. Parking for employees at intakes. This lot would be located along the south side of Hood-Franklin Road immediately east of I-5. The total construction area would be 4.1 acres. The land is currently mostly agricultural land; a Caltrans construction yard occupies a small portion.
- Charter Way Park-and-Ride Lot. Parking for employees at tunnel shafts on Lower Roberts, New Hope Tract, Canal Ranch Tract, Terminous Tract, and King Island. This lot would be located along the south side of Charter Way at the southwest corner of the I-5 overpass, on the south side of SR 4, just west of I-5. The total construction area would be 2.4 acres. The land is currently a private truck parking lot and would only require upgrade or replacement of pavement and lighting systems.

Limited on-site parking would be provided at the intakes and Lower Roberts Island double launch shaft to supplement the park-and-ride lots. On-site parking for all workers would be provided at all other construction sites, including the Twin Cities Complex, all maintenance and reception shafts, and the Bethany Complex. After construction, these facilities would be removed.

#### **6.2.15 Land Reclamation**

As a part of construction, some areas would be temporarily disturbed but not needed for long-term operations (e.g., construction staging areas). DWR would transfer this land to interested parties to be consistent with local land uses, including agricultural production or open

space/natural habitat. To be able to use land for these purposes after construction, construction activities are necessary to reclaim this land.

Areas to be included in land reclamation are located at the Intakes B and C, Twin Cities Complex, Lower Roberts Island double launch shaft, and Bethany. Lands to be reclaimed would be those areas used during construction for material and equipment laydown and staging, material stockpiles, slurry/grout mixing plants, parking areas, and facilities/trailers. DWR would acquire the land for construction and would conduct agronomic testing to help determine whether the temporarily disturbed site could be reclaimed and final reclamation methods. The main goal of the land reclamation efforts would be to restore the soil health and condition, to the extent practical, in these temporary construction areas.

Construction activities, equipment, and material stockpiles could compact near-surface native soils or leave soils less suitable for agriculture or habitat. Initial reclamation tasks would include removal of all construction equipment and materials, demolition and removal of concrete slabs from temporary material storage areas, removal of temporary stockpiles/embankments, removal of temporary haul routes, and grading and leveling of the site to generally meet adjacent lands.

Initial soil treatments would depend on the actual disturbance, but for soils with more than minimal impact, the work would be expected to include ripping the soil and incorporating amendments (e.g., gypsum) to reduce compaction. This would be followed by spreading topsoil, cross disking, and fine grading/leveling to prepare the soil surface for future use. If the land transition would not occur in a relatively short period of time after construction, the areas would be drill seeded to provide erosion and dust control using a grass seed mix appropriate for the desired end use. 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 native seed mix.

Areas excavated to create borrow soil materials would be refilled to existing grade with soil or RTM from existing stockpiles at the end of construction. Treatments for reclamation using RTM base soil would be similar to those recommended for reclamation with native soils; however, additional treatments could be required to address soil conditions (for example, high or low pH). Lime and soil sulfur could be appropriate amendments for addressing soil pH; however, the actual amendments used would be based on soil tests performed at each of the sites postconstruction. Decisions on amendments to address nutrient deficiencies would be made in consultation with the end user. Topsoil would be spread to a depth of 1 foot over the RTM base soil. For agricultural uses, the top 1 foot of soil is typically most important and is where fertilizer application would be focused to address the specific needs of the crop.

Permanent RTM stockpiles would be expected at the tunnel launch sites. These stockpiles would be elevated above the surrounding grades and would be planted with native grasses primarily for erosion control, for habitat enhancement, and to blend with the surrounding area when the stockpile is not being accessed for a soil material source. Recommended treatments for permanent RTM stockpiles would include spreading topsoil, cross disking, and planting native grasses.



## **6.2.16 Other Construction Support Facilities**

### ***6.2.16.1 Concrete Batch Plants***

Concrete batch plants would be located at Lambert Road at the intersection with Franklin Boulevard, and at the Bethany Reservoir Pumping Plant and Surge Basin construction site. The Lambert Road batch plant would be used for concrete delivery to the intakes, the Twin Cities Complex and the other tunnel shafts on New Hope Tract, Canal Ranch Tract, and King Island. Concrete for tunnel shaft sites on Terminous Tract, Lower Roberts Island, Upper Jones Tract, and Union Island would be provided from existing batch plants in Lodi and Stockton which are located in close proximity of these sites. The Bethany Complex concrete batch plants at the Bethany Reservoir Pumping Plant and Surge Basin site would be north of Kelso Road and the new Bethany access road east of Mountain House Road. These batch plants were sited to allow a central delivery location for cement and aggregate and site for distribution of the concrete around the Bethany Complex area.

The concrete batch plant sites would vary in size depending on location. They would include three bulk cement storage silos; a portable cement silo (trailer 10 feet tall by 60 feet long); a 500-square-foot batch trailer; four propane tanks; a 6,800-square-foot concrete block casting area; a 2,000- to 4,000-gallon diesel fuel tank; a 120,000-gallon water system consisting of six 20,000 gallons storage tanks and related collection facilities for stormwater and wash water; an admixing area that would include a pump house, admixture storage tanks, and secondary containment barriers; an aggregate storage area; a wash area for concrete mixing trucks and related returned concrete collection facilities; and parking for concrete trucks and employee vehicles. The concrete batch plant would include batcher, silo, and truck mixer dust collectors to minimize particulates in the surrounding air. Materials collected in the air filter bags would be hauled to licensed off-site disposal locations or added to the raw materials used to produce concrete. Concrete batch plant structures and equipment would be removed following construction.

### ***6.2.16.2 Fuel Station and Fuel Storage***

Two fuel stations with multiple tanks for diesel and gasoline would be constructed at the Bethany Complex. Fuel would also be stored at all tunnel shaft sites and at the intakes. The fuel tanks would be aboveground and would be surrounded by protective bollards to protect against collisions. Double-walled tanks with built-in secondary containment or external secondary containment beneath/around the tanks would protect surroundings from fuel leaks. A protective containment would be used beneath each of the fuel tanks and a protective area would be constructed beneath the refueling area to help contain leaks that may occur during fueling. Spill containment kits would be placed at each of the fueling locations. All fuel stations and storage would be removed following construction.

### ***6.2.16.3 Emergency Response Facilities***

In general, it is expected that primary emergency response services would be provided by the construction contractors. As needed on a site-specific basis, the contractors will be required to prepare a Project Emergency Response Plan with detailed information regarding emergency

services, access to construction sites, and emergency response times to Delta communities. The Project Emergency Response Plan requires on-site emergency response facilities and services at primary work sites during construction. Evaluations and discussions with local agencies would be conducted to determine the most appropriate method to coordinate between project contractor-provided emergency response services at the construction sites and integration with local agencies. Additionally, DWR would enter into mutual aid agreements with emergency services agencies in the project area. Emergency response facilities at construction sites could be removed during construction demobilization depending on DWR's decision for need during operations.

#### ***6.2.16.4 Standby Engine Generators***

Engine generators would be used during construction at the intakes, Twin Cities Complex, Lower Roberts Island shaft site, each of the Bethany Reservoir Aqueduct tunnel portals, and Bethany Reservoir Discharge Structure. Standby engine generators would be used in the event of power outages.

During operations, intakes would each have two permanent standby engine generators. The standby engine generators would be installed inside a fenced area on the top of site embankments, with the fuel tank. The fuel would be provided by a diesel tank with suitable containment, or a propane tank set above ground. The permanent standby engine generators would provide energy to operate the valves and gates, including the ability to stop diversions at the intake structure. The Bethany Reservoir Pumping Plant and the Bethany Reservoir Discharge Structure sites would each have a permanent standby engine generator with an isolated and fully contained fuel tank.

#### ***6.2.16.5 Local Water Supply, Drainage, and Utilities***

Construction and operation would require services of power, water, telecommunications, and SCADA utilities. All features would be designed to not increase peak runoff flows into adjacent storm drains, drainage ditches, or rivers and sloughs. At the intakes and tunnel shafts, water from dewatering activities and stormwater runoff on the construction site would be collected, treated, and stored on-site to reduce the need for off-site water sources. On-site reuse and storage would be maximized to reduce the peak runoff rate from the site and the need to purchase water. If additional stored water is not needed, the treated stormwater runoff flows would be discharged to adjacent waterbodies in a manner that would not increase peak flow rates. Use of the treatment and storage facilities would avoid increased peak stormwater runoff flow rates from project construction sites.

Typical water demands at construction sites include dust control, soil stabilization, mixture with construction materials (e.g., slurry material or bentonite to form cutoff walls), tire wash basins, and restroom facilities. Water supplies in the vicinity of the construction sites are provided by on-site groundwater, import from local sources, exchanges, existing riparian diversions, new temporary appropriations, or existing SWP appropriations. None of the construction sites are served by local or regional water agencies. Existing groundwater supplies occur at all of the

construction sites. Existing surface water right diversions occur on parcels at the intake sites, and Lower Roberts Island tunnel shaft site.

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. Most of these existing facilities are buried and therefore not visible on aerial photographs. 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.

Wastewater service for structures near the project construction sites consist of individual septic systems with septic tanks and leach fields. Regional wastewater facilities are provided to the communities of Courtland and Walnut Grove by the Sacramento Area Sewer District. Interceptor pipelines extend between these communities and a regional pumping plant at the Rio Cosumnes Correctional Center (near the Franklin Field along Bruceville Road). The Rio Cosumnes Correctional Center pumping plant lifts the wastewater into another interceptor that extends to the Sacramento Regional County Sanitation District wastewater treatment plant near the community of Elk Grove.

Wastewater facilities for all of the project construction sites would be provided with portable restrooms. Septic systems would also be constructed at the intakes, Twin Cities Complex, Lower Roberts Island, and at Bethany Reservoir Pumping Plant and Surge Basin site. Because of high groundwater and/or low soil permeability at these sites, the leach fields would be sized larger than for locations with more favorable soil conditions, in accordance with the applicable county regulations.

## **6.3 Conservation Measures**

### **6.3.1 General Avoidance and Minimization Measures**

Table 6.3-1 lists the general avoidance and minimization measures that would be implemented before and during construction. Based on site-specific details and with the Service's concurrence, some of these general avoidance and minimization measures may not apply to specific, pre-construction field investigations. For the full text for each measure refer to Appendix 3A of the BA. The BA did not provide separate measures for delta smelt or longfin smelt. Avoidance and minimization measures specific to listed fish are included in the General Avoidance and Minimization Measures Appendix 3A. Most relevant to delta smelt and longfin smelt is number 7 in AMM-14: Construction Best Management Practices for Biological Resources below:

7. All in-water construction activities where special-status species are known or have a potential to occur will be conducted during the allowable in-water work windows established by the Service, National Marine Fisheries Service (NMFS), and CDFW for the protection of special-status fish or wildlife species. With regard to impact pile

driving, work windows for the north Delta intakes may be lengthened subject to NMFS, CDFW, and Service approval based on success of bubble curtain or other noise attenuation methods and real-time monitoring for fish presence. In-water activities associated with mobilization and demobilization (e.g., initial movement of materials to construction sites) are not subject to the work windows. In-water impact pile installation may occur outside of the work windows if performed within a cofferdam, or behind the sheet pile training walls, and with in-channel acoustic monitoring to verify that generated sound thresholds do not exceed the 150-dB behavioral criterion as described in *Delta Conveyance Project Final Environmental Impact Report* (California Department of Water Resources 2023) Chapter 12, Fish and Aquatic Resources, Impact AQUA-1: Effects of Construction of Water Conveyance Facilities on Fish and Aquatic Species at 10 meters from the cofferdam or sheet pile training walls. Apart from impact pile driving, any other in-water work may occur within a cofferdam, or behind the sheet pile training walls, regardless of the timing of in-water work windows. Any extension/reduction of in-water work windows would focus on half-month increments.

- a. Geotechnical exploration: August 1 to October 31.
- b. North Delta intakes: June 1 to October 31, except that in-water impact pile driving is unlimited during the period June 15 to September 15, and in-water impact pile driving is subject to the conditions noted above for the periods from June 1 to June 15 and September 15 to October 31.
- c. Modified bridges: June 1 to October 31, except that in-water impact pile driving is unlimited during the period June 15 to September 15.
- d. California Aqueduct (between Skinner Fish Facility, Banks Pumping Plant, and Bethany Reservoir) and Delta-Mendota Canal (between Tracy Fish Collection Facility and Jones Pumping Plant): January 1 through December 31.
- e. Work in the Delta except for the north Delta intakes, modified bridges, and California Aqueduct and Delta-Mendota Canal: August 1 to October 31.

**Table 6.3-1. General Avoidance and Minimization Measures**

| AMM    | Title                                                                     |
|--------|---------------------------------------------------------------------------|
| AMM-1  | Conduct Environmental Resources Worker Awareness Training                 |
| AMM-2  | Develop and Implement Hazardous Materials Management Plans                |
| AMM-3  | Develop and Implement Spill Prevention, Control, and Countermeasure Plans |
| AMM-4a | Develop and Implement Erosion and Sediment Control Plans                  |
| AMM-4b | Develop and Implement Stormwater Pollution Prevention Plans               |
| AMM-5  | Develop and Implement a Fire Prevention and Control Plan                  |
| AMM-6  | Conduct Cultural Resources Awareness Training                             |
| AMM-7  | Off-Road Heavy-Duty Engines                                               |
| AMM-8  | On-Road Haul Trucks                                                       |
| AMM-9  | On-Site Locomotives                                                       |
| AMM-10 | Marine Vessels                                                            |

| AMM    | Title                                                                                                                        |
|--------|------------------------------------------------------------------------------------------------------------------------------|
| AMM-11 | Fugitive Dust Control                                                                                                        |
| AMM-12 | On-Site Concrete Batching Plants                                                                                             |
| AMM-13 | DWR Best Management Practices to Reduce GHG Emissions                                                                        |
| AMM-14 | Construction Best Management Practices for Biological Resources                                                              |
| AMM-15 | Sediment Monitoring, Modeling, and Reintroduction Adaptive Management                                                        |
| AMM-16 | Provide Notification of Construction and Maintenance Activities in Waterways                                                 |
| AMM-17 | Avoid and Minimize Impacts on Terrestrial Biological Resources from Maintenance Activities                                   |
| AMM-18 | Avoid and Minimize Operational Traffic Impacts on Wildlife                                                                   |
| AMM-19 | Minimize Fugitive Light from Portable Sources Used for Construction                                                          |
| AMM-20 | Install Visual Barriers along Access Routes, Where Necessary, to Prevent Light Spill from Truck Headlights toward Residences |
| AMM-21 | Develop and Implement a Noise Control Plan                                                                                   |
| AMM-22 | Electrical Power Line Support Placement                                                                                      |
| AMM-23 | Develop and Implement a Mercury Management and Monitoring Plan                                                               |
| AMM-24 | Minimize Access Road Impacts on Listed Amphibian Connectivity                                                                |
| AMM-25 | Develop and Implement a Fish Rescue and Salvage Plan                                                                         |
| AMM-26 | Develop and Implement an Underwater Sound Control and Abatement Plan                                                         |
| AMM-27 | Develop and Implement a Barge Operations Plan                                                                                |

### 6.3.2 Species-Specific Avoidance and Minimization Measures

The following sections detail aspects of the PA intended to avoid and minimize adverse effects on listed species of wildlife and describe offsetting measures intended to compensate for adverse effects. In addition to species-specific avoidance and minimization measures) discussed below, general avoidance and minimization measures that would be implemented uniformly during construction and operations of proposed water facilities and performance of conservation measures are fully detailed in Appendix 3A of the BA. Pre-construction field investigations may not require avoidance and minimization measures, based on site-specific details and with the Service's concurrence.

The following measures will only be required for activities occurring within suitable habitat as modeled in the BA and by additional assessments conducted during the planning for work in a given area. Surveys and monitoring will be conducted from locations where access is allowed. As properties become accessible for initiating project activities within areas of modeled habitat, DWR will require suitability assessments of the modeled habitat by a biologist qualified to identify suitable habitat for this species.

#### 6.3.2.1 San Joaquin Kit Fox Avoidance and Minimization Measures

1. For areas verified as being suitable for San Joaquin kit fox, preconstruction surveys will be initiated within 14 to 30 days prior to ground disturbance, vegetation removal, or establishment of staging areas related to project activities. A Service- and CDFW-approved biologist with experience surveying for and observing the species will survey the project footprint and the area within 200 feet beyond the footprint to identify known

or potential San Joaquin kit fox dens. Adjacent parcels under different land ownership will not be surveyed unless access is granted within the 200-foot radius of the project footprint. The biologists will conduct these searches by systematically walking 30- to 100-foot-wide transects throughout the survey area; transect width will be adjusted based on vegetation height and topography. The biologist will conduct walking transects such that 100% visual coverage of the worksite footprint is achieved. Dens will be classified in one of the following four den status categories outlined in the *Standardized Recommendations for Protection of the Endangered San Joaquin Kit Fox Prior to or During Ground Disturbance* (Service 2011).

- a. Potential den. Any subterranean hole within the species' range that has entrances of appropriate dimensions for which available evidence is sufficient to conclude that it is being used or has been used by a San Joaquin kit fox. Potential dens comprise any suitable subterranean hole or any den or burrow of another species (e.g., coyote, badger, red fox, or ground squirrel) that otherwise has appropriate characteristics for kit fox use. If a potential den is found, the biologist will establish a 50-foot buffer using flagging.
  - b. Known den. Any existing natural den or artificial structure that is used or has been used at any time in the past by a San Joaquin kit fox. Evidence of use may include historical records; past or current radiotelemetry or spotlighting data; kit fox signs such as tracks, scat, or prey remains; or other reasonable proof that a den is being or has been used by a kit fox. If a known den is found, the biologist will establish a 100-foot buffer using flagging.
  - c. Natal or pupping den. Any den used by San Joaquin kit foxes to whelp or rear their pups. Natal or pupping dens may be larger with more numerous entrances than dens occupied exclusively by adults. These dens typically have more kit fox tracks, scat, and prey remains near the den and may have a broader apron of matted dirt or vegetation at one or more entrances. A natal den, defined as a den in which kit fox pups are actually whelped but not necessarily reared, is a more restrictive version of the pupping den. In practice, however, it is difficult to distinguish between the two types of dens; therefore, for purposes of this definition, either term applies. If a natal or pupping den is discovered, a buffer of at least 200 feet will be established using fencing but a final buffer will be established in coordination with the Service and CDFW.
  - d. Atypical den. Any artificial structure that has been or is being occupied by a San Joaquin kit fox. Atypical dens may include pipes, culverts, and diggings beneath concrete slabs and buildings. If an atypical den is discovered, the biologist will establish a 50-foot buffer using flagging.
2. Disturbance to all San Joaquin kit fox den status categories (described directly above) will be avoided to the extent possible. Where dens are found during surveys and avoidance is not possible, the following procedures will be implemented.



- a. If an atypical, natal or pupping, known or potential San Joaquin kit fox den is discovered within a project footprint, the den will be monitored for 3 days by a Service- and CDFW-approved biologist using a tracking medium or an infrared beam camera to determine whether the den is currently being used.
  - b. If an active natal or pupping den is found within a project footprint, Service and CDFW will be notified immediately.
  - c. If San Joaquin kit fox activity is observed at the potential, known, or atypical den during the preconstruction surveys, Service and CDFW will be notified immediately, and the den will be monitored for 5 consecutive days from the time of the first observation.
  - d. Construction requirements from *Standardized Recommendations for Protection of the San Joaquin Kit Fox Prior to or during Ground Disturbance* (U.S. Fish and Wildlife Service 2011) or the latest guidelines will be implemented.
  - e. If potential, known, atypical, or natal or pupping dens are identified within temporary work areas or within a 200-foot buffer of a temporary work area, exclusion zones around each den entrance or cluster of entrances will be demarcated. The configuration of exclusion zones will be circular, with a radius measured outward from the den entrance(s). No activities will occur within the exclusion zones. Exclusion zone radii for atypical dens and potential dens will be at least 50 feet and will be demarcated with four to five flagged stakes. Exclusion zone radii for known dens will be at least 100 feet and will be demarcated with staking and flagging that encircle each den or cluster of dens but do not prevent access to the den by the foxes. Exclusion zone radii for natal or pupping dens will be at least 200 feet and will be demarcated using fencing, but a final buffer will be established in coordination with the Service and CDFW.
  - f. Written results of the surveys will be submitted to the Service and CDFW within 5 calendar days of the completion of surveys and prior to the beginning of ground disturbance and/or construction activities in San Joaquin kit fox modeled habitat.
3. During construction, the following measures will be implemented for all activities in suitable San Joaquin kit fox habitat (as determined by a USFWS- and CDFW-approved biologist):
  - a. The Service- and CDFW-approved biologist for San Joaquin kit fox will be the contact source for any employee or contractor who might incidentally observe or discover kit fox. If a kit fox is observed or discovered within the work area, all work will cease within 200 feet and the Service- and CDFW-approved biologist will contact the Service immediately. The Service contact is the Assistant Field Supervisor of Endangered Species.



- b. New sightings of kit fox will be reported to the California Natural Diversity Database (CNDDB). A copy of the reporting form and a topographic map clearly marked with the location of where the kit fox was observed will also be provided to the Service.

#### ***6.3.2.2 California Least Tern Avoidance and Minimization Measures***

The following measures for the California least tern will only be required for surface construction activities occurring within suitable foraging and nesting habitat.

1. If suitable nesting habitat for California least tern (flat, unvegetated areas near aquatic foraging habitat) is identified during planning-level surveys the year prior to construction, DWR will require that at least three preconstruction surveys for this species will be conducted in all suitable habitat within 500 feet of the construction footprint, where construction-related noise levels could exceed 60 A-weighted decibel (dBA) equivalent continuous sound level (Leq) (1 hour), during the California least tern breeding season (April 15 to August 15). Construction-related noise level will be determined based on a noise contour map, created by a noise expert, showing the 60 dBA noise contour specific to the type and location of construction to occur in the area. Surveys will be conducted by a Service- and CDFW-approved biologist with experience observing the species and its nests. DWR will implement the following requirements to avoid loss of California least tern nesting colonies if construction will take place within 500 feet of a California least tern nest where construction-related noise levels could exceed 60 dBA Leq (1 hour) during the breeding season (April 15 to August 15 or extended as determined through surveys).
  - a. A Service- and CDFW-approved wildlife biologist will monitor construction activities within 500 feet of active nests to ensure that construction activities do not affect nest success. Reduced buffers may be allowed, through coordination with the Service and CDFW, if a full-time Service- and CDFW-approved biologist is present to monitor the nest and has authority to halt construction if bird behavior indicates continued activities could lead to nest failure. Active nests will be monitored to track progress of nesting activities until the biologist determines that the young have fledged and are capable of independent survival or the nest site is no longer active.
  - b. Activities performed during the California least tern breeding season, in occupied least tern nesting habitat, with Service and CDFW approval and under the supervision of a Service- and CDFW-approved biologist will be limited to inspection, research or monitoring.
  - c. If a California least tern is found, construction activities will be limited such that sound will not exceed 60 dBA within 500 feet of the habitat being used until the Service- and CDFW-approved biologist has confirmed that the bird has left the area.

- d. Portable and stationary equipment will be located, stored, and maintained as far as possible, with a minimum distance of 500 feet, from suitable California least tern habitat.
- e. All lights will be screened and directed down toward work activities and away from suitable habitat. A biological construction monitor will ensure that lights are properly directed at all times during construction.

#### ***6.3.2.3 Least Bell's Vireo Avoidance and Minimization Measures***

The following measures for least Bell's vireo will only be required for surface construction activities occurring between May 15 through September 1.

1. Prior to the construction, a noise expert will create a noise contour map showing the 60 dBA noise contour specific to the type and location of construction to occur in the area.
2. Two weeks prior to construction, a Service- and CDFW-approved biologist will conduct daily surveys, consistent with a Service- or CDFW- approved survey protocol (U.S. Fish and Wildlife Service 2001:1-3, or more current guidance) within 500 feet of suitable habitat where construction-related noise levels could exceed 60 dBA Leq (1 hour).
3. If a least Bell's vireo is found, construction activities will be limited such that sound will not exceed 60 dBA within 500 feet of the habitat being used until the Service- and CDFW-approved biologist has confirmed that the bird has left the area.
4. If surveys find least Bell's vireos in an area where vegetation will be removed, vegetation removal will be conducted when the Service- and CDFW-approved biologist has confirmed that least Bell's vireos are not present within 500 feet of vegetation removal activities.
5. Portable and stationary equipment will be located, stored, and maintained as far as possible, with a minimum distance of 500 feet, from suitable least Bell's vireo habitat.
6. All lights will be screened and directed down toward work activities and away from suitable habitat. A biological construction monitor will ensure that lights are properly directed at all times during construction.

#### ***6.3.2.4 Western Yellow-Billed Cuckoo Avoidance and Minimization Measures***

The following measures for western yellow-billed cuckoo will only be required for surface construction activities occurring between May 15 through September 1.

1. Prior to the construction, a noise expert will create a noise contour map showing the 60 dBA noise contour specific to the type and location of construction to occur in the area.

2. Two weeks prior to construction, a Service- and CDFW-approved biologist will conduct daily surveys, consistent with a Service- or CDFW-approved survey protocol (e.g., Halterman *et al.* 2015:9-42, or more current guidance), within 500 feet of suitable habitat where construction-related noise levels could exceed 60 dBA Leq (1 hour).
3. If a yellow-billed cuckoo is found, construction activities will be limited such that sound will not exceed 60 dBA within 500 feet of the habitat being used until the Service- and CDFW-approved biologist has confirmed that the bird has left the area.
4. If surveys find cuckoos in an area where vegetation will be removed, vegetation removal will be conducted when the Service- and CDFW-approved biologist has confirmed that cuckoos are not present within 500 feet of vegetation removal activities.
5. Portable and stationary equipment will be located, stored, and maintained as far as possible, with a minimum distance of 500 feet, from suitable western yellow-billed cuckoo habitat.
6. All lights will be screened and directed down toward work activities and away from migratory habitat. A biological monitor will ensure that lights are properly directed at all times during construction.

#### ***6.3.2.5 California Red-Legged Frog Avoidance and Minimization Measures***

1. When each site is available for surveys, a Service-approved biologist will then delineate California red-legged frog habitat at each project site, based on an agreed upon definition of suitable habitat, including both aquatic and upland habitat.
2. Once habitat has been delineated, the qualified biologist will conduct preconstruction surveys performed using a method approved by the Service to determine whether California red-legged frog is present on the project site to enable further determination of compensatory mitigation requirements. In the event of a dry year, the aquatic habitat will be evaluated based on general suitability (e.g., evidence of suitable ponding depths, proximity to occurrences) and the habitat will be assumed to represent occupied habitat.
3. To the greatest extent possible, identified and delineated habitat will be completely avoided.

For areas verified as being suitable for California red-legged frog and that cannot be avoided, the following measures will be implemented.

4. To the extent practicable, initial ground-disturbing activities will not be conducted between September 1 and April 30, to avoid the wet season which encompasses breeding as well as potential upland migration before and after. Once the area has been surveyed, initial ground disturbance has occurred, and exclusionary fencing is in place, the seasonal restriction would not apply.

5. Ground-disturbing activities will be designed to minimize or eliminate effects on rodent burrows that may provide suitable cover habitat for California red-legged frog. Surface-disturbing activities will avoid areas with a high concentration of burrows to the greatest extent practicable. In addition, when a concentration of burrows is present in a work site, the area will be staked or flagged to ensure that work crews are aware of their location and to facilitate avoidance of the area.
6. All initial ground disturbance or vegetation removal (clearing) will be limited to periods of no or low rainfall (less than 0.08 inch per 24-hour period and less than 40% chance of rain). To the extent practicable, clearing activities within California red-legged frog habitat will cease 24 hours prior to a 40% or greater forecast of rain from the closest National Weather Service (NWS) weather station. Clearing may continue 24 hours after the rain ceases, if no more than 0.5 inch of precipitation is in the 72-hour forecast. If clearing must continue when rain is forecast (i.e., greater than 40% chance of rain), a Service-approved biologist will survey the work site before clearing begins each day rain is forecast. If rain exceeds 0.5 inch during a 24-hour period, clearing will cease until the NWS forecasts no further rain. Modifications to this timing may be approved by the Service based on site conditions and expected risks to California red-legged frog. For a given site that has exclusion fencing in place and all surface soil disturbance completed (i.e., no burrows present), these restrictions would no longer apply.
7. To the maximum extent practicable, nighttime construction will be minimized or avoided when working in suitable California red-legged frog habitat. To the greatest extent practicable, earthmoving and construction activities will cease no less than 30 minutes before sunset and will not begin again prior to no less than 30 minutes after sunrise. Except when necessary for driver or pedestrian safety, artificial lighting at a work site will be prohibited during the hours of darkness when working in suitable California red-legged frog habitat.
8. If work must be conducted at night within 300 feet of California red-legged frog habitat, all lighting will be directed away and shielded from California red-legged frog habitat outside the construction area to minimize light spillover to the greatest extent possible. If light spillover into adjacent California red-legged frog habitat occurs, a Service-approved biologist will be present during night work to survey for California red-legged frogs in areas illuminated by construction lighting. If California red-legged frog is found to be illuminated, the Service-approved biologist has the authority to terminate the project activities until the light is directed away from the frog's location, or the California red-legged frog moves out of the illuminated area.
9. At least 30 days prior to any ground disturbance activities, DWR will prepare and submit a relocation plan for Service's written approval. The relocation plan will contain the name(s) of the Service-approved biologist(s) to relocate California red-legged frogs, the method of relocation (if different from described), a map, and a description of the proposed release site(s) outside of exclusion fencing and within 300 feet of the work area or at a distance otherwise agreed to by the Service, and written permission from the landowner (if other than the State) to use their land as a relocation site.

10. When there is California red-legged frog habitat within 300 feet of construction activities, exclusion fencing will be installed along the perimeter of construction sites to protect California red-legged frog habitat and minimize the potential for frogs to enter the construction work area. The perimeter of construction sites will be fenced with fencing material suitable for excluding amphibians by no more than 14 days prior to the start of construction. The placement of exclusion fencing will be determined, in part, by the locations of suitable habitat for the species. A conceptual fencing plan will be submitted to the Service prior to the start of construction and the approved California red-legged frog exclusion fencing will be shown on the final construction plans. DWR, as project proponent, will include the amphibian exclusion fence specifications including installation and maintenance criteria in the bid solicitation package special provisions. The amphibian exclusion fencing will remain in place for the duration of construction and will be regularly inspected and fully maintained. The biological monitor and construction manager will be responsible for checking the exclusion fencing around the work areas each day of construction for wildlife trapped inside and to ensure that they are intact and upright. This will be especially critical during times of inclement weather that can damage the fencing. Repairs to the amphibian exclusion fence will be made within 24 hours of discovery of a breach. Where construction access is necessary, gates will be installed in the exclusion fence and fencing will direct animals away from the work area to the extent practicable (e.g., fencing will flare out and turn back toward suitable habitat).
11. Preconstruction surveys will be conducted by a Service-approved biologist immediately prior to the initiation of any ground-disturbing activities or vegetation clearing, including immediately prior to exclusion fence installation, in areas identified as having suitable California red-legged frog habitat. These surveys will consist of walking the work site limits. The Service-approved biologist will investigate all potential areas that could be used by the California red-legged frog for feeding, breeding, sheltering, movement, or other essential behaviors. If there is a lapse in construction in a work area for 7 days or more, these preconstruction surveys will be repeated before activities resume.
12. The Service-approved biologist will conduct clearance surveys at the beginning of each day and regularly throughout the workday when construction activities are occurring that may result in take of California red-legged frog. These surveys will consist of walking surveys within the work sites and investigating suitable aquatic and upland habitat including potential refugia habitat such as small woody debris, refuse, and burrow entrances, that are not directly disturbed by project activities.
13. If a California red-legged frog is encountered at any point within a work area, activities within a minimum of 25 feet of the individual will cease immediately and the construction manager and Service-approved biologist will be notified, and the biologist will observe and follow within 10 feet of the individual to ensure it has safely left the area. The frog will be allowed to leave the area of its own volition, and work may resume when it is no longer in harm's way. Depending on site-specific conditions, such as the use of heavy equipment, a larger protective buffer may be established, as determined by

the Service-approved biologist. If the frog does not move out of the area on its own, and it is determined by the Service-approved biologist that relocating the frog is necessary, these steps will be followed:

- a. Prior to handling and relocation, the biologist will take precautions to prevent introduction of amphibian diseases by following guidance in *The Declining Amphibian Task Force Fieldwork Code of Practice* (<https://www.fws.gov/sites/default/files/documents/declining-amphibian-task-force-fieldwork-code-of-practice.PDF>), or the most up-to-date guidance available at that time. California red-legged frogs will also be handled and assessed according to the *Restraint and Handling of Live Amphibians* (U.S. Geological Survey National Wildlife Health Center 2001 as cited in the BA), or the most up-to-date guidance available at that time.
- b. California red-legged frogs will be captured by hand, dipnet, or other Service-approved methodology, transported, and relocated to nearby suitable habitat outside but within 300 feet of the work area, or at a distance otherwise specified in the relocation plan described above, and released as soon as practicable the same day of capture per the relocation plan. Holding/transporting containers and dipnets will be thoroughly cleaned, disinfected, and rinsed with fresh water prior to use within construction areas. The Service will be notified within 24 hours of all capture, handling, and relocation efforts. Service-approved biologists will wear clean, new disposable surgical style (latex, nitrile, etc.) gloves and/or ensure that their hands are free of soaps, oils, creams, lotions, repellents, or solvents of any sort while capturing and relocating individuals. To avoid transferring disease or pathogens in handling of the amphibians, Service-approved biologists will follow the Declining Amphibian Populations Task Force's "Code of Practice" or the most up-to-date, agency-accepted guidance.
- c. If an injured California red-legged frog is encountered and the Service-approved biologist determines the injury is minor or healing and the frog is likely to survive, the frog will be released immediately, consistent with the preapproved relocation plan as described above. The frog will be monitored until it is determined that it is not imperiled by predators or other dangers.
- d. If the Service-approved biologist determines that the frog has major or serious injuries because of activities at the work site, the Service-approved biologist, or designee, will immediately take it to a Service-approved facility. If taken into captivity, the individual will not be released into the wild unless it has been kept in quarantine and the release is authorized by the Service. DWR will bear any costs associated with the care or treatment of such injured frogs. The circumstances of the injury, the procedure followed, and the final disposition of the injured animal will be documented in a written incident report. Notification to the Service of an injured or dead California red-legged frog in the project area will be reported within 24 hours and will include details such as whether or not its condition resulted from activities related to the PA. In addition, the Service-



approved biologist will follow up with USFWS within 2 calendar days of the finding. Written notification to the Service will include the following information: the species, number of animals taken or injured, sex (if known), date, time, location of the incident or of the finding of a dead or injured animal, how the individual was taken, photographs of the specific animal, the names of the persons who observed the take or found the animal, and any other pertinent information. Dead specimens will be preserved, as appropriate, and held in a secure location until instructions are received from the Service regarding the disposition of the specimen.

- e. Work within suitable aquatic habitats will not begin until the habitat is dry or has been adequately surveyed and dewatered. Aquatic habitats that must be dewatered will be surveyed for California red-legged frogs prior to dewatering. Dewatering pumps will be screened with wire mesh not larger than 5 millimeters to prevent larvae from entering the pump. The biological monitor will be present during dewatering. Any California red-legged frogs found will be relocated per the relocation plan.

#### ***6.3.2.6 California Tiger Salamander Avoidance and Minimization Measures***

1. When each site is available for surveys a Service- and CDFW- approved biologist will then delineate California tiger salamander habitat at each project site, based on the definition of suitable habitat, including both aquatic and upland habitat.
2. Once habitat has been delineated, the Service- and CDFW-approved biologist will use preconstruction surveys performed using a method approved by the Service and CDFW to determine presence of the species on the project site to enable further determination of compensatory mitigation requirements. In the event of a dry year, the aquatic habitat will be evaluated based on general suitability (e.g., evidence of suitable ponding depths, proximity to occurrences) and the habitat will be assumed to represent occupied habitat. In areas where ground disturbance will occur, grasses within suitable upland habitat will be mowed within 24 hours of clearance surveys to allow the biologist to see and survey for California tiger salamander and burrows. Light mowing equipment will be used and will only occur during the day in dry conditions when California tiger salamander is unlikely to be aboveground.
3. To the greatest extent possible, identified and delineated habitat will be completely avoided.

For areas verified as being suitable for California tiger salamander and that cannot be avoided, the following measures will be implemented.

4. To the extent practicable, initial ground-disturbing activities will not be conducted between November 1 and March 31, or extended to April 30 during wet years, in areas identified during the planning stages as providing suitable California tiger salamander habitat, to avoid the period when they are most likely to be moving through upland areas.

Once clearance surveys have been conducted, exclusionary fence is in place, the area has been surveyed, and initial ground disturbance has occurred, work within the disturbed area can occur outside the construction window (defined as April 1 through October 31 or, during wet years, May 1 through October 31).

5. If aquatic habitat is identified by the qualified biologist(s) within the project area southwest of Byron Highway, DWR will restrict construction activities to beyond 300 feet of breeding habitat, during the breeding season (November 1 through March 31, or extended to April 30 during wet years). Where aquatic habitat cannot be avoided by 300 feet during the breeding season, DWR will notify and coordinate with the Service and CDFW to implement site-specific avoidance and minimization measures. Where construction takes place in aquatic habitat during the nonbreeding season (April 1 through October 31, or delayed to May 1 during wet years), activities will not be initiated until after the habitat is no longer ponding water or until a Service- and CDFW-approved biologist has conducted clearance surveys of the aquatic habitat for presence of California tiger salamander and results have been submitted to the agencies. No work or dewatering will be allowed in occupied habitat. If a work site is to be temporarily dewatered by pumping, intakes will be completely screened with wire mesh not larger than 5 millimeters to prevent larger aquatic species from entering the pump system.
6. Ground-disturbing activities will be designed to minimize or eliminate effects on rodent burrows that may provide suitable cover habitat for California tiger salamander. Surface-disturbing activities will avoid areas with a high concentration of burrows to the greatest extent practicable. In addition, when a concentration of burrows is present in a work site, the area plus a 50-foot buffer will be staked or flagged to ensure that work crews are aware of their location and to facilitate avoidance of the area.
7. All initial ground disturbance or vegetation removal (clearing) will be limited to periods of no or low rainfall (less than 0.08 inch per 24-hour period and less than 40% chance of rain). DWR will avoid ground disturbance and vegetation removal during rainfall events and between sunset and sunrise. Clearing activities within California tiger salamander habitat will cease 24 hours prior to a 40% or greater forecast of rain from the closest NWS weather station. Clearing may continue 24 hours after the rain ceases, if no more than 0.5 inch of precipitation is in the 72-hour forecast. If clearing must continue when rain is forecast (greater than 40% chance of rain), a Service- and CDFW-approved biologist will survey the work site before clearing begins each day rain is forecast. If rain exceeds 0.5 inch during a 24-hour period, clearing will cease until the NWS forecasts no further rain. If this measure cannot be implemented as written or modifications to this timing is pursued, DWR will notify and coordinate with the agencies based on site conditions and expected risks to California tiger salamander. For a given site that has exclusion fencing in place and all surface soil disturbance completed (i.e., no burrows present), these restrictions would no longer apply. If there is a lapse in construction in a work area for 7 days or more due to weather conditions, preconstruction surveys will be repeated as described below.

8. To the extent practicable, earthmoving and construction activities will cease no less than 30 minutes before sunset and will not begin again until no less than 30 minutes after sunrise within 300 feet of California tiger salamander habitat. Except when necessary for driver or pedestrian safety, to the greatest extent practicable, artificial lighting at a work site will be prohibited during the hours of darkness.
9. At least 30 days prior to any ground-disturbing activities, DWR will prepare and submit a relocation plan for the Service's and CDFW's written approval. The relocation plan will contain the name(s) of the Service and CDFW-approved biologist(s) to relocate California tiger salamanders, the method of relocation (if different from described), a map, and a description of the proposed release site(s) within 300 feet of the work area or at a distance otherwise agreed to by the Service and CDFW, and written permission from the landowner (if other than the State) to use their land as a relocation site. The relocation plan will also include methods for searching for California tiger salamander (i.e., clearance surveys) in the work areas to avoid and minimize the potential for injury and mortality. Generally, work areas will be attempted to be cleared of California tiger salamanders by placing pit fall traps along the inside of the exclusion fence (i.e., within work areas) or by hand-excavating mammal burrows. Methods will be selected based on site-specific conditions in a given work area and will be approved by the Service and CDFW. Any California tiger salamanders found will be relocated according to the agency approved relocation plan and will follow the handling protocols outlined below.
10. When there is California tiger salamander habitat within 300 feet of construction activities, exclusion fencing will be installed along the perimeter of construction sites to protect California tiger salamander habitat and minimize the potential for salamanders to enter the construction work area. The perimeter of construction sites within 300 feet of California tiger salamander habitat will be fenced with fencing material suitable for excluding amphibians by no more than 14 days prior to the start of construction activities (e.g., staging, vegetation removal, grading) in a given area. The placement of exclusion fencing will be determined, in part, by the locations of suitable habitat for the species (defined above). A conceptual fencing plan will be submitted to the Service and CDFW prior to the start of construction and the approved exclusion fencing will be shown on the final construction plans. DWR will include the amphibian exclusion fence specifications including installation and maintenance criteria in the bid solicitation package special provisions. The amphibian exclusion fencing will remain in place for the duration of construction and will be regularly inspected and fully maintained. The biological monitor and construction manager will be responsible for checking the exclusion fencing around the work areas each day of construction for wildlife trapped inside and to ensure that they are intact and upright. This will be especially critical during times of inclement weather that could damage the fencing. Repairs to the amphibian exclusion fence will be made within 24 hours of discovery of a breach. Where construction access is necessary, gates will be installed in the exclusion fence and fencing will be installed to direct animals away from the work area to the extent practicable (e.g., fencing will flare out and turn back toward suitable habitat).

11. Preconstruction surveys will be conducted by a Service- and CDFW-approved biologist immediately prior to the initiation of any ground-disturbing activities or vegetation clearing, including immediately prior to exclusion fence installation, in areas identified as having suitable California tiger salamander habitat. These surveys will consist of walking surveys within the work sites and investigating suitable aquatic and upland habitat including potential refugia habitat such as small woody debris, refuse, burrow entrances, etc., that are not directly disturbed by project activities. If there is a lapse in construction in a work area for 7 days or more, these preconstruction surveys will be repeated before activities resume.
12. The Service- and CDFW-approved biologist will conduct clearance surveys within the construction work area at the beginning of each day and regularly throughout the workday when construction activities are occurring that may result in take of California tiger salamander. Surveys will be conducted in the same manner as the preconstruction surveys.
13. If a California tiger salamander is observed at any point within a work area, the Service- and CDFW-approved biologist will implement the following species observation and handling protocol. Only Service- and CDFW-approved biologists will participate in activities associated with the capture, handling, and monitoring of California tiger salamanders. If a California tiger salamander is encountered in a construction area, activities within a minimum of 25 feet of the individual will cease immediately and the construction manager and Service- and CDFW- approved biologist will be notified, and the biologist will observe and follow within 10 feet of the individual to ensure it has safely left the area. Depending on site-specific conditions, such as the use of heavy equipment, a larger protective buffer may be established, depending on site-specific conditions such as the use of heavy equipment, as determined by the Service- and CDFW- approved biologist. The California tiger salamander will be allowed to leave the area of its own volition, and work may resume when it is no longer in harm's way. All personnel on-site will be notified of the finding and no work will occur within a minimum of 10 feet of the California tiger salamander, or a larger buffer depending on site-specific conditions, without a Service- and CDFW-approved biologist present. If the salamander does not move out of the area on its own, and it is determined by the approved biologist that relocating the California tiger salamander is necessary, these steps will be followed.
  - a. Prior to handling and relocation, the Service- and CDFW-approved biologist will take precautions to prevent introduction of amphibian diseases in accordance with the *Interim Guidance on Site Assessment and Field Surveys for Determining Presence or a Negative Finding of the California Tiger Salamander* (Service 2003), or the most up-to-date guidance available at the time. Disinfecting equipment and clothing is especially important when biologists are coming to the Action Area to handle amphibians after working in other aquatic habitats. California tiger salamanders will also be handled and assessed according to the *Restraint and Handling of Live Amphibians* (U.S. Geological Survey National

Wildlife Health Center 2001 as cited in the BA), or the most up-to-date guidance available at the time.

- b. California tiger salamanders will be captured by hand, dipnet, or other Service- and CDFW-approved methodology, transported, and relocated to nearby suitable habitat outside of the work area and released as soon as practicable the same day of capture. Following the conditions of the relocation plan described in measure 9, individuals will be relocated outside of the exclusion fencing and at a distance no greater than 300 feet outside of the work area to areas with an active rodent burrow or burrow system (unless otherwise approved by the Service). Holding/transporting containers and dipnets will be thoroughly cleaned, disinfected, and rinsed with fresh water prior to use within the Action Area. Service and CDFW will be notified within 24 hours of all capture, handling, and relocation efforts. Service- and CDFW-approved biologists will wear clean, new disposable surgical style (nitrile, etc.) gloves and/or ensure that their hands are free of soaps, oils, creams, lotions, repellents, or solvents of any sort while capturing and relocating individuals. To avoid transferring disease or pathogens in handling of the amphibians, Service- and CDFW-approved biologists will follow the Declining Amphibian Populations Task Force's "Code of Practice" or the most recent guidance.
- c. If an injured California tiger salamander is encountered and the Service- and CDFW-approved biologist determines the injury is minor or healing and the salamander is likely to survive, the salamander will be released immediately, consistent with the preapproved relocation plan as described in measure 9. The California tiger salamander will be monitored until it is determined that it is not imperiled by predators or other dangers.
- d. If the Service- and CDFW-approved biologist determines that the California tiger salamander has major or serious injuries because of activities at the work site, the Service- and CDFW-approved biologist, or designee, will immediately take it to a Service- and CDFW-approved facility. If taken into captivity, the individual will not be released into the wild unless it has been kept in quarantine and the release is authorized by the Service. DWR will bear any costs associated with the care or treatment of such injured California tiger salamanders. The circumstances of the injury, the procedure followed, and the final disposition of the injured animal will be documented in a written incident report. Notification to Service and CDFW of an injured or dead California tiger salamander in the project area will be reported within 24 hours and will include details such as whether or not its condition resulted from activities related to the PA. In addition, the Service- and CDFW-approved biologist will follow up with the Service and CDFW within 2 calendar days of the finding. Written notification to the Service and CDFW will include the following information: the species, number of animals taken or injured, sex (if known), date, time, location of the incident or of the finding of a dead or injured animal, how the individual was taken, photographs of the specific animal, the names of the persons who observed the take or found the animal, and any other



pertinent information. Dead specimens will be preserved, as appropriate, and held in a secure location until instructions are received from the Service regarding the disposition of the specimen.

14. The Service- and CDFW-approved biologist will have the authority to stop activities at the work site if they determine that any of the avoidance and minimization measures are not being fulfilled.
15. If the exclusion fence is compromised during the rainy season, when California tiger salamanders are likely to be active, the fence will be repaired and a survey will be conducted immediately preceding construction activity that occurs in modeled or suitable California tiger salamander habitat, as determined by a Service- and CDFW-approved biologist, or in advance of any activity that may result in take of the species. The biologist will search along exclusion fences, and beneath vehicles each morning before they are moved. The survey will include a careful inspection of all potential hiding spots, such as along exclusion fencing; large, downed woody debris; and the perimeter of ponds, wetlands, and riparian areas. Any California tiger salamanders found will be captured and relocated according to the Service/CDFW-approved relocation plan.
16. If work must be conducted at night within 300 feet of California tiger salamander habitat, all lighting will be directed away and shielded from California tiger salamander habitat outside the construction area to minimize light spillover to the greatest extent possible. If light spillover into adjacent California tiger salamander habitat occurs, a Service- and CDFW-approved biologist will be present during night work to survey for burrows and emerging California tiger salamanders in areas illuminated by construction lighting. If California tiger salamander is found aboveground the Service- and CDFW-approved biologist has the authority to terminate the project activities until the light is directed away from the burrows, the California tiger salamander moves out of the illuminated area, or the California tiger salamander is relocated out of the illuminated area by the Service- and CDFW-approved biologist.
17. If requested before, during, or upon completion of ground disturbance and construction activities where suitable California tiger salamander habitat is present, DWR will require that the Service and CDFW can access and inspect the work site for compliance with the description of the project and avoidance and minimization measures, and to evaluate effects on the California tiger salamander and its habitat. A Service- and CDFW-approved biologist will be on-site during all activities that may result in take of California tiger salamander.

#### ***6.3.2.7 Giant Garter Snake Avoidance and Minimization Measures***

1. When each site is available for surveys, a Service- and CDFW-approved biologist will then delineate giant garter snake habitat at each project site, including both aquatic and upland habitat. Suitability of aquatic and upland habitat characteristics will be determined by the biologist consistent with the description of suitable habitat defined in the BA.



2. Once habitat has been delineated, the biologist will use giant garter snake preconstruction surveys performed using a method approved by the Service and CDFW to determine presence of the species on the project site to enable further determination of compensatory mitigation requirements.
3. For sites where such surveys are performed, the surveys will conform to established protocols for giant garter snake surveys and all occurrence data gathered will be reported to the CNDDDB and Service to add to the understanding of populations and occurrences for the species in the Delta.

To the greatest extent possible, identified and delineated habitat will be completely avoided. If the construction or restoration activity does not fully avoid effects on suitable habitat, the following measures will be implemented.

4. Initiate construction and conduct initial ground disturbance within suitable habitat in the summer months, between May 1 and October 1, and avoid giant garter snake habitat during periods of brumation (between October 1 and May 1). Suitability of aquatic and upland habitat characteristics will be determined by the biologist consistent with the description of suitable habitat defined in the BA. Once initial ground disturbance removing suitable habitat within a construction site has been conducted prior to September 15 and exclusionary fencing is in place, work within the cleared area can occur between October 1 and May 1.
5. To the extent practicable, as determined by project engineers and contractors, in coordination with the Service- and CDFW-approved biologist, conduct all activities within paved roads, farm roads, road shoulders, and similarly disturbed and compacted areas; confine ground disturbance and habitat removal to the minimal area necessary to facilitate construction activities.
6. At least 30 days prior to any ground-disturbing activities, DWR will prepare and submit a relocation plan for Service's and CDFW's written approval. The relocation plan will contain the name(s) of the biologist(s) to relocate giant garter snakes, the method of relocation (if different from described), a map, and a description of the proposed release site(s) within 300 feet of the work area or at a distance otherwise agreed to by the Service and CDFW, and written permission from the landowner (if other than the State) to use their land as a relocation site.
7. When there is giant garter snake habitat within 200 feet of construction activities, exclusion fencing will be installed along the perimeter of construction sites to protect giant garter snake habitat and minimize the potential for snakes to enter the construction work area. The perimeter of construction sites (except for work sites within areas of open water, like the Sacramento River) within or adjacent to giant garter snake habitat will be fenced with exclusion fencing by no more than 14 days prior to the start of construction activities (e.g., staging, vegetation removal, grading) in a given area. The placement of exclusion fencing will be determined, in part, by the locations of suitable habitat for the species. A conceptual fencing plan will be submitted to the Service and CDFW prior to

the start of construction and the approved exclusion fencing will be shown on the final construction plans. DWR, as project proponent, will include the exclusion fence specifications including installation and maintenance criteria in the bid solicitation package special provisions. The exclusion fencing will remain in place for the duration of construction and will be regularly inspected and fully maintained. The biological monitor and construction manager will be responsible for checking the exclusion fencing around the work areas each day of construction to ensure that they are intact and upright. This will be especially critical during times of inclement weather that can damage the fencing. Repairs to the exclusion fence will be made within 24 hours of discovery of a breach. Where construction access is necessary, gates will be installed in the exclusion fence and fencing will direct animals away from the work area to the extent practicable (e.g., fencing will flare out and turn back toward suitable habitat).

8. Immediately prior to the initiation of any vegetation clearing, ground-disturbing activities, and exclusion fence installation, the Service- and CDFW-approved biologist will survey suitable aquatic and upland habitat in the entire work site for the presence of giant garter snakes. Beginning no more than 7 days prior to initiating ground-disturbing activities during the active season (May 1 to October 1), the biologist shall conduct 2 days of walking preconstruction surveys within each construction site and a 3-foot boundary, surrounding the exclusion fencing, where access is allowed. If access is not allowed outside of the exclusion fencing, the biologist will conduct a visual survey of the 3-foot boundary from the edge of the exclusion fencing. The final preconstruction survey shall occur within 24 hours preceding exclusion barrier installation. If there is a lapse in construction in a work area for 7 days or more, these preconstruction surveys will be repeated before activities resume.
9. If exclusionary fencing is found to be compromised, a survey of the exclusion fencing and the area inside the fencing will be conducted immediately preceding construction activity that occurs in delineated giant garter snake habitat or in advance of any activity that may result in take of the species. The biologist will search along exclusionary fences, in pipes, and beneath vehicles before the vehicles are moved.
10. If a giant garter snake is found in the work area, activities within a minimum of 25 feet of the individual will cease immediately and the construction manager and Service- and CDFW-approved biologist will be notified, and the biologist will observe and follow within 10 feet of the individual to ensure it has safely left the area. Depending on site-specific conditions, such as the use of heavy equipment, a larger protective buffer may be established, as determined by the Service- and CDFW-approved biologist. The snake will be allowed to move of its own volition out of harm's way. If the snake does not move and it is deemed necessary to relocate the animal to prevent harm, the snake may be captured and relocated to suitable habitat a minimum of 200 feet outside of the work area in accordance with the relocation plan, prior to resumption of construction activity.
11. Within 24 hours prior to construction activities, and dredging, requiring heavy equipment, a Service- and CDFW-approved biologist will conduct a clearance survey of all the activity area not protected by exclusionary fencing where giant garter snake could

be present. This survey of the work area will be repeated if a lapse in construction or dredging activity of 2 weeks or greater occurs during the aestivation period (October 1 to May 1) or if the lapse in construction activity is more than 12 hours during active season (May 1 to October 1). If a giant garter snake is encountered during surveys or construction, cease activities until appropriate corrective measures have been completed, it has been determined that the giant garter snake will not be harmed, or the giant garter snake has left the work area.

12. The Service- and CDFW-approved biological monitor will help guide access and construction work around wetlands, active rice fields, and other sensitive habitats capable of supporting giant garter snake to minimize habitat disturbance and risk of injuring or killing giant garter snakes.
13. Store equipment in designated staging area areas at least 200 feet away from giant garter snake aquatic habitat to the extent practicable.
14. Visually check for giant garter snake under any vehicles or equipment that have been idle for more than 1 hour, or parked overnight, prior to moving the vehicles. Check any crevices or cavities in the work area where individuals may be present, including stockpiles that have been left for more than 24 hours where cracks/crevices may have formed.

For activities that will occur within suitable giant garter snake habitat during the giant garter snake inactive season (October 2 to April 30) and will last more than 2 weeks, DWR will implement the following additional avoidance and minimization measures.

15. All aquatic giant garter snake habitat will be dewatered between May 1 and October 1 (giant garter snake active season) to the extent that the area is no longer suitable giant garter snake habitat, as defined in the BA. Dewatering will be limited to the immediate construction area and will remain dry for at least 15 consecutive days prior to excavating or filling the dewatered habitat. The Service- and CDFW-approved biologist will be on-site during dewatering activities to salvage and relocate any snakes that cannot escape on their own. Dewatering is necessary because aquatic habitat provides prey and cover for giant garter snake; dewatering serves to remove the attractant and increase the likelihood that giant garter snake will move to other available habitat. Any deviation from this measure will be done in coordination with and with approval of the Service and CDFW.
16. Following dewatering of aquatic habitat, all potential impact areas that provide suitable aquatic or upland giant garter snake habitat will be surveyed for giant garter snake by the biologist. If giant garter snakes are observed, they will be passively allowed to leave the potential impact area. If the snake does not move of its own accord and it is determined necessary, the snake will be relocated in accordance with the approved relocation plan.
17. Once habitat is deemed free of giant garter snakes, exclusion fencing will be installed around the construction site so no snakes may reenter prior to or during construction.

#### **6.3.2.8 Valley Elderberry Longhorn Beetle Avoidance and Minimization Measures**

As properties become accessible for initiating project activities, DWR will require surveys for elderberry shrubs to be conducted in construction areas by a Service-approved biologist.

Elderberry shrubs will be avoided to the maximum extent practicable. Complete avoidance (i.e., no adverse effects) will be assumed when a buffer of at least 165 feet is established and maintained around elderberry shrubs containing stems measuring 1 inch or greater in diameter at ground level (Service 2017b).

Elderberry shrubs determined or assumed to be occupied, according to the criteria in the Service's 2017 *Framework for Assessing Impacts on Valley Elderberry Longhorn Beetle* (*Desmocerus californicus dimorphus*) (2017 Framework) (Service 2017b) or the most recent available guidance at that time, that are identified within project footprints that cannot be avoided (i.e., those in the project footprint) will be transplanted to conservation areas identified in the Compensatory Mitigation Plan (BA Appendix 3B). Transplanting will follow the guidance outlined in the 2017 Framework or the most recent available guidance at that time.

For shrubs not directly affected by construction but that occur within 165 feet of ground-disturbing activities, the following measures, which come from the 2017 Framework, will be implemented to avoid or substantially reduce the impact consistent with the recommendations by a Service-approved biologist.

1. Fencing. All areas to be avoided during construction activities will be fenced and flagged as close to construction limits as feasible.
2. Avoidance area. Activities that may damage or kill an elderberry shrub (e.g., trenching, paving, etc.) may need an avoidance area of at least 20 feet from the drip-line, depending on the type of activity.
3. Timing. As much as feasible, all activities that occur within 165 feet of an elderberry shrub, will be conducted outside of the flight season of the species (March to July).
4. Trimming. Trimming may remove or destroy valley elderberry longhorn beetle eggs and/or larvae and may reduce the health and vigor of the elderberry shrub. In order to avoid and minimize adverse effects on valley elderberry longhorn beetle, trimming will occur between November 1 and February 1 and will avoid the removal of any branches or stems that are  $\geq 1$  inch in diameter. Measures to address regular or largescale maintenance (trimming) should be established in consultation with the Service.
5. Chemical usage. Herbicides will not be used within the drip-line of an elderberry shrub. Insecticides will not be used within 100 feet of an elderberry shrub. All chemicals will be applied using a backpack sprayer or similar direct-application method.

#### ***6.3.2.9 Vernal Pool Fairy Shrimp and Vernal Pool Tadpole Shrimp Avoidance and Minimization Measures***

As properties become accessible for initiating project activities, planning-level surveys will be conducted to assess the suitability of modeled habitat and, where suitable, conduct protocol-level surveys for vernal pool fairy shrimp and vernal pool tadpole shrimp.

To the extent practicable, work areas will be designed to avoid habitat for vernal pool invertebrates, plants, and critical habitat for vernal pool fairy shrimp. Where practicable, the project will be planned and designed to avoid ground-disturbing activities or alterations to hydrology within 250 feet of vernal pool aquatic invertebrate habitat. Where activities need to occur within 250 feet of habitat, those work areas will be assessed for their potential to alter the hydrology of the pool habitat such that the hydroperiod of the pool will no longer support the species. Where the Service agrees that any changes to the hydroperiod will not permanently affect habitat functionality, compensatory mitigation would not be required.

To the extent practicable, DWR will minimize impacts on critical habitat for vernal pool fairy shrimp. To achieve this, project construction will occur at least 250 feet from vernal pool fairy shrimp critical habitat containing the primary constituent elements defined in the *Status of the Species and Critical Habitat* section below unless it is determined through Service review that the activities within the buffer will not substantially modify the primary constituent elements of vernal pool fairy shrimp critical habitat.

For suitable aquatic habitat for vernal pool fairy shrimp and vernal pool tadpole shrimp that will be affected by the project, protocol-level surveys for these species will be conducted to determine whether they are present or where time does not allow for surveys to be completed (e.g., dry years, timely access), the suitable habitat will be assumed to be occupied. Surveys will be conducted according to the most recent Service guidelines by Service-approved biologists with the appropriate recovery permit under section 10(a)(1)(A) of the Act.

Project elements will be designed to avoid direct and indirect effects on vernal pool aquatic invertebrate habitat to the extent practicable. Where avoidance is not possible, and construction occurs within 250 feet of vernal pool crustacean habitat, construction best management practices, as described in AMM-14: Construction Best Management Practices for Biological Resources, will be implemented to ensure that construction activities minimize effects on the habitat. Construction best management practices include protective fencing installed around vernal pool aquatic invertebrate habitat with signage identifying these areas as containing sensitive biological resources. A biological monitor will ensure that fencing and best management practices are maintained for the duration of construction and that construction personnel are provided the necessary worker awareness training.

#### ***6.3.2.10 Northwestern Pond Turtle Avoidance and Minimization Measures***

1. When each site is available for surveys, a Service- and CDFW-approved biologist will then delineate northwestern pond turtle habitat at each project site, including both aquatic and upland habitat. Suitability of aquatic and upland habitat characteristics will be

determined by the biologist consistent with the description of suitable habitat defined in the BA.

2. Once habitat has been delineated, the biologist will use northwestern pond turtle preconstruction surveys performed consistent with a Service- or CDFW-approved survey protocol (U.S. Geological Survey 2006, or more current guidance) to determine presence of the species on the project site to enable further determination of compensatory mitigation requirements.

To the greatest extent possible, identified and delineated habitat will be completely avoided and activities will be conducted within paved roads, farm roads, road shoulders, and similarly disturbed and compacted areas. If the construction or restoration activity cannot fully avoid effects on suitable habitat, the following measures will be implemented.

3. Initiate construction and conduct initial ground disturbance in suitable upland habitat within 300 feet of suitable aquatic habitat prior to the start of nesting season (August 1–February 28) and avoid northwestern pond turtle upland habitat during periods of nesting and nestling emergence (between March 1–July 31). Suitability of aquatic and upland habitat characteristics will be determined by the biologist consistent with the description of suitable habitat defined in the BA. Once initial ground disturbance removing suitable habitat within a construction site has been conducted and exclusionary fencing is in place and maintained, work within the cleared area can occur throughout the year.
4. At least 30 days prior to any ground-disturbing activities that could result in take of northwestern pond turtle, DWR will prepare and submit a relocation plan for the Service's written approval. The relocation plan will contain the name(s) of the biologist(s) to relocate northwestern pond turtles or their nests, the method of relocation, a map, and a description of the proposed release site(s) that are a minimum of 300 feet outside of the work area or at a distance otherwise agreed to by the Service, and written permission from the landowner (if other than the State) to use the land as a relocation site. Any capture and handling of turtles will be done by a Service-approved biologist wearing clean, new disposable surgical style (e.g., nitrile) gloves.
5. Within 72 hours prior to the initiation of any vegetation clearing, ground-disturbing activities, and exclusion fence installation or modification, the Service- and CDFW-approved biologist will conduct a preconstruction survey within suitable aquatic and upland habitat in the entire work site for the presence of northwestern pond turtles or nests. These surveys will consist of walking the work site limits. The biologist will investigate all potential areas that could be used by northwestern pond turtle for feeding, basking, nesting, or other essential behaviors. If there is a lapse in construction of 7 days or more for work areas surrounded by exclusion fencing, these preconstruction surveys will be repeated before activities resume.
6. When there is northwestern pond turtle habitat within 300 feet of construction activities, exclusion fencing will be installed along the perimeter of construction sites to protect northwestern pond turtle habitat and minimize the potential for turtles to enter the



construction work area. The perimeter of construction sites (except for work sites within areas of open water, like the Sacramento River) within 300 feet of suitable northwestern pond turtle aquatic habitat will be fenced with exclusion fencing no more than 14 days prior to the start of construction activities (e.g., staging, vegetation removal, grading) in a given area. To the greatest extent feasible, exclusion fencing will be installed prior to the start of nesting season (March 1). The placement of exclusion fencing will be determined, in part, by the locations of suitable habitat for the species. A conceptual fencing plan will be submitted to the Service and CDFW prior to the start of construction and the approved exclusion fencing will be shown on the final construction plans. DWR, as project proponent, will include the exclusion fence specifications including installation and maintenance criteria in the bid solicitation package special provisions. The exclusion fencing will remain in place for the duration of construction and will be regularly inspected and fully maintained. Where openings need to be maintained, such as on the levee road, fencing will be installed to direct turtles away from the work area to the extent practicable (e.g., fencing will flare out and turn back toward the river and adjacent riparian). Where construction access is necessary, gates will be installed in the exclusion fence and fencing will direct animals away from the work area to the extent practicable (e.g., fencing will flare out and turn back toward suitable habitat).

7. The biological monitor and construction manager will be responsible for checking the exclusion fencing around the work areas each day of construction to ensure that they are intact and upright. Repairs to the exclusion fence will be made within 24 hours of discovery of damage. If exclusionary fencing is found to be compromised, the suitable habitat inside the fencing will be surveyed in advance of any activity that may result in take of the species. Following repairs, the biologist will search all potential areas that could be used by northwestern pond turtle for feeding, basking, nesting, or other essential behaviors, including along exclusion fencing and beneath vehicles before the vehicles are moved.
8. For work sites where exclusion fencing cannot be placed around the entire perimeter, the Service- and CDFW-approved biological monitor will help guide access and construction work around wetlands, ponds, and other sensitive habitats capable of supporting northwestern pond turtle to minimize habitat disturbance and risk of injuring or killing northwestern pond turtles.
9. The Service- and CDFW-approved biologist will conduct clearance surveys prior to the start of construction each day and regularly throughout the workday when construction activities are occurring that may result in take of northwestern pond turtle. Surveys will be conducted in the same manner as the preconstruction surveys.
10. If a northwestern pond turtle is encountered in a construction or restoration area, all personnel on-site will be notified and activities within a minimum of 25 feet of the individual will cease immediately, the construction manager and Service- and CDFW-approved biologist will be notified, and the biologist will observe and follow within 10 feet of the individual to ensure it has safely left the area. Depending on site-specific conditions, such as the use of heavy equipment or other activities that may cause harm to

the individual, as determined by the biologist, a larger protective buffer may be established. The turtle will be allowed to leave the area of its own volition out of harm's way. If the turtle does not move out of the area on its own, and it is determined by the biologist, in coordination with the construction manager that relocating the turtle is necessary to prevent harm, the turtle may be captured and relocated to suitable habitat a minimum of 300 feet outside the work area in accordance with the relocation plan, prior to resumption of construction activity.

11. Equipment must be stored in designated staging areas at least 300 feet away from northwestern pond turtle aquatic habitat to the extent practicable.
12. If a work site is to be temporarily dewatered by pumping during the northwestern pond turtle active season, intakes will be completely screened with wire mesh not larger than 5 millimeters to prevent juvenile northwestern pond turtles and other aquatic species from entering the pump system. Any turtles found in the dewatered area will be relocated according to the Service- and CDFW-approved relocation plan.

For proposed activities that will occur within suitable northwestern pond turtle aquatic habitat during the northwestern pond turtle inactive season (October 1 through February 28), DWR will implement the following additional avoidance and minimization measures.

13. All aquatic northwestern pond turtle habitat will be dewatered prior to the start of the inactive season (October 1) to the extent that the area is no longer suitable northwestern pond turtle habitat, as defined in the BA. Dewatering is necessary because aquatic habitat provides overwintering habitat for northwestern pond turtle; dewatering serves to remove the attractant and increase the likelihood that northwestern pond turtle will move to other available habitat. Pump intakes will be completely screened with wire mesh not larger than 5 millimeters to prevent juvenile northwestern pond turtle and other aquatic species from entering the pump system. Dewatering will be limited to the immediate construction area. The Service- and CDFW-approved biologist will be on-site during dewatering activities to salvage and relocate any turtles that cannot escape on their own according to the Service- and CDFW-approved relocation plan. Any deviation from this measure will be done in coordination with and with approval of the Service and CDFW.
14. Following dewatering of aquatic habitat, all potential impact areas that provide suitable aquatic or upland northwestern pond turtle habitat will be surveyed for northwestern pond turtle by the biologist. If northwestern pond turtles are observed, they will be allowed to move of their own accord or relocated in accordance with the approved relocation plan.
15. Once habitat is deemed free of northwestern pond turtles, exclusion fencing will be installed around the construction site so no turtles may reenter prior to or during construction.

### ***6.3.2.11 Western Spadefoot Avoidance and Minimization Measures***

1. When each site is available for surveys a Service-approved biologist will then delineate western spadefoot habitat at each project site, based on the definition of suitable habitat, including both aquatic and upland habitat. Suitability of aquatic and upland habitat characteristics will be determined by the biologist consistent with the description of suitable habitat defined in the BA.
2. Once habitat has been delineated, the biologist will use western spadefoot preconstruction surveys performed consistent with a Service-approved survey protocol to determine presence of the species on the project site to enable further determination of compensatory mitigation requirements.
3. To the greatest extent possible, identified and delineated habitat will be completely avoided and activities will be conducted within paved roads, farm roads, road shoulders, and similarly disturbed and compacted areas. If the construction or restoration activity cannot fully avoid effects on suitable habitat, the following measures will be implemented. Except for limited vegetation clearing necessary to minimize effects on nesting birds, initial suitable upland habitat clearance and disturbance will not be conducted between November 1 and March 31, with the period extending to April 30 during wet years. Once the initial ground disturbance has occurred, the area has been surveyed, and exclusionary fencing is in place, work in the disturbed area can occur outside the construction window (defined as April 1 through October 31 or, during wet years, May 1 through October 31).
4. Where construction or restoration activities take place in aquatic habitat, activities will not be initiated until after the habitat is no longer ponding water or until a Service-approved biologist has surveyed the aquatic habitat for presence of western spadefoot larvae. No work or dewatering will be allowed in occupied habitat. If a work site is to be temporarily dewatered by pumping, intakes will be completely screened with wire mesh not larger than 5 millimeters to prevent larger aquatic species from entering the pump system.
5. Ground-disturbing activities will be designed to minimize or eliminate effects on rodent burrows that may provide suitable upland habitat for western spadefoot. Surface-disturbing activities will avoid areas with a high concentration of burrows to the greatest extent practicable. In addition, when a concentration of burrows is present in a work site, the area plus a 50-foot buffer will be staked or flagged to ensure that work crews are aware of their location and to facilitate avoidance of the area.
6. All initial ground disturbance or vegetation removal (clearing) will be limited to periods of no or low rainfall (less than 0.08 inch per 24-hour period and less than 40% chance of rain). To the extent practicable, clearing activities within western spadefoot habitat will cease 24 hours prior to a 40% or greater forecast of rain from the closest NWS weather station. Clearing may continue 24 hours after the rain ceases, if no more than 0.5 inch of precipitation is in the 72-hour forecast. If clearing must continue when rain is forecast (greater than 40% chance of rain), a qualified biologist will survey the work site before

clearing begins each day rain is forecast. If rain exceeds 0.5 inch during a 24-hour period, clearing will cease until the NWS forecasts no further rain. For a given site that has exclusion fencing in place and all surface soil disturbance completed (i.e., no burrows present), these restrictions would no longer apply.

7. To the extent practicable, earthmoving and construction activities will cease no less than 30 minutes before sunset and will not begin again until no less than 30 minutes after sunrise within 300 feet of western spadefoot habitat. Suitability of aquatic and upland habitat characteristics will be determined by the Service-approved biologist consistent with the description of suitable habitat defined in the BA and by additional assessments conducted prior to ground disturbance. Except when necessary for driver or pedestrian safety, to the greatest extent practicable, artificial lighting at a work site will be prohibited during the hours of darkness.
8. At least 30 days prior to any ground-disturbing activities that could result in take of western spadefoot, DWR will prepare and submit a relocation plan for the Service's written approval. The relocation plan will contain the name(s) of the biologist(s) to relocate western spadefoot, the method of relocation, a map, and a description of the proposed release site(s) a minimum of 300 feet outside of the work area or at a distance otherwise agreed to by the Service and written permission from the landowner (if other than the State) to use their land as a relocation site.
9. When there is western spadefoot habitat within 300 feet of construction activities, exclusion fencing will be installed along the perimeter of construction sites to protect western spadefoot habitat and minimize the potential for spadefoot to enter the construction work area. The perimeter of construction and restoration sites within western spadefoot habitat will be fenced with fencing material suitable for excluding amphibians by no more than 14 days prior to the start of construction activities (e.g., staging, vegetation removal, grading) in a given area. The placement of exclusion fencing will be determined, in part, by the locations of suitable habitat for the species (defined above). A conceptual fencing plan will be submitted to the Service and CDFW prior to the start of construction and the approved exclusion fencing will be shown on the final construction plans. DWR will include the amphibian exclusion fence specifications including installation and maintenance criteria in the bid solicitation package special provisions. The amphibian exclusion fencing will remain in place for the duration of construction and will be regularly inspected and fully maintained.
10. The biological monitor and construction manager will be responsible for checking the exclusion fencing around the work areas each day of construction for wildlife trapped inside and to ensure that they are intact and upright. This will be especially critical during times of inclement weather that can damage the fencing. Repairs to the amphibian exclusion fence will be made within 24 hours of discovery of a breach. Where construction access is necessary, gates will be installed in the exclusion fence and fencing will direct animals away from the work area to the extent practicable (e.g., fencing will flare out and turn back toward suitable habitat). If the exclusion fence is compromised during the rainy season, a survey will be conducted immediately preceding construction

activity that occurs in suitable western spadefoot habitat, or in advance of any activity that may result in take of the species. The biologist will search along exclusion fences, and beneath vehicles each morning before the vehicles are moved. Surveys will be conducted in the same manner as the preconstruction surveys.

11. Preconstruction surveys will be conducted by a Service-approved biologist immediately prior to the initiation of any ground-disturbing activities or vegetation clearing, including immediately prior to exclusion fence installation, in areas identified as having suitable western spadefoot habitat. These surveys will consist of walking surveys within the work sites and investigating suitable aquatic and upland habitat including potential refugia habitat such as small woody debris, refuse, burrow entrances, etc., that are not directly disturbed by project activities. If there is a lapse in construction in a work area for 7 days or more, these preconstruction surveys will be repeated before activities resume.
12. The Service-approved biologist will conduct clearance surveys within the construction work area at the beginning of each day and regularly throughout the workday when construction activities are occurring that may result in take of western spadefoot. Surveys will be conducted in the same manner as the preconstruction surveys.
13. If a western spadefoot is encountered in a construction or restoration area, activities within a minimum of 25 feet of the individual will cease immediately, the construction manager and biological monitor will be notified, and the biological monitor will observe and follow the individual within 10 feet to ensure it has safely left the area. A larger protective buffer may be established, depending on site-specific conditions such as the use of heavy equipment, or other activities that may cause harm to the individual, as determined by the biological monitor. The spadefoot will be allowed to leave the area of its own volition out of harm's way. If the spadefoot does not move out of the area on its own, and it is determined by the biologist, in coordination with the construction manager that relocating the individual is necessary to prevent harm, the individual may be captured and relocated to suitable habitat a minimum of 300 feet outside the work area in accordance with the relocation plan, prior to resumption of construction activity.
  - a. Prior to handling and relocation, the biologist will take precautions to prevent introduction of amphibian diseases by following guidance in *The Declining Amphibian Task Force Fieldwork Code of Practice* or the most up-to-date guidance available at the time. Western spadefoot will also be handled and assessed according to the Restraint and Handling of Live Amphibians (U.S. Geological Survey National Wildlife Health Center 2001 as cited in the BA) or the most up-to-date guidance available at the time.
  - b. Western spadefoot will be captured by hand, dipnet, or other Service-approved methodology, transported, and relocated to nearby suitable habitat outside of the work area and released as soon as practicable the same day of capture.

#### ***6.3.2.12 Monarch Butterfly Avoidance and Minimization Measures***

Prior to project construction, DWR will implement the following measures if surface ground disturbance will occur during the monarch butterfly breeding season (March 15 through October 31).

1. All areas that will be affected by construction activities will be surveyed for monarch adults, eggs, larvae, and chrysalids, and milkweed host plants according to the methodology below or in alignment with a future Service-approved methodology by a qualified biologist familiar with the identification and life histories of monarch butterfly and milkweeds.
  - a. **Preconstruction Surveys.** Within one week prior to construction activity, the qualified biologist will perform meandering transects through the planned construction footprint, plus a 50-foot buffer where accessible, to visually survey the area for butterfly activity and presence of milkweed host plants. All milkweeds encountered will be inspected for presence of monarch butterfly eggs or larvae, and evidence of past caterpillar herbivory, which would indicate potential presence of chrysalids nearby.
  - b. **Notification.** If any monarch butterfly eggs, larvae, or chrysalids are identified during preconstruction surveys, the location will be recorded with Global Positioning System (GPS) by the qualified biologist and will be reported to the Service within 48 hours.
  - c. **Unoccupied Milkweed Removal.** If unoccupied milkweed plants (i.e., no eggs, larvae, or chrysalids present) are observed during preconstruction surveys, unoccupied plants within the disturbance footprint will immediately be cut to ground level and removed from the site to prevent monarch egg deposition. If new unoccupied milkweed plants are observed within the disturbance footprint after removal activities occur, then exclusion devices (such as mesh fencing or netting) will be installed to prevent monarchs from depositing eggs on emerging milkweeds that sprout after removal.
2. If only monarch butterfly adults are observed and no milkweed plants are found, or if all milkweed plants are unoccupied and immediately cut and maintained at ground level (effectively made unavailable for egg deposition), construction activities can proceed without a full-time biological monitor being present; however, if there is a lapse in initial construction disturbance greater than 2 weeks, an additional clearance survey will be made prior to ground disturbance. If monarch butterfly eggs, larvae, or chrysalids are found, a biological monitor will provide biological construction monitoring as long as necessary to ensure implementation of applicable measures below.
3. If monarch butterfly eggs, larvae, or chrysalids are discovered within the construction or restoration area, a protective buffer of 30 feet will be established around the observed location until it is no longer in use, as determined by the qualified biologist or biological monitor or until the project activities in the project area are complete, whichever is first.



4. If implementation of a 30-foot non-disturbance buffer is not possible but take of the individual can be avoided by implementing a non-disturbance buffer of less than 30 feet, a buffer of the greatest distance possible will be established in coordination with and approved by the Service prior to any ground disturbance, and ground disturbance can proceed under supervision of the qualified biologist.
5. If the individual cannot be avoided and mortality is likely to occur without intervention, an attempt will be made to relocate the individual, with review and approval by the Service and CDFW. If approved, a qualified biologist will attempt to relocate the individual to a suitable location outside the project footprint. A monarch butterfly relocation plan will be prepared and submitted to the Service for approval prior to ground disturbance. The relocation plan will describe the following: (a) how the different monarch life stages will be relocated; (b) who will conduct the relocation; where potential relocation sites will be located (i.e., as close to the existing location as feasible and with access to suitable habitat to sustain the individual through metamorphosis); and suitable habitat requirements.
6. If biological monitoring or surveys find a recently deceased monarch butterfly within the project area, the Service will be notified and the individual will be photographed and the date of observation, location, and suspected cause of mortality will be recorded.
7. Temporarily disturbed grassland will be reseeded as described in AMM-14, Construction Best Management Practices for Biological Resources (Appendix 3A, General Avoidance and Minimization Measures in the BA) with a seed mix that includes native milkweeds and nectar-producing plants commonly used as a food source by monarch butterfly.

Currently, there are no Service-approved survey protocols specific to monarch butterfly. Therefore, DWR proposes to use a project-specific methodology (as described), which includes the following major requirements: (1) surveyors are knowledgeable about the identification and biology of monarch butterfly life stages; (2) surveys are conducted at the appropriate time of year; and (3) suitable breeding habitat is surveyed prior to ground disturbance. If a survey methodology is developed specifically for determining presence or absence of breeding monarch butterfly and is approved by the Service, that methodology will be used.

#### **6.4 Compensatory Mitigation Plan for Special-Status Species and Aquatic Resources (CMP)**

This section summarizes the Compensatory Mitigation Plan (CMP) as proposed in the BA's Appendix 3B. The CMP describes project-specific (enhancement of the initial mitigation sites at Bouldin Island and the I-5 ponds) and programmatic actions (tidal restoration and channel margin enhancement) that would be implemented to offset the impacts associated with the PA. See Appendix 3B for specific details. The CMP includes compensatory mitigation measures for each species, which are described in Attachment 3B.1, *Compensatory Mitigation Design Parameters* of the BA and are included by reference.

#### **6.4.1 Bouldin Island Mitigation Sites**

Three separate mitigation sites are proposed on Bouldin Island: B1, B2, and B3 (Figure 7-2). Sites B1 and B2 would support the creation and enhancement of extensive wetland habitat and other aquatic resources and would provide compensatory mitigation for losses to waters of the U.S. and State. They would be designed and managed specifically to fulfill Federal and state wetland mitigation requirements, while also providing suitable habitat for several special-status species. Mitigation Site B3 would support the creation of native perennial grassland habitat. The approximate total of created or enhanced habitat is 552.21 acres for Site B1, 94.30 acres for Site B2, and 309.78 acres for Site B3.

The following general sequence of anticipated construction activities for Mitigation Site B1 includes: (1) weed control; (2) wildlife protection; (3) site preparation; (4) earthmoving; (5) planting and seeding; (6) access improvements; and (7) optional water control structures.

Sites B2 and B3 near the center of Bouldin Island would be restored without excavation or grading. Mitigation Site B2 would expand and enhance existing riparian vegetation around an existing depression to create a larger patch of forested wetland through plantings. Mitigation Site B3 near the center of Bouldin Island would create grasslands through vegetation clearing and grubbing, soil preparation/disking, and planting with native grasses.

The mitigation sites would be built over a period of several years, with construction beginning once relevant permits and approvals have been acquired for the project. Construction would likely occur over a period of 2 to 4 years given the scale of the three mitigation sites on Bouldin Island. Each site would be protected in perpetuity under a conservation easement.

#### **6.4.2 I-5 Ponds**

DWR owns three rectangular former borrow pits near West Woodbridge Road and SR 12, known as I-5 Ponds 6, 7, and 8 (Figure 7-2). The proposed design at these sites would reconfigure the three ponds to develop compensatory habitat to mitigate project impacts on giant garter snake and other species. The approximate total of created or enhanced habitat is 181.49 acres for Pond 6, and 161.25 acres for Ponds 7 and 8. The following general sequence of anticipated construction activities for all three sites includes: (1) weed control; (2) wildlife protection; (3) site preparation; (4) earthmoving; (5) planting and seeding; (6) access improvements; (7) optional water control structures; and (8) culvert improvements.

The mitigation sites would be built out over a period of several years, with construction beginning once relevant permits and approvals have been acquired for the project. Each parcel would require approximately one construction season for initial establishment; however, the timing could overlap so various parcels would undergo restoration simultaneously. Construction would likely occur over a period of 2 to 4 years. Pond 6 would most likely be built first due to the abundance of upland habitat that could be created. Construction would likely occur on the Pond 7 site before the Pond 8 site given the site access constraints for Pond 8. Note that initial ground-disturbance activities would be conducted during the giant garter snake active season (May 1 to October 1) to minimize potential impacts on giant garter snake. Like the

Bouldin Island sites, the I-5 Pond sites would be protected in perpetuity under a conservation easement.

#### **6.4.3 Mitigation Credits and Site Protection Instruments**

The second approach of the CMP is to obtain credits from approved mitigation/conservation banks or to develop site protection instruments to meet mitigation needs for certain natural community types, including some types of wetlands and other waters, and for species.

##### *Mitigation Credits from Approved Banks*

The final amount of mitigation credits to be secured for aquatic resources and species habitats will be determined during the construction phase of the project, as preconstruction surveys have the potential to reduce mitigation needs. On-the-ground land cover surveys and presence/absence surveys will inform more precise impact calculations and may reduce the final mitigation articulated in Table 3B.S-1. Estimated Permanent Habitat Loss with the Proposed Action and Corresponding Mitigation Commitments for Special-Status Species in Appendix 3B. In some instances, reduced impact calculations may not result in changes to restoration design and implementation. However, as described in Section 3B.S.2 of Appendix 3B, mitigation implementation will stay ahead of the cumulative, permanent suitable habitat loss by 10%.

##### *Site Protection Instruments*

Another approach to provide on- or off-site mitigation is to use real estate protection instruments and other site protection instruments to ensure the long-term protection of a mitigation site. Examples include conservation easements, deed restrictions, transfer of title, or other documents such as Conservation Land Use Agreements. The site protection instrument would describe site ownership, management (e.g., vegetation or pest control, crop type requirements, water provisions for wildlife), and enforcement of any use restrictions (e.g., pesticide restrictions). Once the site protection instrument is drafted, DWR will share it with the appropriate agencies.

#### **6.4.4 Tidal Habitat Mitigation Framework**

Appendix 3B of the BA describes the general approach to identify and construct mitigation sites for channel margin and tidal wetland habitats as referenced in the 2024 LTO BiOp. As this will be fully analyzed in a subsequent consultation, please refer to the Appendix 3B for the description of these elements.

### **7. DESCRIPTION OF THE ACTION AREA**

The Action Area is defined in 50 CFR § 402.02, as “all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action.” The Action Area for this BiOp is based on the PA elements described in the *Description of the Proposed Action* (and as described in the BA), including some for which exact locations and extent of the effects are not yet known. These components are addressed both standard and programmatically and will either rely on existing consultations or be subject to subsequent consultation or

reinitiation. Please note, the BA used a Study Area that is not the same as the Action Area and, at times, used the terms interchangeably. The Action Area identified in the main BA is much smaller than the Study Area and consists of the aquatic and terrestrial habitats within the footprint of the proposed facilities, which include the intakes in the north Delta, tunnel shafts, access roads, park-and-ride lots, and facilities associated with the proposed Bethany Complex, and Bouldin Island and I-5 Ponds initial mitigation sites. See Figures 7-1 and 7-2 for the general footprints for the DCP and initial mitigation sites.

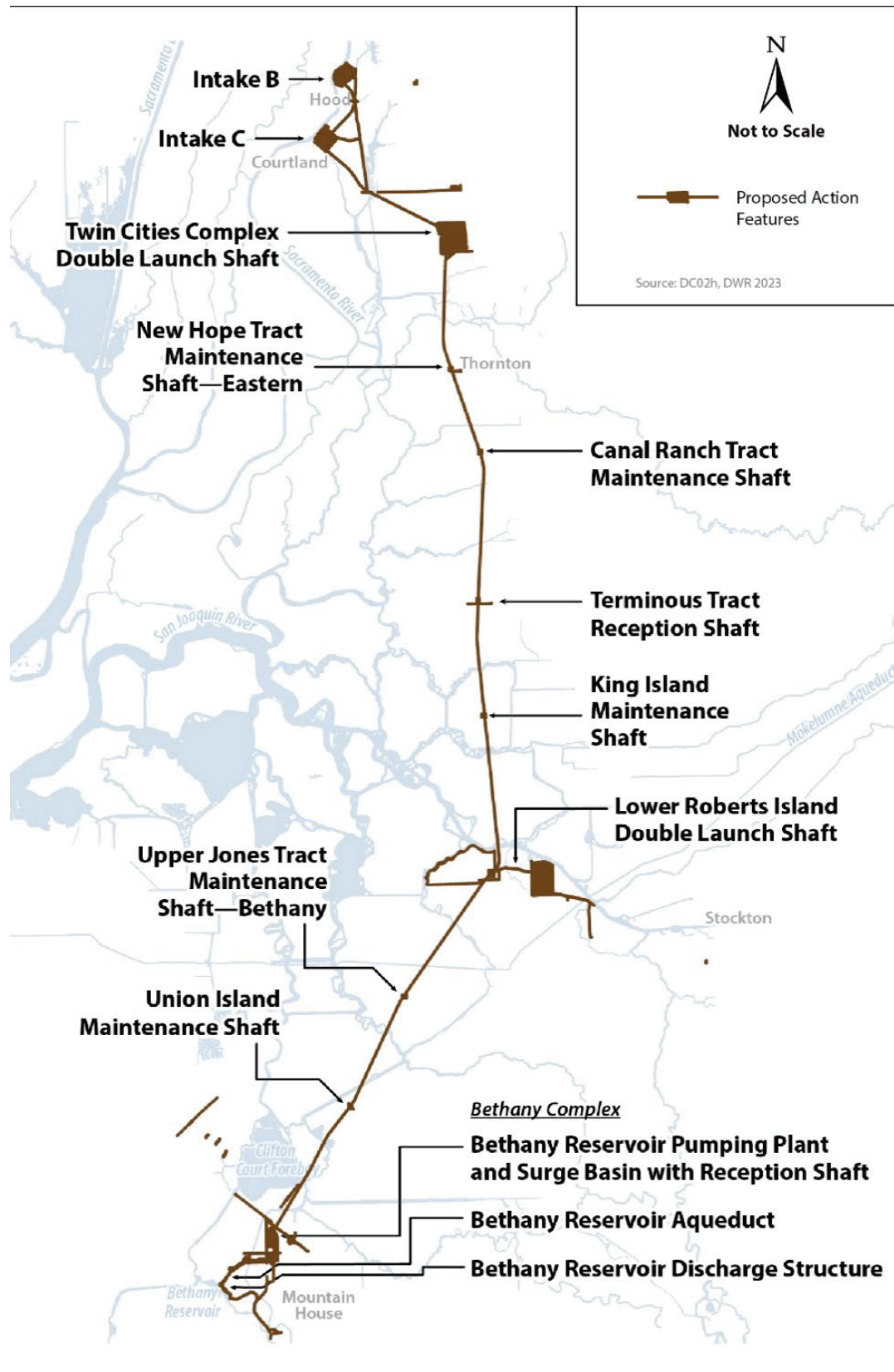


Figure 7-1. BA Figure 3.1-1 Bethany Reservoir Alignment Map



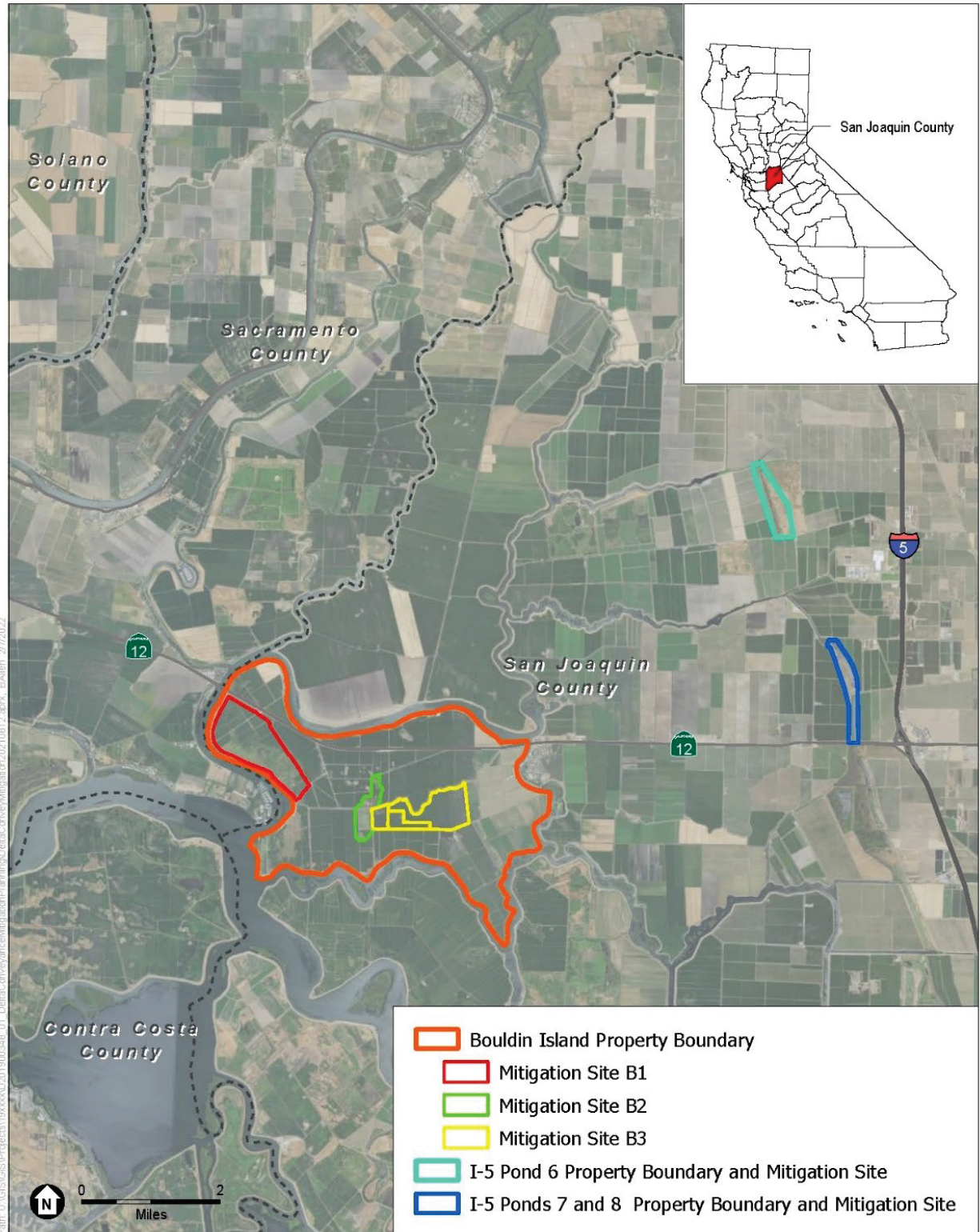


Figure 7-2. BA Figure 3B-1. Mitigation Site Locations



## 8. ANALYTICAL FRAMEWORK FOR THE JEOPARDY DETERMINATION

Section 7(a)(2) of the Act requires that Federal agencies ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of listed species. “Jeopardize the continued existence of” means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR § 402.02).

The jeopardy analysis in this BiOp considers the effects of the proposed Federal action, and any cumulative effects, on the range-wide survival and recovery of the listed species. It relies on four components: (1) the *Status of the Species*, which describes the current range-wide condition of the species, the factors responsible for that condition, and its survival and recovery needs; (2) the *Environmental Baseline*, which analyzes the current condition of the species in the Action Area without the consequences to the listed species caused by the PA, the factors responsible for that condition, and the relationship of the Action Area to the survival and recovery of the species; (3) the *Effects of the Action*, which includes all consequences that are caused by the proposed federal action, including the consequences of other activities that are caused by the PA but that are not part of the action; and (4) the *Cumulative Effects*, which evaluates the effects of future, non-federal activities in the Action Area on the species. The *Effects of the Action* and *Cumulative Effects* are added to the *Environmental Baseline* and in light of the status of the species, the Service formulates its opinion as to whether the PA is likely to jeopardize the continued existence of listed species.

## 9. ANALYTICAL FRAMEWORK FOR THE ADVERSE MODIFICATION DETERMINATION

Section 7(a)(2) of the Act requires that Federal agencies ensure that any action they authorize, fund, or carry out is not likely to destroy or to adversely modify designated critical habitat. “Destruction or adverse modification” means a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species (50 CFR 402.02).

The adverse modification analysis in this BiOp relies on four components: (1) the *Status of Critical Habitat*, which describes the current range-wide condition of the critical habitat in terms of the key components (i.e., essential habitat features, primary constituent elements, or physical and biological features) that provide for the conservation of the listed species, the factors responsible for that condition, and the intended value of the critical habitat overall for the conservation/recovery of the listed species; (2) the *Environmental Baseline*, which analyzes the current condition of the critical habitat in the Action Area without the consequences to designated critical habitat caused by the PA, the factors responsible for that condition, and the value of the critical habitat in the Action Area for the conservation/recovery of the listed species; (3) the *Effects of the Action*, which determines all consequences to designated critical habitat that are caused by the proposed federal action, including the consequences of other activities that are caused by the PA but that are not part of the action, on the key components of critical habitat that provide for the conservation of the listed species, and how those impacts are likely to influence

the conservation value of the affected critical habitat; and (4) *Cumulative Effects*, which evaluate the effects of future non-federal activities that are reasonably certain to occur in the Action Area on the key components of critical habitat that provide for the conservation of the listed species and how those impacts are likely to influence the conservation value of the affected critical habitat. The *Effects of the Action* and *Cumulative Effects* are added to the *Environmental Baseline* and in light of the status of critical habitat, the Service formulates its opinion as to whether the action is likely to destroy or adversely modify designated critical habitat. The Service's opinion evaluates whether the action is likely to impair or preclude the capacity of critical habitat in the Action Area to serve its intended conservation function to an extent that appreciably diminishes the rangewide value of critical habitat for the conservation of the listed species. The key to making that finding is understanding the value (i.e., the role) of the critical habitat in the Action Area for the conservation/recovery of the listed species based on the *Environmental Baseline* analysis.

## **10. STATUS OF THE SPECIES AND CRITICAL HABITAT**

### **10.1 San Joaquin Kit Fox**

The Service listed the San Joaquin kit fox on March 11, 1967 as endangered under the Endangered Species Preservation Act (Service 1967; [https://www.fws.gov/sites/default/files/federal\\_register\\_document/FR-1967-03-11.pdf](https://www.fws.gov/sites/default/files/federal_register_document/FR-1967-03-11.pdf)). Critical habitat has not been designated for this species. The species recovery strategy is described in the *Recovery Plan for Upland Species of the San Joaquin Valley, California*, along with 33 additional species of plants and animals that occur in the region (Service 1998). Please refer to the *Species Status Assessment Report for the San Joaquin Kit Fox (Vulpes macrotis mutica) Version 1.0 (SSA)* (Service 2020a) for the current status of the species. No change in the species' listing status was recommended in the Service's most recent 5-year review (Service 2025a). Threats evaluated during that review and previous reviews have continued to act on the species since the review was published.

### **10.2 Least Bell's Vireo**

The Service listed the least Bell's vireo as endangered on May 2, 1986 (Service 1986). Critical habitat was designated for least Bell's vireo on February 2, 1994, consisting of ten units across Santa Barbara, Ventura, Riverside, and San Diego counties (Service 1994a). Critical habitat does not occur within the Action Area; therefore, it will not be addressed further in this consultation. A Draft Recovery Plan was printed and distributed within and outside of the Service on May 6, 1998 (Service 1998b). This plan was never finalized and remains in draft form. A 5-year review was conducted in 2006 where a downlist to threatened status was recommended (Service 2006a). Please refer to the 2006 5-year review for the species description, life history, distribution, and habitat use.

### **10.3 Western Yellow-Billed Cuckoo**

The Service listed the western distinct population segment (DPS) of the yellow-billed cuckoo (*Coccyzus americanus*) as threatened on October 3, 2014 (Service 2014). Critical habitat was

designated on April 21, 2021 (Service 2021) but does not occur in the Action Area. On September 16, 2020, the Service announced a 12-month finding on a petition to delist the western yellow-billed cuckoo DPS and concluded that delisting was not warranted at that time (Service 2020b). The information in the 12-month finding served as the 5-year review for the species and no change to the listing status was made. There is currently no Recovery Plan available for this species. Please refer to the Service's 2014 listing document for the species description, life history, distribution, and habitat use.

#### **10.4 California Red-Legged Frog and Critical Habitat**

##### *California Red-Legged Frog*

The Service listed the California red-legged frog (*Rana draytonii*) as threatened on May 23, 1996 (Service 1996) and designated critical habitat on May 17, 2010 (Service 2010). A recovery plan for the species was finalized on September 12, 2002 (Service 2002). For the most recent comprehensive assessment of the range-wide status for the California red-legged frog, please refer to the *California Red-Legged Frog 5-Year Review* (Service 2022; [https://ecos.fws.gov/docs/tess/species\\_nonpublish/4021.pdf](https://ecos.fws.gov/docs/tess/species_nonpublish/4021.pdf)). No change in the listing status for the species was recommended in the 5-year review. Threats evaluated during that review and discussed in the final document have continued to act on the species since the December 2022 5-year review was finalized, with habitat loss and fragmentation, isolation of populations south of Santa Barbara County and in the Sierra Nevada, invasive predators, and climate change being the most significant effects.

##### *California Red-Legged Frog Critical Habitat*

The Service designated critical habitat for the California red-legged frog on April 13, 2006 (Service 2006b) and a revised designation to the critical habitat was published on March 17, 2010 (Service 2010). The PCEs defined for the California red-legged frog are: (1) aquatic breeding habitat; (2) aquatic non-breeding habitat; (3) upland habitat; and (4) dispersal habitat. The final revised critical habitat designation encompasses those areas containing the PCEs that are necessary to support one or more of the species' life history functions and that are laid out in the appropriate quantity and spatial arrangement essential to the conservation of the species. Because not all life-history functions require all the PCEs, not all areas designated as critical habitat will contain all the PCEs. Refer to the final designation of critical habitat for California red-legged frog for additional information (Service 2010).

#### **10.5 California Tiger Salamander**

The Service listed the Central California DPS of the California tiger salamander as threatened on August 4, 2004 (Service 2004). Critical habitat was designated in 2005; however, there is no designated critical habitat in the action area for the PA and will not be discussed further. The Service completed a recovery plan for the species on June 6, 2017 (Service 2017a). For the most recent comprehensive assessment of the range-wide status of the California tiger salamander, please refer to the California Tiger Salamander Central California Distinct Population Segment (*Ambystoma californiense*) 5-Year Review: Summary and Evaluation (Service 2023b). Threats

discussed in the final document have continued to act on the species, with loss of habitat being the most significant effect.

## 10.6 Giant Garter Snake

The Service listed the giant garter snake as a threatened species on October 20, 1993 (Service 1993). Critical habitat has not been designated for this species. A Draft Recovery Plan was proposed for the snake on July 2, 1999 (Service 1999) and published as the *Revised Draft Recovery Plan for the Giant Garter Snake* (Service 2015). A 5-year review was conducted in 2006 where no change of status was recommended (Service 2006c). Another 5-year review was conducted in 2012 where no change of status was recommended (Service 2012) and the most recent 5-year review was completed in June 2020 where again no change in status was recommended (Service 2020c). In 2017, the Service issued the final *Recovery Plan for the Giant Garter Snake (Thamnophis gigas)* (Service 2017c) ([https://ecos.fws.gov/docs/recovery\\_plan/20170928\\_Signed%20Final\\_GGS\\_Recovery\\_Plan.pdf](https://ecos.fws.gov/docs/recovery_plan/20170928_Signed%20Final_GGS_Recovery_Plan.pdf)). Please refer to the 2017 Recovery Plan for the species' description, habitat preference, and life history and the most recent 5-year review for the most recent status assessment.

## 10.7 Delta Smelt and Critical Habitat

### *Delta Smelt*

The Service listed the delta smelt as threatened on March 5, 1993 (Service 1993) and designated critical habitat for the species on December 19, 1994 (Service 1994b). The delta smelt was one of eight fish species addressed in the *Recovery Plan for the Sacramento–San Joaquin Delta Native Fishes* (Service 1996). A 5-year status review of the delta smelt was completed on March 31, 2004 (Service 2004). The review concluded that delta smelt remained a threatened species. A subsequent 5-year status review recommended uplisting delta smelt from threatened to endangered (Service 2010a). A 12-month finding on a petition to reclassify the delta smelt as an endangered species was completed on April 7, 2010 (Service 2010b). After reviewing all available scientific and commercial information, the Service determined that re-classifying the delta smelt from a threatened to an endangered species was warranted but precluded by other higher priority listing actions (Service 2010c). The Service reviews the status and uplisting recommendation for delta smelt during its Candidate Notice of Review (CNOR) process. Each year it has been published, the CNOR has recommended the uplisting from threatened to endangered. Electronic copies of these documents are available at <https://ecos.fws.gov/ecp/species/321>. Please refer to the 2022 delta smelt Species Assessment and Listing Priority Assignment Form of the CNOR for the status of the species. Electronic copies of this document are available at [https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public\\_docs/publication/4119.pdf](https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/publication/4119.pdf) (Service 2023c).

The delta smelt is predominantly an annual fish meaning most individuals live about one year and die shortly after spawning in the late winter and spring. The Service now considers delta smelt a conservation-reliant species existing as an integrated hatchery-wild population (*Delta Smelt Supplementation Strategy Update* Service 2025b). For the past five years, most individuals

have completed a large majority of their life cycle in captivity at UC Davis' Fish Conservation and Culture Laboratory (FCCL; Lindberg *et al.* 2013). Most of the captive-reared individuals have been released back into the Delta after reaching an age of 200-300 days post hatch. The actual numbers of fish released in each of the past five years was 55,733 in Water Year (WY) 2022, 43,940 in WY2023, 91,468 in WY2024, and 124,946 in WY2025 and 163,349 in WY2026 (Service unpublished). Several thousand adult fish are retained at FCCL to be used as broodstock for the next year's production and a subset of these fish is held as a back-up refuge population at the Service's Livingston Stone National Fish Hatchery. Each year, a few released individuals have spawned in the wild to produce wild-born offspring. A few of those appear to have survived each year. For each of the previous five years, the number of captive-bred fish released into the Delta is believed to have been much higher than the number of wild-born fish that survived to adulthood.

### *Delta Smelt Critical Habitat*

The Service designated critical habitat for the delta smelt on December 19, 1994 (Service 1994b). The geographic area encompassed by the designation includes all water and all submerged lands below ordinary high water and the entire water column bounded by and contained in Suisun Bay (including the contiguous Grizzly and Honker Bays); the length of Goodyear, Suisun, Cutoff, First Mallard (Spring Branch), and Montezuma sloughs; and the existing contiguous waters contained within the legal Delta (as defined in section 12220 of the California Water Code) (Service 1994b).

### *Conservation Role of Delta Smelt Critical Habitat*

The Service's primary objective in designating critical habitat was to identify the key components of delta smelt habitat that support successful completion of the life cycle, including spawning, larval and juvenile transport, rearing, and adult migration back to spawning sites. Delta smelt are endemic to the Bay-Delta and the vast majority of wild-born individuals only live one year. Thus, regardless of annual hydrology, the Bay-Delta estuary must provide suitable habitat all year, every year but as detailed in the 2024 LTO BiOp and identified in the 2022 delta smelt Species Assessment and Listing Priority Assignment Form of the CNOR it no longer does (Service 2023c). The primary constituent elements (PCEs) considered essential to the conservation of the delta smelt as they were characterized in 1994 are physical habitat, water, river flow, and salinity concentrations required to maintain delta smelt habitat for spawning, larval and juvenile transport, rearing, and adult migration (Service 1994b). Please refer to the 2022 delta smelt Species Assessment and Listing Priority Assignment Form of the CNOR for the status of the PCEs at [https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public\\_docs/publication/4119.pdf](https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/publication/4119.pdf) (Service 2023c).

## **10.8 Longfin Smelt**

The Service listed the longfin smelt DPS as endangered on July 30, 2024 (Service 2024a). For the comprehensive assessment of the longfin smelt DPS, please refer to the listing rule at <https://www.govinfo.gov/content/pkg/FR-2024-07-30/pdf/2024-16380.pdf#page=1> and the Species Status Assessment for the San Francisco Bay-Delta Distinct Population Segment of the



Longfin Smelt at <https://ecos.fws.gov/ServCat/DownloadFile/253023> (Service 2024b). Critical habitat was proposed on January 15, 2025 (Service 2025c; <https://www.govinfo.gov/content/pkg/FR-2025-01-15/pdf/2024-29641.pdf#page=1>) but does not occur in the Action Area.

### 10.9 Valley Elderberry Longhorn Beetle

The valley elderberry longhorn beetle was listed as threatened throughout its range and critical habitat was designated on August 8, 1980 (Service 1980). Critical habitat for the valley elderberry longhorn beetle does not occur within the Action Area; therefore, it will not be addressed further in this biological opinion. The most recent recovery plan was published on October 4, 2019 (Service 2019). For the most recent comprehensive assessment of the range-wide status of the valley elderberry longhorn beetle, please refer to the species' 2023, *5-Year Review* (Service 2023a). Primary threats discussed in the 5-year review include destruction, modification, and curtailment of the insect's habitat or range, climate change, invasive plant species, ant predation, drought, and fires.

### 10.10 Vernal Pool Fairy Shrimp, Vernal Pool Tadpole Shrimp, and Vernal Pool Fairy Shrimp Critical Habitat

#### *Vernal Pool Fairy Shrimp and Vernal Pool Tadpole Shrimp*

The Service listed the vernal pool fairy shrimp and vernal pool tadpole shrimp as threatened species on September 19, 1994 (Service 1994c) and revised critical habitat was designated on February 10, 2006 (Service 2006d). The status of the vernal pool fairy shrimp and vernal pool tadpole shrimp have been assessed in the *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (Service 2005) (Recovery Plan) and 5-year reviews. For the most recent comprehensive assessment of the range-wide status of the vernal pool fairy and tadpole shrimp, please refer to the *Vernal Pool Fairy Shrimp (Branchinecta lynchi) Vernal Pool Tadpole Shrimp (Lepidurus packardii) Conservancy Fairy Shrimp (Branchinecta conservatio) 5-Year Review: Summary and Evaluation* (Service 2024c). Threats discussed in the original listing have continued to act on the species, with loss of habitat being the most significant effect.

#### *Vernal Pool Fairy Shrimp Critical Habitat*

The Service designated critical habitat for 4 vernal pool crustaceans, including vernal pool fairy shrimp, and 11 vernal pool plants in 34 counties in California and 1 county in southern Oregon in a final rule of August 11, 2005, and subsequently published species-specific critical habitat unit descriptions and maps on February 10, 2006 (Service 2006d).

The primary constituent elements of critical habitat for vernal pool fairy shrimp are the habitat components that provide: (1) Topographic features characterized by mounds and swales and depressions within a matrix of surrounding uplands that result in complexes of continuously, or intermittently, flowing surface water in the swales connecting the pools, providing for dispersal and promoting hydroperiods of adequate length in the pools; (2) depressional features including isolated vernal pools with underlying restrictive soil layers that become inundated during winter



rains and that continuously hold water for a minimum of 18 days, in all but the driest years; thereby providing adequate water for incubation, maturation, and reproduction. As these features are inundated on a seasonal basis, they do not promote the development of obligate wetland vegetation habitats typical of permanently flooded emergent wetlands; (3) sources of food, expected to be detritus occurring in the pools, contributed by overland flow from the pools' watershed, or the results of biological processes within the pools themselves, such as single-celled bacteria, algae, and dead organic matter, to provide for feeding; and (4) structure within the pools consisting of organic and inorganic materials, such as living and dead plants from plant species adapted to seasonally inundated environments, rocks, and other inorganic debris that may be washed, blown, or otherwise transported into the pools, that provide shelter.

### 10.11 Northwestern Pond Turtle

The Service proposed to list the northwestern pond turtle as a threatened species on October 3, 2023 with a section 4(d) rule (Service 2023d). The proposed listing can be found at [2023-21685.pdf](#). At this time, a final listing determination has not been issued. Critical habitat has not yet been proposed and no recovery plan has been developed for the northwestern pond turtle. In April 2023, the Service published a species status assessment report for northwestern pond turtle and southwestern pond turtle. Please refer to the 2023 species status assessment (Service 2023e) and the listing proposal for a comprehensive assessment of the species' range-wide status, life history, and habitat preferences.

### 10.12 Western Spadefoot

In 2005, the Service issued the *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (Service 2005) which included western spadefoot as a species of concern. This recovery plan was for multiple plant and animal species, using an ecosystem-level approach because many of the listed species and species of concern co-occur in the same natural ecosystem and share the same threats. The Service proposed to list both the northern and southern DPSs of the western spadefoot as threatened on December 4, 2023 (Service 2023f). For a current and comprehensive assessment of the northern DPS of the western spadefoot, please refer to the proposed listing rule at <https://www.govinfo.gov/content/pkg/FR-2023-12-05/pdf/2023-26579.pdf#page=1> and the *Species Status Assessment Report for Western Spadefoot (Spea hammondi)* Version 1.1 at <https://iris.fws.gov/APPS/ServCat/DownloadFile/238764> (Service 2023g).

### 10.13 Monarch Butterfly

The Service proposed to list the monarch butterfly as threatened and designate critical habitat on December 12, 2024 (Service 2024d). For a comprehensive assessment of the monarch butterfly, please refer to the proposed listing rule at <https://www.govinfo.gov/content/pkg/FR-2024-12-12/pdf/2024-28855.pdf#page=1> and the *Monarch Butterfly (Danaus plexippus) Species Status Assessment Report, Version 2.3* at <https://iris.fws.gov/APPS/ServCat/DownloadFile/263030> (Service 2024d).

## 11. ENVIRONMENTAL BASELINE

*Environmental Baseline* refers to the condition of the listed species or its designated critical habitat in the Action Area, without the consequences to the listed species or designated critical habitat caused by the PA. The environmental baseline includes the past and present impacts of all federal, State, or private actions and other human activities in the Action Area, the anticipated impacts of all proposed federal projects in the Action Area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. The impacts to listed species or designated critical habitat from ongoing federal agency activities or existing federal agency facilities that are not within the agency's discretion to modify are part of the *Environmental Baseline*.

### 11.1 General Environmental Conditions

#### 11.1.1 Intakes and Aquatic Delta within the Action Area

The leveed, channelized reaches of the Sacramento River near the proposed north Delta intakes primarily function as a listed fish migration corridor. The physical and biological features of migration and rearing habitat for listed fish species have been degraded from historical conditions. The temporary and permanent footprints of the intake facilities are characterized by steep, riprap-armored levee slopes with low quantities of overhanging and instream woody cover. Vegetation densities are low and much of the levee slope is unshaded. Shallow water is limited to a narrow band along the steep levee slope and there is no off-channel or floodplain habitat.

The Interagency Ecological Program (IEP) conducts various aquatic monitoring and research studies in the Delta. The Service has issued several consultations/amendments over the lifetime of the program including the most recent one in 2024 for the longfin smelt DPS (Service file numbers: 2024-0052290-S7-001, 1-1-98-F-1296, 1-1-96-F-91, 1-1-95-FW-38). Some studies like the Georgiana Slough Salmonid Migratory Barrier Project have separate consultations (Service file number: 2022-0012599-S7-001).

#### 11.1.2 Bethany Complex

The Bethany Conservation Easement area is part of multi-agency mitigation requirements for the South Bay Aqueduct Improvement and Enlargement Project (Service file numbers: 1-1-05-F-0028, 1-1-06-F-0129, 81420-2008-F-1422-2) managed for wetlands, San Joaquin kit foxes, California red-legged frogs, California tiger salamanders, and burrowing owls (*Athene cunicularia*).

In addition to the conservation easement on the Bethany parcel that is being impacted, other protected habitats occur within and adjacent to the Action Area. The Mountain House Conservation Bank, just north of the Bethany Reservoir, was established on July 24, 2012, for the purpose of preserving habitat for several State and/or federally listed species. The federally listed species include the California tiger salamander, San Joaquin kit fox, California red-legged frog, and vernal pool fairy shrimp. North of the Mountain House Conservation Bank is the sold-out Byron Conservation Bank that had State credits for the California tiger salamanders, San

Joaquin kit foxes, and California red-legged frogs. Figure 11.2-3 illustrates the Bethany Complex and the conservation easement areas.

In 2015 and 2020 the Service issued a biological opinion and reinitiated biological opinion for DWR's Bethany Dams Improvements Project (Service file numbers: 08ESMF00-2014-F-0664 and 08ESMF00-2014-F-0664-R001). DWR compensated for effects by purchasing credits at Mountain House Conservation Bank. In 2017, the Service issued a biological opinion on DWR's Bethany Dam Sediment Removal Project (Service file number: 08ESMF00-2017-F-0115).



**Figure 11.2-3. Bethany Reservoir Aqueduct Route with Tunnel Reaches (Figure 3.2-8 in BA)**

### **11.1.3 Bouldin Island**

Bouldin Island, owned by the Metropolitan Water District of Southern California, is an approximately 5,900-acre island that is bounded to the north by the South Mokelumne River, to the east by Little Potato Slough, to the south by Potato Slough, and to the west by the Mokelumne and San Joaquin Rivers. SR 12 crosses the northern part of Bouldin Island. A swing bridge over the Mokelumne River on SR 12 connects the northwestern part of the island to Andrus Island. Near the northeastern tip of Bouldin Island, a high-level bridge on SR 12 spans Little Potato Slough, connecting the island to the small community of Terminous. Currently the island consists of roughly 98% farmland with the remaining 2% being wetlands, riparian, or open water habitat. Site elevations on Bouldin Island range from -24 feet NAVD 88 to 19 feet NAVD 88, with an average elevation of -13 feet NAVD 88. Current land use is predominately agricultural, including corn, alfalfa, and row crops. The land is leased to farmers for this production, with primary farming activities taking place between March and November of each

year. Fields are typically flooded in the winter months for soil management, weed control, stubble decomposition, and duck hunting.

Mitigation Site B1 is located near the northwest corner of the island, just south of SR 12. The site is currently dominated by agricultural fields (primarily row crops) as well as seasonal wetlands within the farmed fields. Ditches and maintenance roads are also present. It is bounded by the perimeter levee to the west, SR 12 to the north, and irrigation ditches to the south and east. Mitigation Site B2 and Mitigation Site B3 are near the center of the island. Mitigation Site B2 contains a mixture of agricultural fields, patches of valley/foothill riparian habitat, and open water (remnants of a borrow pit). Mitigation Site B3 includes agricultural fields and roads.

#### **11.1.4 I-5 Ponds**

DWR owns three rectangular former borrow pits near West Woodbridge Road and SR 12, known as I-5 Ponds 6, 7, and 8. They are located within the White Slough Wildlife Area and within 2 miles of Woodbridge Ecological Reserve. The three ponds, totaling approximately 345 acres, were excavated between 1974 and 1978 to provide fill for freeway construction. Currently, all three ponds are managed under an interagency agreement with CDFW as Class C wildlife areas that are open to the public for hunting and fishing. The borrow pits are fed by groundwater and via periodic overland flow from precipitation, irrigation runoff, and high canal flows, creating three perennial ponds characterized by deep open water, steep vegetated banks, and relatively flat adjacent uplands.

### **11.2 Species**

Due to access issues, DWR did not conduct on-the-ground habitat assessments for the BA but instead developed habitat suitability models primarily using land cover data from existing geographic information system (GIS) data sources. The species models likely include habitat that may not be suitable or is unoccupied, they provide a conservative estimate of potentially suitable habitat.

#### **11.2.1 San Joaquin Kit Fox**

Within the Action Area, the range of the species is limited to areas of suitable habitat generally around Bethany Reservoir. There are 55.90 acres of modeled habitat that overlap with the project footprint, 55.63 acres of which are modeled low-quality habitat, 0.08 acre of which is modeled moderate-quality habitat, and 0.19 acre of which is modeled high-quality habitat.

Bethany Reservoir is part of the Livermore analysis unit and is noted to be in very low condition as showing “no evidence of a current population” and having records that are over 10 years old (Service 2020a). There are historical CNDDDB occurrences that overlap with the Action Area (CDFW 2025). These occurrences are generally to the west of Clifton Court Forebay and consist of observations that range from 1972 to 2000. Some observations consist of observed tracks and others consist of adult and juvenile observations. The most recent occurrence from 2000 (#34) consists of an observation of dens (not adults), hearing a “yip,” and frequent observations by Western Area Power Authority employees (CDFW 2025). A non-CNDDDB verified 2015



observation was reported in the *Tracy Hills Habitat Conservation Plan* (ICF 2020) in the California Aqueduct right-of-way. The BA notes surveys and monitoring conducted between 2009 and 2017, and again in 2021, to the east and west of Bethany Reservoir, which included den surveys and trail camera use, did not detect San Joaquin kit fox in these areas (California Department of Water Resources 2021; Environmental Science Associates 2017 as cited in the BA). Based on this information, there is low potential for San Joaquin kit fox to be present in the Action Area. However, because the Action Area maintains some connectivity with the region south of San Luis Reservoir where San Joaquin kit fox persist, it is assumed that there remains some potential for dispersing individuals to occur in the Action Area, and permanent protection of suitable San Joaquin kit fox habitat, such as the Bethany Conservation Easement and Mountain House Conservation Bank, occurs within the Action Area.

### 11.2.2 Least Bell's Vireo

In recent years, there have been a number of observations of adult least Bell's vireos and nesting activity in central and northern California, indicating the species is attempting to recolonize the Central Valley. Additionally, recent modeling of habitat suitability suggests that parts of the Central Valley are highly suitable for least Bell's vireos (Klicka *et al.* 2016). However, the least Bell's vireo population in Central and Northern California has remained very low. Limited suitable habitat between the species' stronghold in the riparian corridors of southern California and suitable restored habitats in the Central Valley may be limiting the ability of the species to disperse and recolonize the northern extent of its historic range. Major contributing factors to the loss of riparian habitat throughout the Action Area include hydrologic regulation and decreased flows in rivers from dams, in-channel water diversions, and groundwater pumping, construction of flood control levees and bank protection, conversion of riparian zones to agriculture and grazing, timber harvest, mining, and urbanization (Katibah 1984; Dybala *et al.* 2017).

The DCP BA modeled suitable riparian habitat within the Action Area and the larger Study Area. Riparian corridors within the Action Area currently have the potential to support populations of least Bell's vireo during breeding and migration (Howell *et al.* 2010; Klicka *et al.* 2016). Least Bell's vireos rarely over-winter in California and are not anticipated to regularly occupy habitat in the Action Area between November and March. Based on recent observations of attempted and successful breeding, restored and managed riparian habitats along the San Joaquin and Sacramento Rivers are currently playing an important role in the dispersal of the species from southern California back into its historic range in the Central Valley. While the species does not have a final recovery plan, the Service has established delisting criteria, including "stable or increasing least Bell's vireo populations/metapopulations, each consisting of several hundred or more breeding pairs, having become established and are protected and managed at the following sites: Salinas River, a San Joaquin metapopulation, and a Sacramento Valley metapopulation" (Service 1998a, Service 2006a). While it is possible that a few more least Bell's vireo breeding territories are dispersed across the region than what has been reported, this delisting criterion is far from being met. The Service has not yet completed a population viability analysis (PVA) for least Bell's vireo, nor a final recovery plan. However, researchers have attempted to model the potential response of the least Bell's vireo population within the Action Area to large-scale riparian restoration. Dybala *et al.* (2017) estimated that the population of least Bell's vireos

across the Sacramento Valley, San Joaquin Valley, Tulare Basin, and Yolo Basin-Delta could increase to between 1,000 and 10,000 individuals within 10 years if 31,923 acres (12,919 hectares) of riparian habitat were restored. The researchers also predicted the species could become resilient within 100 years if 460,848 acres (186,499 hectares) were restored (Dybala *et al.* 2017). Within the Action Area, the least Bell's vireo is likely in the beginning phases of reoccupation of its Central Valley breeding habitat from which it has been extirpated since the 1970s. If existing and permitted (but not yet implemented) Federal actions to restore riparian habitat within the Central Valley are successful in creating and maintaining suitable habitat for the least Bell's vireo, the Service expects the species' numbers to increase in the Action Area.

### **11.2.3 Western Yellow-Billed Cuckoo**

The western yellow-billed cuckoo is known to have been historically common in riparian habitat throughout the Central Valley, from Kern County north to Redding (Laymon 1998). While the species has been detected in watersheds near the Action Area, only the Sacramento River Valley is believed to currently sustain breeding populations at isolated sites along the Sacramento River and Sutter Bypass between Red Bluff and Colusa (Laymon and Halterman 1989; Laymon 1998; Halterman 2001; Hammond 2011; Dettling 2014; Stanek 2014; Parametrix Inc. and Southern Sierra Research Station 2015).

The DCP BA contains a description of modeled suitable habitat within the Action Area and the larger Study Area. Most of the riparian habitat in the Action Area tends to be more narrow and linear than in the mainstem Sacramento River between Red Bluff and Colusa where the cuckoo is more frequently detected and where breeding/nesting typically occurs. Based on sightings in and around the proposed Action Area, cuckoos likely use locations throughout the Action Area as stop-over habitat for feeding, resting, and sheltering during their migration from Mexico to the Upper Sacramento River. As suitable nesting habitat exists, it is possible for cuckoos to breed and nest in the Action Area; however, the cuckoo is not known to actively use habitat within the Action Area for nesting.

### **11.2.4 California Red-Legged Frog and Critical Habitat**

#### *California Red-Legged Frog*

Within the Action Area, the range of the species is limited to areas of suitable habitat generally around Clifton Court Forebay and Bethany Reservoir and is within the South and East San Francisco Bay Recovery Unit. Bethany Reservoir in the East San Francisco Bay Core Area of the larger recovery unit. There are multiple occurrences in this region, including extant populations in and adjacent to Italian Slough, Byron-Bethany Irrigation District Canal, and along the northeast border of Bethany Reservoir (CDFW 2020). Byron Highway, which runs northwest to southeast along the southwest border of Clifton Court Forebay, is considered a somewhat permeable barrier to California red-legged frog movement. Also, habitat quality is assumed to decrease west to east, between Bethany Reservoir and Clifton Court Forebay, as the density of artificial water conveyance infrastructure and agricultural land cover types increase, and occurrences decrease. The DCP BA includes modeled 148 acres of aquatic, 668 acres of upland, and 21,580 acres of their defined dispersal habitat within this area.



*California Red-Legged Frog Critical Habitat*

The Bethany Reservoir Aqueduct, Bethany Reservoir Discharge Structure, access road to the Bethany Reservoir Discharge Structure, and underground SCADA fiber routes overlap with critical habitat unit CCS-2B for California red-legged frog. There are over 1.6 million acres of designated critical habitat for California red-legged frog, and approximately 44,470 acres of critical habitat in Unit CCS-2B. Unit CCS-2B contains PCEs 1-4.

**11.2.5 California Tiger Salamander**

Within the Action Area, the range of the species is limited to areas of suitable habitat generally around Clifton Court Forebay and Bethany Reservoir. The DCP BA modeled suitable habitat within the Action Area and the larger Study Area. The DCP footprint overlaps with modeled habitat in the southwestern part of the Action Area, west, south, and southwest of Clifton Court Forebay, where there are known, extant California tiger salamander CNDDDB occurrences in the Central Valley Recovery Unit (CDFW 2020; Service 2017a).

**11.2.6 Giant Garter Snake**

The Action Area includes the sub-population in the Delta Basin Population and Recovery Unit as defined in the Recovery Plan for Giant Garter Snake (Service 2017c). The Delta Basin includes portions of Sacramento, Yolo, Solano, Contra Costa, and San Joaquin counties. A large portion of the Sacramento-San Joaquin Delta area has not been comprehensively surveyed for the giant garter snake, primarily because the majority of land is privately owned. There are numerous CNDDDB records of giant garter snakes throughout the Action Area (CDFW 2025). The population status of giant garter snakes in the Delta is relatively undetermined and likely underestimated because sightings are sporadic in time and distance. The DCP BA includes a description of modeled suitable habitat within the Action Area and the larger Study Area.

Habitat has also been preserved, created, or restored in the Action Area. Projects such as the Sherman Island Whale's Mouth Wetland Restoration Project (Service File No. 08FBDT00-2014-F-0027) restored approximately 600 acres of palustrine emergent wetlands and the Twitchell Island East End Habitat Restoration Project (Service File No. 08FBDT00-2013-I-0013) restored approximately 740 acres of palustrine emergent wetlands in the western portions of the Sacramento-San Joaquin Delta. There are various section 7 consultations with biological opinions for giant garter snake that occur throughout the Action Area. Large scale habitat restoration projects such as the Prospect Island Habitat Restoration Project (Service File No. 08FBDT00-2018-F-0069) and the Lookout Slough Habitat and Restoration Project (Service File No. 08FBDT00-2020-F-0181) are in stages of converting portions of terrestrial habitat that could be utilized by giant garter snake to primarily aquatic habitats for fish species and upland habitat for giant garter snake. The Corps dredges the Sacramento and Stockton Deep Water Shipping Channels annually and deposits the dredged material into landside placement sites throughout the Delta that have or are near suitable habitat for giant garter snake (Service File Nos. 08FBDT00-2017-F-0098, 08FBDT00-2017-F-0099). Several flood protection projects such as the Twitchell Island Levee Improvement Project (08FBDT00-2015-F-0023) and the North Mokelumne River

Multi-Benefit Project (Service File No. 2024-0048110-S7-001) proposed to repair or build new levees that have or were near suitable giant garter snake habitat.

### **11.2.7 Delta Smelt and Critical Habitat**

#### *Delta Smelt*

Historically, surveys conducted within the Sacramento River reach of the proposed intake locations indicate few delta smelt were found in that vicinity. As discussed in the *Status of the Species*, delta smelt are now a conservation reliant species and have not been detected in recent surveys in this area of the Sacramento River. Since experimental releases began in December of 2021, the Service has not collected any delta smelt in the Sacramento River between the American River confluence and Isleton despite considerable sampling effort (more than 900 beach seine hauls and more than 6,400 trawl tows; Lodi Fish and Wildlife Office, unpublished data). The Service has previously concluded delta smelt used this area, but our recent information provides no evidence that they continue to do so.

There are two bridge crossings proposed: one located in Snodgrass Slough east of the river where the proposed intakes would be constructed and one in the Burns Cutoff a waterway that surrounds Rough and Ready Island in Stockton. Neither location is known to be a place delta smelt have regularly occurred in the past few decades. Occasionally, individuals may have moved through Snodgrass Slough or Burns Cutoff in the winter and spring, but delta smelt are not anticipated to be in these proposed construction sites during the June-October work windows.

As described above, existing IEP monitoring and other studies are on-going and have existing consultations. The 2024 LTO BiOp addressed effects of operations of the CVP and SWP which includes influencing the abundance and distribution of delta smelt in the Action Area as well as supplementation of cultured delta smelt to the wild.

#### *Delta Smelt Critical Habitat*

The PA is within the delta smelt's designated critical habitat and contains PCEs 1-3 described in the critical habitat designation but is outside the low salinity zone (PCE 4). The temporary and permanent footprints of the intake facilities are characterized by steep, riprap-armored levee slopes with low quantities of overhanging and instream woody cover. Shallow water habitat for spawning (PCE 1) is limited to a narrow band along the steep levee slope and there is no off-channel or floodplain habitat. During the proposed summer-fall in-water work window, PCEs 2 and 3 (water quality and river flow) conditions at the intake and bridge crossing locations vary depending on upstream dam releases, in-Delta irrigation and agricultural run-off, and aquatic vegetation.

### **11.2.8 Longfin Smelt**

Longfin smelt migrate back into the estuary from the Pacific Ocean in the fall and winter to spawn mainly during the winter months. Most spawning is now believed to take place in the

estuary's low-salinity zone which is outside the proposed construction area. Historically, surveys conducted within the Sacramento River reach and upstream of the proposed intake locations indicate few longfin smelt are found in that vicinity. The Service has previously concluded longfin smelt used this area, but our recent information provides no evidence that they currently do. Since December of 2021, the Service's Lodi Fish and Wildlife Office has not collected any longfin smelt in the Sacramento River between the American River confluence and Isleton despite considerable sampling effort (more than 900 beach seine hauls and more than 6,400 trawl tows; Service unpublished data).

There are two bridge crossings proposed: one located in Snodgrass Slough east of the river where the proposed intakes would be constructed and one in the Burns Cutoff a waterway that surrounds Rough and Ready Island in Stockton. Neither location is known to be a place longfin smelt have regularly occurred in the past few decades, though occasional individuals may have moved through Snodgrass Slough or Burns Cutoff in the winter and spring, but these species are not anticipated to be in these proposed construction sites during the June-October work windows.

As described above, existing IEP monitoring and other studies are on-going and have existing consultations. The 2024 LTO BiOp addressed effects of operations of the CVP and SWP which includes influencing the abundance and distribution of longfin smelt in the Action Area.

### **11.2.9 Valley Elderberry Longhorn Beetle**

The DCP is within the range of the valley elderberry longhorn beetle but there are no occurrences within the Action Area and very few in the larger Study Area. The current distribution of valley elderberry longhorn beetle in the Action Area is unknown. Comprehensive surveys for the species or its host plant, elderberry, have not been conducted and thus the population size and location of the species in the Action Area is unknown. Distribution is typically based on the occurrence of elderberry shrubs, which are known to occur along riparian corridors throughout the Action Area, including the Sacramento River, San Joaquin River, and along smaller natural and channelized drainages, as well as in upland habitats.

### **11.2.10 Vernal Pool Fairy Shrimp, Vernal Pool Tadpole Shrimp, and Vernal Pool Fairy Shrimp Critical Habitat**

#### *Vernal Pool Fairy Shrimp and Vernal Pool Tadpole Shrimp*

The DCP is within the range of the vernal pool fairy shrimp and vernal pool tadpole shrimp and there are occurrences within the Action Area and the larger Study Area. The Action Area overlaps with the Southeastern Sacramento Valley, San Joaquin Valley, and Livermore Vernal Pool Regions defined in the *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (Service 2005). The modeled habitat in the Livermore region overlaps with the Altamont Hills core area. Vernal pool fairy shrimp and vernal pool tadpole shrimp occur in the edges of the Action Area near Stone Lakes National Wildlife Refuge and west of Clifton Court Forebay.

### *Vernal Pool Fairy Shrimp Critical Habitat*

Designated critical habitat Unit 19B for vernal pool fairy shrimp within the Action Area is located west of Clifton Court Forebay near Byron. Unit 19B contains 4,925 acres out of the total of 597,821 total acres of designated critical habitat for vernal pool fairy shrimp. Approximately 0.57 acre of the West Tracy Fault work area overlaps with vernal pool modeled habitat that is within this unit. The BA states this area is degraded due to proximity to agricultural land use but did not specifically describe the quality of the PCEs.

#### **11.2.11 Northwestern Pond Turtle**

The entire Action Area falls within the range of northwestern pond turtle where suitable habitat exists. The Action Area overlaps with the Bay Delta and Nevada analysis unit and the San Joaquin Valley analysis unit identified in the Species Status Assessment (Service 2023e). Each of these basins includes an extant population of northwestern pond turtle. There are numerous CNDDDB records of northwestern pond turtle throughout the Action Area (CDFW 2025) and the DCP BA modeled suitable habitat within the Action Area and the larger Study Area.

#### **11.2.12 Western Spadefoot**

The DCP is within the range of the northern DPS of the western spadefoot but there are no known extant occurrences or populations within the Action Area or the larger Study Area (CDFW 2025). The Action Area overlaps with the Southeastern Sacramento Valley, San Joaquin Valley, and Livermore western spadefoot regions identified in the Species Status Assessment (Service 2023g) which mirror the vernal pool regions defined in the *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (Service 2005). The modeled habitat in the Livermore region overlaps with the Altamont Hills core area. The BA modeled western spadefoot habitat in the larger Study Area but specific to the Action Area near Hood, around the I-5 ponds, and southwest of Clifton Court Forebay and near Bethany Reservoir; however, the western spadefoot is associated with vernal pool and grassland habitat which only occurs southwest of Clifton Court Forebay and near Bethany Reservoir. The modeled habitat in BA near the PA footprint outside of these areas is likely an overestimate as most of the Delta islands were historically tidal marsh and therefore did not historically or currently support appropriate habitat for vernal pool species.

#### **11.2.13 Monarch Butterfly**

The DCP is within the range of the monarch butterfly and there are numerous occurrences within the Action Area and the larger Study Area. The area supports various species of milkweed (*Asclepias* sp.), which are potential spring and summer breeding locations, and a broad variety of flowering plants provide foraging opportunities. Areas with active agriculture or herbicide/pesticide use likely have a lower abundance of milkweed and suitable flowering plants and butterflies.

The DCP BA contains a description of modeled suitable habitat within the Action Area and the larger Study Area. Modeled habitat at Bouldin Island and the I-5 ponds consists of agricultural fields and undeveloped natural areas likely to provide low- to moderate-quality monarch habitat,

depending on agricultural activity, level of ground disturbance, amount of contiguous natural areas, and presence of seasonal floral resources.

## 12. EFFECTS OF THE PROPOSED ACTION

*Effects of the action* are all consequences to listed species or critical habitat that are caused by the PA, including the consequences of other activities that are caused by the PA but that are not part of the action. A consequence is caused by the PA if it would not occur but for the PA and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action.

Construction elements and compensatory mitigation for construction effects to terrestrial species have been analyzed and described in the BA at the site-specific level with no future Federal action required, including biological surveying and species relocations required prior to start of construction. Subsequent Federal approvals will occur for the 2024 LTO BiOp programmatic-level actions, such as listed fish species compensatory mitigation (including monitoring and adaptive management) and operations and maintenance of the DCP.

Construction of the water conveyance facility will continue for 13 years; the construction schedule includes preconstruction field investigations, habitat suitability surveys, vegetation removal and grading, facility construction, restoration of undeveloped portions of the construction footprint, and creation and enhancement of the I-5 Ponds and Bouldin Island mitigation sites. The total duration of construction work at each intake is 5.5 years.

### 12.1 San Joaquin Kit Fox

The PA will result in the permanent loss of 38.69 acres of modeled low-quality dispersal habitat, 0.06 acres of modeled moderate-quality habitat, and 0.13 acres of modeled high-quality habitat. Field investigations and construction of access roads would temporarily disturb another 16.94 acres of modeled low-quality habitat, 0.06 acre of modeled high-quality habitat, and 0.02 acre of modeled moderate-quality habitat. The permanent loss of 38.88 acres of modeled San Joaquin kit fox habitat would be offset by the purchase of Service-approved conservation bank credits at a 1:1 ratio or an undetermined site protection instrument. Reinitiation may be required if the undetermined site protection instrument results in effects not analyzed in this consultation.

While there is low potential for an individual to be present in the vicinity of the PA as described above, construction activities will occur over a long period of time increasing chances of exposure to the wide-ranging species. San Joaquin kit foxes could be attracted to the construction footprint due to the increased availability of cover (e.g., within pipes, trenches, or materials staging areas) or the increased availability of forage items such as food scraps and trash, increasing their risk of injury. San Joaquin kit foxes near the construction footprint are expected to experience disturbance resulting from increased levels of human disturbance and vehicle use and excavation of dens and burrows. These activities could displace kit foxes which will make them vulnerable to increased predation, exposure, starvation, or stress through disorientation, loss of shelter, and intraspecific and interspecific aggression. The disturbance caused by the PA resulting from construction noise, nighttime illumination, vibration, odors, and human activity



can interfere with sensory perception of kit fox, decreasing their ability to locate prey, pups, or mates, or detect approaching predators. Disturbance can induce stress which can alter normal behaviors. The resulting effects can lead to increased energetic requirements, decreased reproductive success and immunological functions, altered temporal or spatial use patterns, displacement, and in some cases death. Responses to external stresses vary among individuals, causing some animals to be more affected than others; however, it is unknown whether disturbance results in reduced local abundance. While kit fox could also be injured or killed by construction vehicles, the proposed vehicle speed limits are likely to avoid collisions with kit foxes. As mentioned above, the potential for San Joaquin kit foxes to occur in the Action Area is low. Implementation of preconstruction surveys and the *Standardized Recommendations for Protection of the San Joaquin Kit Fox Prior to or during Ground Disturbance* (U.S. Fish and Wildlife Service 2011) or the latest guidelines if dens or sign is expected to reduce most construction-related effects.

Construction effects on the kit fox are expected to be greater during the den selection, gestation, and the early rearing period of the breeding cycle (December through July) than at other times of the year. These adverse effects would be minimized through implementation of avoidance and minimization measures to reduce the risk of disturbance, injury, and mortality of individuals although den destruction, if occupied, could result in mortality of individuals and effects noted above from displacement.

#### *Effects to Recovery*

The PA would not increase the threats currently impacting the San Joaquin kit fox core or satellite areas as identified in the recovery plan, as described in the *Status of the Species*, or preclude implementation of recovery actions. The resulting adverse effects of the PA's construction footprint are considered permanent due to duration of construction, proposed structures and ongoing operations and maintenance. The suitable habitat affected is outside of the core recovery areas; therefore, with implementation of the proposed *Conservation Measures*, the PA is expected to ultimately result in minimal change in population numbers and distribution. DWR has proposed to minimize the adverse effects to species resulting from the loss of individuals.

## **12.2 Least Bell's Vireo**

Construction activities associated with field investigations, north Delta intakes, tunnel shafts, RTM, access roads, electrical and SCADA facilities, Bethany Complex, and the CMP have the potential to affect the least Bell's vireo and will impact a total of 17.44 acres of modeled habitat. Per the BA, the PA will result in the permanent loss of 9.68 acres. Approximately 7.67 modeled upland acres will be temporarily affected and restored to pre-project conditions. Compensatory mitigation for loss of suitable riparian habitat will consist of the restoration of habitat and the creation of habitat, through purchasing of mitigation credits at either a Service-approved conservation bank or at a non-bank site approved by the Service supporting habitat for vireo at a 2:1 ratio for a total commitment of 19.36 acres. However, creation and enhancement of approximately 204.79 acres of riparian habitat at Bouldin Island is proposed to offset the permanent loss of sensitive natural communities and habitat for special-status species, including



least Bell's vireo. The creation and enhancement actions at Bouldin Island are assumed to have a long-term benefit to the species. Reinitiation may be required if the site protection instrument results in effects not analyzed in this consultation.

While there is low potential for an individual to be present in the vicinity of the PA as described above, construction activities will occur over a long period of time increasing chances of exposure if the vireo is present within the Action Area. The activities listed in the above paragraph are expected to affect the vireo through mortality, injury, disturbance, and harm of individuals if present. Ground disturbance associated with construction activities will result in removal of vegetation and other materials utilized for cover, migration, and foraging. Disturbance caused by construction activities may cause individuals to disperse into areas containing unsuitable habitat, and increase the risk of predation or other sources of mortality. Disturbance, injury, or mortality to the vireo may result from night-lighting, noise, and vibration, which are further described below. Construction-related contaminants, such as fuels, cement, and oils accidentally discharged or spilled into modeled habitat could expose the species to toxic materials, resulting in injury and mortality, and lead to habitat degradation. These adverse effects would be minimized through implementation of avoidance and minimization measures to reduce the risk of disturbance, injury, and mortality of individuals.

### *Effects to Recovery*

Given the baseline conditions in the Action Area, the PA is not expected to increase the threats currently impacting the least Bell's vireo as described in the *Draft Recovery Plan for the Least Bell's Vireo* (Service 1998b) and or preclude implementation of recovery actions. Although suitable habitat will be temporarily and permanently affected this loss would be offset with the restoration or creation of 19.36 acres of suitable riparian habitat (2:1 ratio) which is assumed to be included in the creation and enhancement of up to 204.79 acres of suitable riparian habitat, primarily on Bouldin Island. With implementation of the proposed *Conservation Measures*, the PA is expected to ultimately result in little to no change in population numbers and distribution.

### **12.3 Western Yellow-Billed Cuckoo**

Construction activities associated with field investigations, north Delta intakes, tunnel shafts, RTM, access roads, electrical and SCADA facilities, Bethany Complex, and the CMP have the potential to affect the cuckoo and will impact a total of 17.34 acres of modeled habitat. Per the BA, the PA will result in the permanent loss of 9.68 acres. Approximately 7.67 modeled upland acres will be temporarily affected and restored to pre-project conditions. Compensatory mitigation for loss of suitable riparian habitat will consist of the restoration of habitat and the creation of habitat, through purchasing of mitigation credits, at either a Service-approved conservation bank or at a non-bank site approved by the Service supporting habitat for cuckoo at a 2:1 ratio for a total commitment of 19.36 acres. However, creation and enhancement of approximately 204.79 acres of riparian habitat at Bouldin Island is proposed to offset the permanent loss of sensitive natural communities and habitat for special-status species, including the cuckoo. The creation and enhancement actions at Bouldin Island are assumed to have a long-term benefit to the species. Reinitiation may be required if the site protection instrument results in effects not analyzed in this consultation.

While there is low potential for an individual to be present in the vicinity of the PA as described above, construction activities will occur over a long period of time increasing chances of exposure if the cuckoo is present within the Action Area. The activities listed in the above paragraph are expected to affect the cuckoo through mortality, injury, disturbance, and harm of individuals if present. Ground disturbance associated with construction activities will result in removal of vegetation and other materials utilized for cover, migration, and foraging. Disturbance caused by construction activities may cause individuals to disperse into areas containing unsuitable habitat, and increase the risk of predation or other sources of mortality. Disturbance, injury, or mortality to the cuckoo may result from night-lighting, noise, and vibration, which are further described below. Construction-related contaminants, such as fuels, cement, and oils accidentally discharged or spilled into modeled habitat could expose the species to toxic materials, resulting in injury and mortality, and lead to habitat degradation. These adverse effects would be minimized through implementation of avoidance and minimization measures to reduce the risk of disturbance, injury, and mortality of individuals.

#### *Effects to Recovery*

A recovery plan has yet to be developed for the western yellow-billed cuckoo. Given baseline conditions in the Action Area, the PA is not expected to increase the threats currently impacting the western yellow-billed cuckoo as described in the cuckoo's listing documents. With implementation of the proposed *Conservation Measures*, the PA is expected to ultimately result in little to no change in population numbers and distribution.

## **12.4 California Red-Legged Frog and Critical Habitat**

### *California Red-Legged Frog*

The PA will affect a total of approximately 421.57 acres of modeled habitat and result in the permanent loss of 0.21 acre of modeled aquatic habitat, 7.06 acres of modeled upland habitat, and 363.48 acres of modeled dispersal habitat. Temporary loss of habitat would include 0.12 acre of aquatic habitat, 2.72 acres of upland habitat, and 47.97 acres of dispersal habitat. While the BA acknowledges the adverse effects to California red-legged frogs from temporary and permanent impacts to dispersal habitat, DWR is not proposing to offset the loss of modeled dispersal habitat. However, the permanent loss of 0.21 aquatic and 7.06 upland acres of modeled California red-legged frog habitat would be offset by the purchase of Service-approved conservation bank credits at a 3:1 ratio or an undetermined site protection instrument. Reinitiation may be required if the undetermined site protection instrument results in effects not analyzed in this consultation.

Activities included in the PA that will have adverse effects on California red-legged frog and its modeled suitable habitat are activities related to the construction of the Bethany Complex. This would include construction of the pumping plant, surge basin, reception shaft, discharge structure, aqueduct, and the construction of a water pipeline, electrical substation, switchyard, and access roads which would be used in support of construction and operations within the Bethany Complex footprint.

The activities listed above are expected to affect the California red-legged frog through mortality, capture, relocation, injury, disturbance, and harm of individual eggs, larvae, subadults and adults. Ground disturbance associated with construction activities will result in removal of vegetation and other materials utilized for cover and aestivation, fill or crush burrows or crevices, and reduce the prey base for the California red-legged frog. Since California red-legged frog utilizes small mammal burrows and soil crevices for shelter, individuals may be crushed, buried, or otherwise injured during construction activities. Disturbance caused by construction activities may cause individuals to disperse into areas containing unsuitable habitat and increase the risk of predation or other sources of mortality. Injury or mortality to the animals may result from night-lighting, noise, and vibration. These adverse effects would be minimized through implementation of avoidance and minimization measures to reduce the risk of disturbance, injury, and mortality of individuals.

#### *Effects to Recovery*

The PA would not increase the threats currently impacting the California red-legged frog recovery unit or core area as identified in the recovery plan, as described in the Status of the Species, or preclude implementation of recovery actions. The resulting adverse effects of the PA to the species habitat are considered permanent due to the PA's footprint and duration. Suitable habitat will be affected inside and adjacent to the East San Francisco Bay Core Recovery Area. DWR has proposed to minimize the adverse effects of the loss of individuals and compensate for the permanent loss of habitat at 3:1 ratio by purchasing mitigation or conservation bank credits from banks subject to Service-approval or through an undetermined site protection instrument. With implementation of the proposed *Conservation Measures*, the PA is expected to ultimately result in no change in population numbers and distribution.

#### *California Red-Legged Frog Critical Habitat*

The PA would permanently remove 0.01 acre of modeled aquatic habitat (PCE 1 and PCE 2); 1.65 acres of modeled upland habitat (PCE 3), and 43.61 acres of modeled dispersal habitat (PCE 3 and PCE 4) within this unit. This is less than 0.01% of total California red-legged frog designated critical habitat, and 0.10% of California red-legged frog critical habitat in Unit CCS-2B. Permanent and temporary habitat loss due to the PA would result in fragmentation and isolation of habitat within this critical habitat unit, but this effect would be small because the access road would not be heavily traveled and is assumed frogs can traverse the road without impediments or added risk of vehicular strikes, and the Bethany Reservoir Discharge Structure is located adjacent to the edge of Bethany Reservoir (and therefore does not pose a new, substantial barrier to movement).

The PA would not appreciably reduce the conservation value of critical habitat for California red-legged frog because the impact is to a small percentage of designated critical habitat; the impact occurs in a very small portion at the northeastern edge of designated critical habitat in an area that is already highly fragmented with water conveyance facilities and roads; avoidance and minimization measures would be implemented; and compensation (if within the critical habitat unit) would minimize the loss.

## 12.5 California Tiger Salamander

The PA will affect approximately 79.49 acres of modeled habitat and result in the permanent loss of 0.20 acre of modeled aquatic habitat, and 60.20 acres of modeled upland habitat. Temporary loss of habitat would include 19.08 acres of upland habitat. The permanent loss of 60.4 acres of modeled California tiger salamander habitat would be offset by the purchase of Service-approved conservation bank credits at a 3:1 ratio or an undetermined site protection instrument.

Reinitiation may be required if the undetermined site protection instrument results in effects not analyzed in this consultation.

Activities included in the PA that will have adverse effects on California tiger salamander and its modeled suitable habitat are activities related to the construction of the Bethany Complex. This would include construction of the pumping plant, surge basin, reception shaft, discharge structure, aqueduct, and the construction of a water pipeline, electrical substation, switchyard, and access roads which would be used in support of construction and operations within the Bethany Complex footprint.

The activities listed above are expected to affect the threatened Central California tiger salamander through capture, relocation, disturbance, harm, injury and mortality of all life stages. Ground disturbance and construction activities associated with the PA will result in loss of upland habitat used for dispersal, refugia, and foraging. Central California tiger salamanders that are using small mammal burrows or cracks in the soil within the construction footprint of the PA are likely to be killed during grading and ground compaction activities as burrows are crushed and the inhabitants of burrows are entombed. Central California tiger salamanders may be killed or injured from inadvertent trampling by workers from foot traffic and operation of construction equipment during construction activities. Central California tiger salamanders may also become trapped in open excavations or construction trenches, making them vulnerable to desiccation, starvation, and predation. Injury or mortality to the Central California tiger salamanders may result from harassment from night lighting, noise and vibrations due to increased exposure to desiccation and predation. These adverse effects would be minimized through implementation of avoidance and minimization measures to reduce the risk of disturbance, injury, and mortality of individuals.

### *Effects to Recovery*

The PA would not increase the threats currently impacting the Central California tiger salamander in the Central Valley Recovery Unit identified in the recovery plan and described in the *Status of Species* or preclude implementation of recovery actions. The PA is expected to result in permanent loss of 60.4 acres of Central California tiger salamander habitat. DWR has proposed to offset the adverse effects of the loss of individuals and habitat through the purchase of mitigation or conservation bank credits from banks subject to Service-approval or from a non-bank site at a 3:1 ratio. With implementation of the proposed *Conservation Measures*, the PA is expected to ultimately result in no change in population numbers and distribution.

## 12.6 Giant Garter Snake

The PA is estimated to adversely affect a total of 132.47 acres of modeled habitat. Approximately 80.89 acres of modeled habitat will be permanently impacted of which 9.65 acres is aquatic habitat and 71.24 acres is upland habitat. The PA is also estimated to temporarily affect approximately 51.57 acres of modeled habitat resulting from construction of permanent facilities such as intake structures and associated electrical buildings and facilities, and permanent access roads. The Service considers impacts occurring over multiple years to be a permanent effect to listed species. To compensate for the loss of this habitat and minimize effects from habitat loss to giant garter snake, DWR proposes to either restore, create, or enhance high quality habitat areas targeted for giant garter snake recovery at an approximately 2.5:1 ratio. Under a full implementation of the CMP, DWR proposes to restore, create, or enhance approximately 340.35 acres that will benefit the giant garter snake in the Delta (150.54 acres of suitable aquatic and 189.81 acres of suitable upland habitats) at the Bouldin Island and I-5 Ponds. The creation and enhancement actions at Bouldin Island and the I-5 ponds are assumed to have a long-term benefit to the species.

Construction and ground disturbing activities related to the PA are likely to affect giant garter snake. Construction activities at each intake include ground clearing and grading, construction of the intakes and associated facilities, and vehicular use including transport of construction equipment and materials. Giant garter snake may be killed or injured by vehicles and heavy construction equipment used as part of the PA. This effect would be most likely to occur during site clearing (up to several days at each location). Vehicle strikes are a common threat to giant garter snake and several occurrence records of giant garter snake in the CNDDDB are from dead individuals found along roadsides which were struck by vehicles. Giant garter snakes commonly use roadside ditches for movement corridors or for foraging and are known to use roadsides for basking sites. The recent documented observations of giant garter snakes using riprap along major river levee banks also show that giant garter snakes can use this habitat for basking and sheltering and possibly for foraging or brumation/aestivation. This makes giant garter snakes highly vulnerable to vehicle strikes as giant garter snakes bask on the road or cross back and forth over roads from the various suitable aquatic and upland habitats.

Associated equipment noise, vibration, and increased human activity may interfere with normal behaviors. These behaviors include feeding, sheltering, movement between refugia and foraging habitats, and other essential behaviors of giant garter snake. Project related activities that occur in areas that have suitable habitat but create intolerable levels of disturbance may force individuals from cover and potentially subject them to circumstances that otherwise would not occur and could result in an increased threat to their survival such as predation.

Natural food sources may also be reduced as a result of habitat disturbance and loss. Short-term temporal effects will occur when vegetative cover is removed within upland habitat during project implementation, which may also subject this species to an increased risk of predation. Since snakes use small mammal burrows, soil crevices, and/or rock crevices for shelter for brumation during the winter season and aestivation during extremely hot days during their active period, implementation of the PA will likely result in harassing snakes away from suitable habitat or by disrupting brumation/aestivation if snakes are occupying a burrow or rock



outcropping. As ground squirrel burrows can be deep and long, construction and maintenance equipment may come into direct contact with a brumating/aestivating snake which would likely be killed from these ground disturbing activities. Snakes in terrestrial habitat may also become entombed under soil, crushed or damaged by equipment or personnel, thereby resulting in harm or mortality to individuals. To minimize these effects, DWR proposes a series of conservation measures such as work windows, exclusionary fencing, biological monitoring and worker awareness training.

### *Effects to Recovery*

The PA could increase the threats currently impacting the giant garter snake in the Delta Basin Population and Recovery Unit as described in the *Recovery Plan for the Giant Garter Snake (Thamnophis gigas)* (Service 2017c) and preclude implementation of recovery actions in the areas of suitable habitat which will be temporarily and permanently affected within the Delta Recovery unit. However, DWR has proposed to implement conservation measures to minimize effects to individuals and minimize the loss of habitat by restoring/creating habitat at an approximately 2.5:1 ratio including the creation and enhancement of the I-5 Ponds and Bouldin Island sites. Therefore, with implementation of the proposed *Conservation Measures*, the PA is expected to ultimately result in minimal to no change in population numbers and distribution.

## **12.7 Delta Smelt, Longfin Smelt, and Delta Smelt Critical Habitat**

### *Delta Smelt and Longfin Smelt*

Construction of the two intake structures would result in a permanent loss or alteration of 5.6 acres of tidal perennial habitat near the northern limit of the geographic area used by delta smelt and longfin smelt (smelts) for migration, potential spawning, and larval dispersal to the estuary. An additional 1.5 acres within the aquatic footprint will be temporarily impacted. Upstream spawning migration and access to spawning habitat may be blocked, delayed, or impeded due to replacement of low-velocity nearshore habitat at the north Delta intake locations with the cofferdams, fish screens, and associated structures. There is uncertainty about the impact because of the adult smelts' potential use of low-velocity habitat along the opposite riverbank from the cofferdams, deeper water near the river bottom, or velocity refuges created by the flutes of the cofferdams themselves. There is also uncertainty regarding whether either smelt still occurs in this part of the river. Assuming they do, per the BA, 2D modeling of the hydrodynamic effects of the cofferdams indicates that suitably low-velocity habitat would be present even at relatively high river flows. The reduction in the extent of low-velocity shoreline areas and increased predation risk at the intake sites could potentially reduce the number of migrating adults that successfully pass the sites and survive to reach upstream spawning areas. Delta and longfin smelt larvae and early juveniles dispersing from upstream spawning areas to estuarine rearing areas may be subject to an elevated risk of predation as they pass the intake construction sites because of the presence of in-water and overwater structures.



Any delta smelt that successfully spawn in the Sacramento River at or upstream of the proposed construction areas would produce larvae may rear for variable amounts of time before being transported downriver. These young delta smelt would be unlikely to remain in the area past June. Subadult/adult fish would be unlikely to return that far up-estuary until the following December. See Table 12.7-0-1 for a summary of seasonal occurrence relative to construction areas. Thus, if the effects of construction stay within the proposed June-October work window, they would be unlikely to affect delta smelt except possibly small numbers of larvae or early juvenile life stages in June.

If any longfin smelt spawn in the Sacramento River at or upstream of the proposed construction areas, the larvae would be expected to be quickly transported to the estuary and would be unlikely present after April. Subadult/adult fish would be unlikely to return that far up-estuary until the following November or December. See Table 12.7-0-1 for a summary of seasonal occurrence relative to construction areas. Thus, if the effects of construction stay within the proposed June-October work window, they would be unlikely to affect longfin smelt.

**Table 12.7-0-1. Summary of Delta Smelt and Longfin Smelt Spawning Seasons and Occurrences in the Action Area**

|                                                                                  | <b>Delta Smelt</b>                                                                                                                | <b>Longfin Smelt</b>                                                                                                                                                                                                            |
|----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Spawning season                                                                  | February-May though newer information indicates spawning after April was rare in recent decades (e.g., Kurobe <i>et al.</i> 2022) | December-April though newer information indicates spawning after March was rare in recent decades (e.g., Eakin 2021; Gross <i>et al.</i> 2022)                                                                                  |
| Core spawning locations                                                          | In recent decades, Cache Slough Complex and regions to the west of it (e.g., Kurobe <i>et al.</i> 2022)                           | In recent decades, the estuary's low-salinity zone which was usually centered in Suisun Bay/Marsh or the westernmost part of the Delta during the spawning season (e.g., Grimaldo <i>et al.</i> 2020; Gross <i>et al.</i> 2022) |
| Historically observed in the vicinity of the proposed construction sites         | Yes – except that Snodgrass Slough was not sampled (Merz <i>et al.</i> 2011)                                                      | Yes – except that Snodgrass Slough was not sampled (Merz <i>et al.</i> 2013)                                                                                                                                                    |
| Observed in vicinity of proposed intake construction site in previous five years | No (Lodi Fish and Wildlife Office, unpublished data)                                                                              | No (Lodi Fish and Wildlife Office, unpublished data)                                                                                                                                                                            |

For those few individuals that may occur during the work window, in-water construction may result in physical injury or mortality from activities including pile driving, barge/tugboat operations, dredging, enclosing construction areas, 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, the seasonal work windows and limited if any ongoing use of the area by either smelt species. Further, there is a high probability of fish avoiding such activities; therefore, displacement of fish away from habitat near construction activities seems to be the most likely adverse 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 these effects.

The total duration of construction work at each intake is 5.5 years. The timing of in-water work during a June–October work window avoids the time of year that longfin smelt might be present and mostly avoids the time of year that delta smelt would be present. Although there is potential temporal overlap of the work window with juvenile delta smelt in the early summer, there would be very limited if any spatial overlap because habitat is usually unsuitable at this time of year so any fish spawned in the affected reach of the river (or above it) would have moved downstream at an earlier life stage. Given that the location of the north Delta intakes is near the northernmost range of the smelts, there would be limited if any exposure to construction impacts.

#### Turbidity/Suspended Sediments/Contaminants

Construction of the DCP would result in the generation and release of suspended sediments to the water column, temporarily increasing water-column turbidity above ambient levels and altering aquatic habitat conditions. Turbidity-producing construction activities include bed and bank disturbance during cofferdam and log boom installation, dredging prior to riprap placement adjacent to the new intake locations, and the placement of bed and bank riprap armoring at the new intake locations in the north Delta. In-water work associated with riprap would have greater relative effects on turbidity than the other activities but would be limited to one season at each intake. Propeller wash associated with boat traffic at the intake sites during dredging and placement of riprap may also produce localized turbidity pulses, depending on location. Increases in turbidity and suspended sediment levels associated with these activities would be temporary and localized and generally not considered harmful to the smelts.

During in-water construction activities at the proposed intake sites, turbidity and suspended sediment levels in the river are anticipated to be greater than ambient river levels in the immediate vicinity of these activities, creating turbidity plumes that may extend several hundred feet downstream of construction activities. The BA provides the assumption that there could be some effect up to 1,000 feet downstream from each intake, temporarily affect 1.7 acres of tidal perennial habitat at Intake B and 2.5 acres of tidal perennial habitat at Intake C. The proposed work that could generate turbidity plumes would occur at earliest in June and would therefore be very unlikely to have any impact on either smelt species, both of which are not only turbidity-adapted but unlikely to be present in the area during the summer and early fall months.

Construction of the DCP in and near their aquatic habitat poses an exposure risk to the smelts from potential spills of hazardous materials from construction equipment, barges and towing vessels, and other machinery and from potential mobilization of contaminated sediment. The risk of accidental spills of contaminants and other hazardous materials would exist throughout the construction period but would be highest during in-water construction activities due to the proximity of construction activities to the Sacramento River. Once cofferdams are installed and

dewatered at the intakes, any spills within the cofferdam essentially would preclude movement of spill materials into the river because of river water pressure on the cofferdams. Other construction elements that occur in upland areas or are isolated from fish-bearing waters have little potential for accidental spills that could affect the smelts. Additionally, risk of construction-related contaminants is reduced with implementation of proposed pollution-prevention and erosion- and sediment-control avoidance and minimization measures.

#### Underwater Noise

Underwater noise would be generated by a variety of construction activities, including pile driving, tugboat operations, dredging, geotechnical investigations, riprap placement, and TBM activities. Construction noise, vibration, and increased human activity may interfere with normal behavior, including feeding, sheltering, and other essential behaviors of delta smelt. Intolerable levels of disturbance may force individuals from suitable habitat cover and subject them to predation that otherwise would not occur. However, given the smelts' seasonal to transient use of the locations where the activities will occur and implementation of in-water work windows and measures to minimize underwater noise, few delta smelt and longfin smelt are expected to be exposed to the effects of construction generated underwater noise.

Underwater sound pressure waves can harass and harm fish species (Reyff 2003; Abbott and Bing-Sawyer 2002; California Department of Transportation 2001; Longmuir and Lively 2001; Stotz and Colby 2001). As the pressure wave passes through a fish, the swim bladder is rapidly squeezed due to the high pressure, and then rapidly expanded as the under-pressure component of the wave passes through the fish. This can cause adverse effects including rupture of the swim bladder, rupture of capillaries, internal hemorrhage, neurological stress, and auditory damage. Extreme sound waves can cause instantaneous death, latent death within minutes after exposure, or can occur several days later.

Elevated noise levels can cause sub-lethal injuries affecting survival and fitness. Similarly, if injury does not occur, noise may modify fish behavior that may make them more susceptible to predation. Fish suffering damage to hearing organs may suffer equilibrium problems and may have a reduced ability to detect predators and prey. Other types of sub-lethal injuries can place the fish at increased risk of predation and disease. Adverse effects on survival and fitness can occur even in the absence of overt injury. Exposure to elevated noise levels can cause a temporary shift in hearing sensitivity, decreasing sensory capability for periods lasting from hours to days (Turnpenny *et al.* 1994; Hastings *et al.* 1996).

Among the construction activities likely to generate noise, the use of impact hammers for pile installation poses the greatest risk to fish because the levels of underwater noise produced by impulsive types of sounds can reach levels of sufficient intensity to injure or kill fish (Popper and Hastings 2009). Factors that may influence the potential for injury include species, life stage, and size of fish; type and size of pile and hammer; frequency and duration of pile driving; site characteristics (e.g., water depth); and distance of fish from the source. Dual interim criteria representing the acoustic thresholds associated with the onset of physiological effects in fish have been established to provide guidance for assessing the potential for injury resulting from pile-driving noise (Fisheries Hydroacoustic Working Group 2008) (Table 12.7-0-2). These

criteria have been established only for impact pile driving. Other pile-driving methods such as vibratory, oscillatory, and drilling methods generally produce more continuous, lower energy sounds below the thresholds associated with injury. No established noise thresholds currently are associated with continuous sound waves, and vibratory and oscillation methods generally are considered effective measures for avoiding or minimizing the risk of injury to fish from pile-driving noise.

**Table 12.7-0-2 Interim Criteria for Assessing the Potential for Injury to Fish from Pile-Driving Activities**

| <b>Interim Criteria</b>               | <b>Agreement in Principle</b>                                                                                                           |
|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Peak sound pressure level (SPL)       | 206 dB re 1 $\mu$ Pa (for all sizes of fish)                                                                                            |
| Cumulative sound exposure level (SEL) | 187 dB re 1 $\mu$ Pa <sup>2</sup> -sec—for fish size $\geq$ 2 grams<br>183 dB re 1 $\mu$ Pa <sup>2</sup> -sec—for fish size $<$ 2 grams |
| Behavioral (RMS)                      | 150 dB re 1 $\mu$ Pa (for all sizes of fish)                                                                                            |

Source: Fisheries Hydroacoustic Working Group 2008

dB re 1 $\mu$ Pa = dB referenced to a pressure of 1 microPascal

dB re 1 $\mu$ Pa<sup>2</sup>-sec = dB referenced to a pressure of 1 microPascal squared per second RMS = root mean square

The dual criteria are: (1) 206 dB for peak SPL and (2) 187 dB for cumulative SEL for fish larger than 2 grams and 183 dB SEL for fish smaller than 2 grams. The peak SPL threshold is considered the maximum SPL a fish can receive from a single strike without injury. The cumulative SEL threshold is considered the total amount of acoustic energy that a fish can receive from single or multiple strikes without injury. The cumulative SEL threshold is based on the total daily exposure of a fish to noise from sources that are discontinuous (in this case, noise that occurs up to 12 hours a day, with 12 hours between exposures). This assumes that fish are able to recover from any effects during this 12-hour period between exposures. The current estimated threshold for behavioral effects is 150 dB.

The pile-driving analysis for the test-pile program reflected one pile of each type on three separate days at a single site. The analysis indicated that the distance to sound-level thresholds would range from 28 feet (206 dB) to 24,135 feet (150 dB) (Table 12.7-0-3). The area of effect, accounting for attenuation of sound by land at river bends (California Department of Transportation 2020a:4-32 as cited in the BA), ranges from 0.06 acre (206-dB threshold for sheet and steel pipe piles) to ~59 acres (150-dB threshold for H piles) (Table 12.7-0-3). The duration of the test-pile impact driving at a single intake site would be 3 days (one day for each pile type/~ 2 minutes per pile; Table 12.7-0-3).

**Table 12.7-0-3. Assumptions and Estimates of Impact Pile-Driving Distance and Area of Acoustic Effect at a Single Intake Site for the Test-Pile Program**

| Variable                                                   | Sheet Pile Pair | Steel Pipe Pile | H Pile |
|------------------------------------------------------------|-----------------|-----------------|--------|
| Number of piles                                            | 1               | 1               | 1      |
| Number of piles per day                                    | 1               | 1               | 1      |
| Number of days of pile driving                             | 1               | 1               | 1      |
| Number of strikes per pile                                 | 19              | 19              | 19     |
| Number of strikes per day                                  | 19              | 19              | 19     |
| Peak single-strike sound level at 10 meters [33 feet] (dB) | 205             | 205             | 208    |
| Sound exposure level at 10 meters [33 feet] (SEL, dB)      | 180             | 180             | 177    |
| Root mean square at 10 meters [33 feet] (RMS, dB)          | 190             | 190             | 193    |
| Distance to 206-dB threshold (feet) <sup>a</sup>           | 28              | 28              | 45     |
| Distance to 187-dB threshold (feet) <sup>a</sup>           | 80              | 80              | 50     |
| Distance to 183-dB threshold (feet) <sup>a</sup>           | 147             | 147             | 93     |
| Distance to 150-dB threshold (feet) <sup>a</sup>           | 15,228          | 15,228          | 24,135 |
| Area of 206-dB threshold (acres)                           | 0.06            | 0.06            | 0.15   |
| Area of 187-dB threshold (acres)                           | 0.46            | 0.46            | 0.18   |
| Area of 183-dB threshold (acres)                           | 1.28            | 1.28            | 0.60   |
| Area of 150-dB threshold (acres)                           | 58.41           | 58.41           | 58.64  |

Note: Assumed testing would occur at Intake B.

<sup>a</sup> Note that this distance does not account for sound attenuation by site configuration (e.g., sound not going round corners at the bends in the river), which is accounted for in the area estimates given in the table.

The pile-driving analysis for construction of the cofferdams and training walls indicated that the distance to sound-level thresholds would range from 28 feet (206 dB) to 15,228 feet (150 dB) Table 12.7-0-4 (206-dB threshold). The area of effect, accounting for attenuation of sound by river bends, ranges from 0.06 acre (206-dB threshold) to 134.10 acres (150-dB threshold at Intake C) (Table 12.7-0-4).

**Table 12.7-0-4. Assumptions and Estimates of Impact Pile-Driving Distance and Area of Acoustic Effect at Each Intake for Construction of Cofferdams and Training Walls**

| Variable                                                   | Intake B | Intake C |
|------------------------------------------------------------|----------|----------|
| Number of piles (pairs)                                    | 420      | 410      |
| Number of piles per day                                    | 20       | 20       |
| Number of days of pile driving                             | 21       | 21       |
| Number of strikes per pile                                 | 19       | 10       |
| Number of strikes per day                                  | 380      | 200      |
| Peak single-strike sound level at 10 meters [33 feet] (dB) | 205      | 205      |
| Sound exposure level at 10 meters [33 feet] (SEL, dB)      | 180      | 180      |
| Root mean square at 10 meters [33 feet] (RMS, dB)          | 190      | 190      |
| Distance to 206-dB threshold (feet) <sup>a</sup>           | 28       | 28       |
| Distance to 187-dB threshold (feet) <sup>a</sup>           | 588      | 383      |
| Distance to 183-dB threshold (feet) <sup>a</sup>           | 1,086    | 708      |
| Distance to 150-dB threshold (feet) <sup>a</sup>           | 15,228   | 15,228   |
| Area of 206-dB threshold (acres)                           | 0.06     | 0.06     |
| Area of 187-dB threshold (acres)                           | 12.30    | 6.72     |
| Area of 183-dB threshold (acres)                           | 25.06    | 18.47    |
| Area of 150-dB threshold (acres)                           | 67.69    | 134.10   |

<sup>a</sup> Note that this distance does not account for sound attenuation by site configuration (e.g., sound not going round corners at the bends in the river), which is accounted for in the area estimates given in the table.

To install steel pipe piles to support the floating log boom, 2 to 4 days of pile driving would be required during the final year of construction. Existing geotechnical information suggests that all log-boom piles could be vibrated into place without the need for any impact pile driving, but this analysis used a conservative estimate of impact pile driving that could be required. This analysis indicated that the distance to sound-level thresholds would range from 82 feet (206 dB) to 13,061 feet (150 dB) (Table 12.7-0-5). Accounting for attenuation of sound by land at river bends, the area of effect ranges from 0.5 acre (206-dB threshold at Intakes B and C) to nearly 118 acres (150-dB threshold at Intake C) (Table 12.7-0-5).

**Table 12.7-0-5. Assumptions and Estimates of Impact Pile-Driving Distance and Area of Acoustic Effect at Each Intake for Construction of Log Booms**

| Variable                                                   | Intake B | Intake C |
|------------------------------------------------------------|----------|----------|
| Number of piles                                            | 32       | 32       |
| Number of piles per day                                    | 10       | 10       |
| Number of days of pile driving                             | 4        | 4        |
| Number of strikes per pile                                 | 504      | 66       |
| Number of strikes per day                                  | 5,040    | 660      |
| Peak single-strike sound level at 10 meters [33 feet] (dB) | 212      | 212      |
| Sound exposure level at 10 meters [33 feet] (SEL, dB)      | 181      | 181      |
| Root mean square at 10 meters [33 feet] (RMS, dB)          | 189      | 189      |



| Variable                                         | Intake B | Intake C |
|--------------------------------------------------|----------|----------|
| Distance to 206-dB threshold (feet) <sup>a</sup> | 82       | 82       |
| Distance to 187-dB threshold (feet) <sup>a</sup> | 3,825    | 990      |
| Distance to 183-dB threshold (feet) <sup>a</sup> | 3,825    | 1,830    |
| Distance to 150-dB threshold (feet) <sup>a</sup> | 13,061   | 13,061   |
| Area of 206-dB threshold (acres)                 | 0.5      | 0.5      |
| Area of 187-dB threshold (acres)                 | 66.4     | 27.2     |
| Area of 183-dB threshold (acres)                 | 66.4     | 51.7     |
| Area of 150-dB threshold (acres)                 | 69.3     | 117.9    |

<sup>a</sup> Note that this distance does not account for sound attenuation by site configuration (e.g., sound not going around corners at the bends in the river), which is accounted for in the area estimates given in the table.

Restricting pile driving to June 1–October 31 at the north Delta intakes would avoid most of the adult smelts' migration period (December–March) and most of the smelts' spawning (February–June) and early life stages (March–June) seasons, although some potential for exposure would occur in June. As noted above, fish smaller than 2 grams are more sensitive to underwater noise than larger individuals and may experience injury at 183 dB (Fisheries Hydroacoustic Working Group 2008). Larval and juvenile delta smelt generally are smaller than 2 grams, whereas adults average 2 to 3 grams (Foott and Bigelow 2010). Because some adult delta smelt are less than 2 grams, the lower injury threshold (183 dB) applies to this life stage, as well. As illustrated above, areas of habitat near the north Delta intakes that could be affected by pile driving at the 183-dB threshold ranges from 0.6 to 1.3 acres for the test-pile program (Table 12.7-0-3), 18.5 to 25.1 acres for construction of cofferdams and training walls (Table 12.7-0-4), and 51.7 to 66.4 acres for construction of log booms (Table 12.7-0-5).

In addition to the timing of the in-water work window to avoid smelts, potential exposure of the population to pile-driving noise would be minimized further by implementation of an underwater sound control and abatement plan (Appendix 3A and AMM-26: *Develop and Implement an Underwater Sound Control and Abatement Plan*) that includes best available and practicable methods such as vibratory pile driving, attenuation devices, and other potential physical and operational measures (e.g., starting impact pile driving at lower levels of intensity to allow fish to leave the area before the intensity is increased) and hydroacoustic monitoring and compliance requirements to avoid or minimize impacts on listed fish.

Pile driving would also be required at two bridge crossings located in Snodgrass Slough in the north Delta and Burns Cutoff in the south Delta. Accounting for attenuation of sound by river bends, the area of effect ranges from 0.04 acre (206-dB threshold at Snodgrass Slough) to 12.37 acres (150-dB threshold at Burns Cutoff) (Table 12.7-0-6). The location of this work likely has very little spatial overlap with delta smelt life stages because the Snodgrass Slough location is located far from the main tidally influenced channels through which most smelts likely move and Burns Cutoff is in the south Delta, an area with few if any smelts occurring during the in-water work window.

**Table 12.7-0-6. Assumptions and Estimates of Impact Pile-Driving Distance and Area of Acoustic Effect at Each Bridge Crossing**

| Variable                                         | Snodgrass Slough | Burns Cutoff |
|--------------------------------------------------|------------------|--------------|
| Pile diameter (steel pipe, inches)               | 16               | 24           |
| Number of piles                                  | 26               | 50           |
| Number of piles per day                          | 6                | 6            |
| Number of days of pile driving                   | 5                | 9            |
| Number of strikes per pile                       | 150              | 150          |
| Number of strikes per day                        | 900              | 900          |
| Peak single-strike sound level (dB)              | 204              | 212          |
| Sound exposure level (SEL, dB)                   | 179              | 181          |
| Root mean square (RMS, dB)                       | 189              | 189          |
| Distance to 206-dB threshold (feet) <sup>a</sup> | 24               | 82           |
| Distance to 187-dB threshold (feet) <sup>a</sup> | 896              | 1,217        |
| Distance to 183-dB threshold (feet) <sup>a</sup> | 1,655            | 2,249        |
| Distance to 150-dB threshold (feet) <sup>a</sup> | 13,061           | 13,061       |
| Area of 206-dB threshold (acres)                 | 0.04             | 0.47         |
| Area of 187-dB threshold (acres)                 | 4.12             | 12.38        |
| Area of 183-dB threshold (acres)                 | 7.34             | 12.36        |
| Area of 150-dB threshold (acres)                 | 25.45            | 12.37        |

<sup>a</sup> Note that this distance does not account for sound attenuation by site configuration (e.g., sound not going round corners at the bends in the river), which is accounted for in the area estimates given in the table.

Other noise generating components of the PA could result in temporary behavioral effects on delta smelt in the vicinity above the baseline hydroacoustic conditions, but the implementation of work windows reduces the likelihood of exposure and adverse effects.

#### Fish Stranding/Rescue

Installation of cofferdams to isolate the construction areas for the proposed intake sites has the potential to strand fish, including delta smelt and longfin smelt, resulting in mortality of fish from dewatering, dredging, and pile driving within the enclosed areas of the channel. To minimize entrapment risk and the number of fish subject to capture and handling, injury, and mortality during fish rescue and salvage operations, cofferdam construction would be limited to the proposed in-water construction period (June 1–October 31) to avoid the peak abundance of the smelts in the reach of the Sacramento River that would be affected by the proposed activities. DWR will prepare and submit a fish rescue and salvage plan (BA Appendix 3A AMM-25: Fish Rescue and Salvage Plan) to the fish and wildlife agencies (i.e., NMFS, Service, and CDFW) for review and approval prior to implementation. The likelihood of smelts being stranded behind the cofferdam is low during the in-water construction window.

### *Effects to Recovery*

The delta smelt now exists as an integrated hatchery population. This means there is no longer a separate wild population that exists independently of the captive broodstock maintained by UC Davis and the Service. The Service and its partners in the Culture and Supplementation of Smelt (CASS) group decide how many delta smelt to produce each year for release into the wild and where to release them.

The longfin smelt DPS is a fully wild population. Some individuals have occasionally migrated up the Sacramento River to and beyond the proposed DCP construction site (Merz et al. 2013) but as reviewed above, no longfin smelt have been captured in the Sacramento River between Isleton and the American River confluence in the past five years, likely due to both habitat constraints and low population densities.

The construction of the DCP would permanently reduce approximately 5.6 acres low-velocity migratory habitat in the northern portion of the smelts' range where few smelts have been detected and none in the previous five years. With implementation of the proposed *Conservation Measures*, the construction activities are expected to result in minimal change in population numbers and distribution.

### *Delta Smelt Critical Habitat*

Construction of the north Delta intakes would result in the permanent loss of approximately 5.6 acres and temporary loss of 1.5 acres of critical habitat for the delta smelt. Based on existing site conditions, none of this habitat is considered preferred spawning habitat for delta smelt; however, the cofferdam and intakes could hinder access to spawning habitat upstream. As described in above, construction activities have the potential for effects because of increased turbidity, suspended sediment, and contaminants, which could affect water quality (PCE 2). These will be minimized by implementation of the *Conservation Measures*. The proposed intakes would affect the river flow PCE 3 by changing water velocity in the vicinity of the north Delta intake fish screens. Construction activities would not affect PCE 4 because there would be no effect on salinity during construction or placement of structures in the water.

## **12.8 Valley Elderberry Longhorn Beetle**

Activities affecting valley elderberry longhorn habitat include the construction of the north Delta intakes, the tunnel shafts at the Twin Cities Complex, the Bethany Complex, the CCWD interconnection facilities, and the Bouldin Island and I-5 pond mitigation sites. Activities include the construction of support facilities (e.g., emergency facilities, fuel station), electrical substations, switchyards, and access roads. An estimated 78.03 acres of modeled valley elderberry longhorn beetle riparian habitat would be adversely affected by the PA. According to the BA, implementation of the PA will permanently affect 16.03 acres and temporarily affect 14.33 acres of modeled riparian habitat related to the construction. Habitat creation and enhancement at Bouldin Island and the I-5 ponds would affect 47.67 acres of modeled valley elderberry longhorn beetle riparian habitat. The creation and enhancement actions are assumed to

convert the existing, low-quality habitat to high-quality valley elderberry longhorn beetle habitat and would ultimately offset the modeled habitat impact from construction.

Individual valley elderberry longhorn beetles and their larvae may be directly injured or killed by actions leading to the loss of habitat (*i.e.*, the killing of or damage to elderberry plants) in which they live. Vegetation maintenance could affect shrubs they establish within, or occur adjacent to, through physical damage, trimming, removal or pesticide or herbicide drift. Likewise, maintenance equipment could crush or kill beetles or disrupt normal behaviors (*i.e.*, feeding, breeding, dispersal), especially during the adult flight period (March to July). Similarly, daily and weekly inspections by vehicle could strike flying beetles. The Service views that any ground disturbance within 20 feet of the dripline of an elderberry plant has the potential to adversely affect that plant and may cause mortality to the host plant and subsequently the beetle. Elderberry shrubs may be indirectly affected by actions occurring within 100 feet of the elderberry plant's dripline. These may include dust accumulating on plants, soil compaction, inadvertent herbicide application, and fuel spills. Implementation of conservation measures will minimize indirect effects that may occur outside of the 20-foot buffer around an elderberry plant. In addition, habitat creation and enhancement at the Bouldin Island and I-5 pond mitigation sites would offset the effects, including loss, of riparian habitat.

#### *Effects on Recovery*

The PA will result in adverse effects but would not increase the threats currently impacting the valley elderberry longhorn beetle as identified in the recovery plan. Actions including but not limited to dust accumulation, soil compaction, inadvertent herbicide application, and fuel spills also have the potential to cause indirect adverse effects to the valley elderberry longhorn beetle. These effects will be minimized by DWR's proposal to implement avoidance and minimization measures for the valley elderberry longhorn beetle. The approximately 16.03 acres of modeled habitat lost as a result of the construction of the water conveyance facilities will not appreciably alter conditions in the Action Area. The protection, creation and enhancement of riparian habitat may provide relatively greater benefit to the valley elderberry longhorn beetle than provided under existing conditions because of the importance of this habitat type being conserved into perpetuity. With implementation of the proposed *Conservation Measures*, the PA is expected to ultimately result in no change in population numbers and distribution.

### **12.9 Vernal Pool Fairy Shrimp, Vernal Pool Tadpole Shrimp, and Vernal Pool Fairy Shrimp Critical Habitat**

#### *Vernal Pool Fairy Shrimp and Vernal Pool Tadpole Shrimp*

An estimated 15.06 acres of modeled habitat would be adversely affected as a result of project construction; 0.42 acre of which is permanently, directly affected by construction and 14.64 acres of which may be indirectly (within 250 feet of mapped vernal pool habitat) affected. Compensatory mitigation for loss of vernal pool habitat will consist of the preservation of habitat and the creation of habitat, through purchasing of credits at either a Service-approved conservation bank or at a non-bank site approved by the Service supporting habitat for vernal pool species at a 2:1 ratio for direct loss and 1:1 ratio for indirect loss. Reinitiation may be

required if the undetermined site protection instrument results in effects not analyzed in this consultation.

Activities included in the PA that will have adverse effects on vernal pool fairy shrimp and vernal pool tadpole shrimp and their modeled suitable habitat are activities related to the construction of the Bethany Complex. These would include construction of the pumping plant, surge basin, reception shaft, discharge structure, aqueduct, and the construction of a water pipeline, electrical substation, switchyard, and access roads which would be used in support of construction and operations within the Bethany Complex footprint.

Individual vernal pool fairy shrimp and vernal pool tadpole shrimp, and their cysts may be injured or killed through implementation of protocol-level surveys and by actions leading to the loss of habitat (i.e., filling or inundating vernal pools) in which they live. Protocol-level surveys require walking through vernal pool habitat in the wet and dry season capturing and collecting both shrimp and their cysts. Walking through wet pool sediments and substrate can damage branchiopod cysts, vernal pool plants and their seeds and capture/collection results in mortality to individuals. The Service maintains that the partial filling of a vernal pool directly affects the whole vernal pool. Vernal pool habitat indirectly affected includes all habitat supported by impacted upland areas and swales, and all habitat otherwise affected by changes to the watershed, human intrusion, introduced species, and disturbance that will be caused by a PA. Changes in hydrology or the degradation of water quality within vernal pools and seasonal wetlands that are not directly affected by the PA may result in indirect effects to vernal pool fairy shrimp and vernal pool tadpole shrimp habitat and may not currently be fully known or described by the BA.

#### *Effects to Recovery*

The PA would not increase the threats currently impacting the vernal pool regions or core areas as identified in the *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* or preclude implementation of recovery actions. With implementation of the proposed *Conservation Measures*, the PA is expected to ultimately result in no change in population numbers and distribution.

#### *Vernal Pool Fairy Shrimp Critical Habitat*

The West Tracy Fault work is only expected to result in temporary effects on vernal pool fairy shrimp critical habitat and indirect effects should be reduced because the borings and CPTs would be backfilled with grout and the native soil profile would be restored within the test trenches such that the hydroperiod of the habitat is not expected to be affected. These temporary activities are not expected to result in hydrological changes that could indirectly affect areas outside the field investigations temporary construction footprint.

The temporary ground disturbance related to field investigations is not expected to appreciably reduce the conservation value of critical habitat for vernal pool fairy shrimp because the impact is temporary; the disturbance is a small percentage of total critical habitat; and the impact occurs at the eastern edge of critical habitat unit 19B where the existing condition is degraded due to proximity to agricultural land use.

### 12.10 Northwestern Pond Turtle

Construction and ground disturbing activities related to the PA are likely to affect northwestern pond turtle. Construction activities at each intake include ground clearing and grading, construction of the intakes and associated facilities, and vehicular use including transport of construction equipment and materials. Northwestern pond turtles may be killed or injured by vehicles and heavy construction equipment used as part of the PA. This effect would be most likely to occur during site clearing (up to several days at each location). Northwestern pond turtles commonly use roadside ditches for movement corridors or for foraging and are known to use roadsides embankments for basking sites. This makes northwestern pond turtles highly vulnerable to vehicle strikes as northwestern pond turtles bask on the road or cross back and forth over roads from the various suitable aquatic and upland habitats.

Associated equipment noise, vibration, and increased human activity may interfere with normal behaviors. These behaviors include feeding, sheltering, movement between refugia and foraging habitats, and other essential behaviors of northwestern pond turtle. Project related activities that occur in areas that have suitable habitat but create intolerable levels of disturbance may force individuals from cover and potentially subject them to circumstances that otherwise would not occur and could result in an increased threat to their survival such as predation.

Natural food sources may also be reduced as a result of habitat disturbance and loss. Short-term temporal effects will occur when vegetative cover is removed within upland habitat during project implementation, which may also subject this species to an increased risk of predation. The PA will likely have some adverse effect by harassing turtles away from suitable habitat or by disrupting brumation/aestivation if turtles are occupying a cavity in the ground or mud shallow. A Brumating/aestivating turtle can be killed from direct contact with construction and maintenance equipment. Turtles in terrestrial habitat may also become entombed under soil, crushed or damaged by equipment or personnel, thereby resulting in harm or mortality to individuals. To minimize these effects, DWR proposes a series of conservation measures such as work windows, exclusionary fencing, biological monitoring and worker awareness training.

An estimated 223.60 acres of modeled northwestern pond turtle habitat would be adversely affected by the PA. The PA is estimated to permanently impact approximately 149.77 acres of modeled habitat throughout the Action Area. The PA is also estimated to temporarily affect approximately 73.83 acres of modeled habitat resulting from construction of permanent facilities such as intake structures and associated electrical buildings and facilities, and permanent access roads. To compensate for the loss of permanent habitat and minimize effects from habitat loss to northwestern pond turtle, DWR proposes to either restore, create, or enhance high quality habitat areas targeted for northwestern pond turtle recovery at an approximately 1:1 ratio. Under full implementation of the Compensatory Mitigation Plan, DWR proposes to restore, create, or enhance approximately 690.04 acres that will benefit the northwestern pond turtle in the Delta. The habitat creation and enhancement at Bouldin Island and the I-5 ponds is expected to offset the permanent loss of wetlands and habitat for special-status species, including northwestern pond turtle.



### *Effects to Recovery*

A recovery plan has yet to be developed for the northwestern pond turtle. The PA could increase the threats currently impacting the northwestern pond turtle as described in the turtle's listing documents and Species Status Assessment (Service 2023e) within the localized Action Area. However, with implementation of the proposed *Conservation Measures*, the PA is expected to ultimately result in little to no change in population numbers and distribution.

### **12.11 Western Spadefoot**

Construction activities associated with field investigations, access roads, electrical and SCADA facilities, and the Bethany Complex have the potential to affect the western spadefoot and will impact a total of 37.44 acres of modeled habitat. Per the BA, the PA will result in the permanent loss of 33.10 acres which includes 0.20 acre of aquatic habitat and 32.90 acres of modeled upland habitat. Approximately 4.34 modeled upland acres will be temporarily affected and restored to pre-project conditions. The BA did not include modeled habitat impacts from the I-5 ponds creation and enhancement in the acreage impact assessment above but treated them separately and qualitatively explained why the I-5 ponds do not support western spadefoot habitat. Compensatory mitigation for loss of western spadefoot aquatic and upland habitat will consist of the preservation of habitat and the creation of habitat, through purchasing of mitigation credits, at either a Service-approved conservation bank or at a non-bank site approved by the Service supporting habitat for western spadefoot at a 1:1 ratio. Reinitiation may be required if the undetermined site protection instrument results in effects not analyzed in this consultation.

While there is low potential for an individual to be present in the vicinity of the PA as described above, construction activities will occur over a long period of time which will increase chances of exposure if the western spadefoot establishes within the Action Area. The activities listed above are expected to affect the western spadefoot through mortality, injury, harassment, and harm of individual eggs, larvae, subadults and adults if present. Ground disturbance associated with construction activities will result in removal of vegetation and other materials utilized for cover and aestivation, fill or crush burrows or crevices, and reduce the prey base for the western spadefoot. Since the western spadefoot utilizes small mammal burrows and soil crevices for shelter, individuals may be crushed, buried, or otherwise injured during construction activities. Disturbance caused by construction activities may cause individuals to disperse into areas containing unsuitable habitat and increase the risk of predation or other sources of mortality. Disturbance, injury, or mortality to the animals may result from night-lighting, noise, and vibration, which are further described below. Construction-related contaminants, such as fuels, cement, and oils accidentally discharged or spilled into modeled habitat could expose the species to toxic materials, resulting in injury and mortality, and lead to habitat degradation. These adverse effects would be minimized through implementation of avoidance and minimization measures to reduce the risk of disturbance, injury, and mortality of individuals.

### *Effects to Recovery*

The PA would not increase the threats currently impacting the vernal pool regions or core areas as identified in the *Recovery Plan for Vernal Pool Ecosystems of California and Southern*

*Oregon* or preclude implementation of recovery actions. Suitable modeled habitat affected is outside of any core recovery area or known population; therefore, with implementation of the proposed *Conservation Measures*, the PA is expected to ultimately result in no change in population numbers and distribution.

## **12.12 Monarch Butterfly**

Activities associated with field investigations, north Delta intakes, tunnel shafts, RTM, Bethany Complex, access roads, electrical and SCADA facilities, other construction support facilities, Contra Costa Water District Interconnection, and the CMP overlap with monarch butterfly modeled breeding habitat and will impact a total of 727.3 acres of modeled habitat. An estimated 146.67 acres of modeled monarch butterfly breeding habitat would be permanently impacted and 68.54 acres of modeled habitat would temporarily impacted as a result of DCP construction. Temporarily disturbed grasslands that are revegetated would use a seed mix combination that includes nectar-producing plants, including milkweed. Habitat creation and enhancement of the initial mitigation sites at Bouldin Island and the I-5 ponds would affect 512.09 acres of modeled monarch butterfly breeding habitat from vegetation removal and grading to create the appropriate topography and soil conditions to establish or restore habitats. The creation and enhancement actions are assumed to convert the existing, low- to moderate-quality habitat to high-quality monarch butterfly habitat that will be protected and managed in perpetuity as described in CMP-32: Monarch Butterfly Habitat (BA Attachment 3B.1, Table 3B.1-3). The creation and enhancement actions at Bouldin Island and the I-5 ponds are assumed to have a long-term benefit to the species.

In addition to modeled habitat impacts, the activities listed above are expected to affect the monarch butterfly through mortality, injury, and harm of individuals of eggs, larvae/caterpillars, chrysalids, and adults. Ground clearing and grading, on-land pile driving, excavation, placement of fills, cutoff walls and structures, and drilling would require the use of heavy equipment within the intake construction site as well as along the access roads to the site and could result in injury, mortality, and the disruption of normal behaviors of monarch butterfly. Overland driving and use of heavy equipment has the potential to crush individual monarch adults, eggs, larvae, and chrysalids or result in injury or mortality due to vehicle strikes. Construction-related contaminants, such as fuels, cement, and oils accidentally discharged or spilled into modeled monarch butterfly habitat could expose monarch butterfly eggs, larvae, or chrysalids to toxic materials, resulting in injury and mortality, and lead to habitat degradation. These adverse effects would be minimized through implementation of avoidance and minimization measures to reduce the risk of disturbance, injury, and mortality of individuals.

### *Effects to Recovery*

A recovery plan has yet to be developed for the monarch butterfly. The PA would not increase the threats currently impacting the monarch butterfly and impacts are mainly located in or near agricultural areas with herbicide and pesticide use. With implementation of the proposed *Conservation Measures*, the PA is expected to ultimately result in no change in population numbers and distribution.

### 13. CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the Action Area considered in this BiOp. Future Federal actions that are unrelated to the PA are not considered in this section; they require separate consultation pursuant to section 7 of the Act.

Major human interactions and uses of the landscape within the Action Area include agricultural use, urbanization, and recreational use.

#### 13.1 Agriculture

Farming occurs throughout the Delta and its watershed, including on lands adjacent to many waterways used by smelts and giant garter snakes. Conversion of existing suitable habitat to agriculture results in habitat destruction, degradation, and fragmentation. Habitat loss through agricultural conversion has been identified as a primary threat to giant garter snake (Service 2017c), monarch butterfly (Service 2024d), northwestern pond turtle (Service 2023d) vernal pool branchiopods (Service 2024c), and western spadefoot (Service 2023f). Agricultural practices are a major cause of the current loss of biodiversity. Levees are reinforced with continual vegetation removal and over time, riprapping has accumulated as a commonly deployed method to stabilize the levees and protect the land behind the levees for agricultural purposes. Agricultural practices can lead to habitat degradation and other impacts by introducing nitrogen, phosphorous and other nutrients into the watershed, which then flow into receiving waters, adding to other inputs such as wastewater treatment (Lehman *et al.* 2013); however, urban wastewater treatment provides the bulk of ammonium loading (Jassby 2008). Stormwater and irrigation discharges related to both agricultural and urban activities contain numerous pesticides and herbicides that may negatively affect the smelts' reproductive success and survival rates (Dubrovsky *et al.* 1998; Kuivila *et al.* 2004; Scholz *et al.* 2012). Discharges occurring outside the Action Area that flow into the Action Area also contribute to contaminant exposure.

Water diversions for irrigated agriculture, municipal and industrial use, and managed wetlands are found throughout the Action Area, and many of them remain unscreened. Depending on the size, location, and season of operation, these unscreened diversions have the potential to entrain many life stages of aquatic species, including delta smelt (Nobriga *et al.* 2004). Most diversions of any substantial size and cost along the Sacramento River have been screened, and in the Delta, newer municipal water diversions are routinely screened per existing BiOps. Private irrigation diversions in the Delta are mostly unscreened, but the total amount of water diverted onto Delta farms and waterfowl clubs has remained stable for decades (Culberson *et al.* 2008) so the cumulative impact should remain similar to baseline.

#### 13.2 Urbanization and Industry

Increases in urbanization and housing development can impact habitat by altering watershed characteristics and changing both water use and stormwater runoff patterns. Increased growth will place additional burdens on resource allocations, including natural gas, and electricity, as

well as on infrastructure such as wastewater sanitation plants, roads and highways, and public utilities. Some of these actions will not require consultation.

Adverse effects on listed species and their critical habitat may result from urbanization-induced point and non-point source chemical contaminant discharges within the Action Area. These contaminants include, but are not limited to, ammonia, numerous pesticides and herbicides, pharmaceuticals and their degradation products, personal care products, vehicle and roadway-derived copper, and oil and gasoline product discharges. Oil and gasoline product discharges may be introduced into Delta waterways from shipping and boating activities and from urban activities and runoff. Implicated as potential stressors to delta smelt, these contaminants may adversely affect delta smelt reproductive success, survival rates, and food supply.

Other future, non-Federal actions within the Action Area that are likely to occur and may adversely affect listed species and their designated critical habitats include: the dumping of domestic and industrial garbage that decreases water quality; oil and gas development and production that may affect aquatic habitat and may introduce pollutants into the water; and State or local levee maintenance that may also destroy or adversely affect habitat and interfere with natural, long-term habitat-maintaining processes.

### 13.3 Green House Gas Emissions

The world's climate is warming (IPCC 2001; 2007a, b; 2014) due in large part to emissions of carbon dioxide and other greenhouse gases in the atmosphere as a result of human activities, particularly the use of fossil fuels (IPCC 2007b; Solomon *et al.* 2009). Scientists use a variety of climate models, which include consideration of natural processes and variability, as well as scenarios incorporating current and potential future greenhouse gas emissions to predict how the climate will change and what the consequences will be for global weather patterns, ocean current systems, the global hydrologic cycle (including polar ice), and aquatic and terrestrial ecosystems (e.g., Meehl *et al.* 2007; Ganguly *et al.* 2009; Thompson *et al.* 2021). Global climate models have been downscaled so they can be applied to particular locations, for instance, to the western U.S. (Dettinger *et al.* 2015) and the Central Valley (Dettinger 2005; Dettinger *et al.* 2016). All combinations of climate models and emissions scenarios yield very similar projections for the Bay-Delta region, consistently predicting increases in sea level and air temperature, with higher uncertainty in predictions of average precipitation. However, there is also increasing scientific recognition that weather in California will become more variable and include a higher frequency of drought conditions (Swain *et al.* 2018).

The changing climate affects listed species not evolutionarily adapted to rapid change. Species dependent on ephemeral wetlands (e.g., vernal pool branchiopods and western spadefoot), riparian corridors (e.g., valley elderberry longhorn beetle), aquatic habitats (e.g., northwestern pond turtle and giant garter snake), and pollinator habitat (e.g., monarch butterfly) are especially vulnerable. Please refer to the 2024 LTO BiOp for a specific discussion on how climate change is affecting the delta smelt.

## 14. CONCLUSION

After reviewing the current *Status of Species* for the San Joaquin kit fox, least Bell's vireo, western yellow-billed cuckoo, California red-legged frog, California tiger salamander, giant garter snake, delta smelt, longfin smelt, valley elderberry longhorn beetle, vernal pool fairy shrimp, vernal pool tadpole shrimp, northwestern pond turtle, western spadefoot, and monarch butterfly, the *Environmental Baseline* for the Action Area, the *Effects of the Proposed Action*, and the *Cumulative Effects*, it is the Service's biological and conference opinion that the Delta Conveyance Project, as proposed, is not likely to jeopardize the continued existence of these species. The Service reached this conclusion because the construction-related effects to the species, when added to the environmental baseline and analyzed in consideration of the cumulative effects, will not rise to the level of precluding recovery or reducing the likelihood of survival of the species based on the following:

1. The construction-related components of the PA are extensive in scale and scope but are located in areas of fragmented habitat of varying quality and quantity. The PA includes conservation measures to avoid, minimize, and mitigate the adverse effects to the species. Measures such as training construction personnel, implementing pre-construction surveys for species, installing exclusion fencing, etc., will serve to avoid and minimize the specific loss of, injury to, and impairment of individuals of each species. Additionally, proposed compensatory mitigation measures will offset the loss of, disturbance to, and indirect effects to on-site habitats for all of the species.
2. Because the range of each species extends variably beyond the Action Area and are not restricted only to the construction footprint, the resulting adverse effects of the PA (reduced by the aforementioned conservation measures) are not expected to appreciably diminish the likelihood of both the survival and recovery of the listed species in the wild by reducing their reproduction, numbers, or distribution.

After reviewing the current *Status of the Critical Habitat* for delta smelt, California red-legged frog, and vernal pool fairy shrimp critical habitat, the *Environmental Baseline* for the Action Area, the *Effects of the Action*, and the *Cumulative Effects*, it is the Service's biological opinion that the Delta Conveyance Project is not likely to result in destruction or adverse modification to these designated critical habitats based on the following:

1. The small size of the temporary and permanent impacts will not diminish the value of critical habitat as a whole for the conservation of these species.

## 15. INCIDENTAL TAKE STATEMENT

Section 9 of the Act and federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm in the definition of "take" in the Act means an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering (50 CFR 17.3). Harass in the definition of "take" in the



Act means an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding or sheltering (50 CFR 17.3). Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not the purpose of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the proposed protective measures and the terms and conditions of an incidental take statement and occurs as a result of the action as proposed.

The measures described below are non-discretionary and must be undertaken by the Corps so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps (1) fails to assume and implement the terms and conditions or (2) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Corps must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(4)].

The prohibitions against taking found in section 9 of the Act do not apply to the northwestern pond turtle, western spadefoot, and monarch butterfly until the species are listed. However, the Service advises the Corps to consider implementing the following Reasonable and Prudent Measures for these species. If this conference opinion is adopted as a biological opinion following a listing, the Reasonable and Prudent Measures, with their implementing Terms and Conditions, will be non-discretionary.

## **15.1 Amount or Extent of Take**

Due to the implementation of the standard consultation components of the PA, the Service anticipates the following levels of incidental take. Upon implementation of the Reasonable and Prudent Measures and Terms and Conditions, incidental take associated with the Project will become exempt from the prohibitions described under section 9 of the Act.

### **15.1.1 San Joaquin Kit Fox**

The Service anticipates that incidental take of the San Joaquin kit fox will be difficult to detect due to their rare sightings in the northern part of their range, nocturnal behavior and propensity to seek refuge within dens if injured, disturbed or startled. For these reasons, it is not practical to express the amount or extent of anticipated take of this species or monitor take-related impacts in terms of individual San Joaquin kit foxes. Due to the difficulty in quantifying the number of San Joaquin kit foxes that will be subject to incidental take as a result of the PA, the Service is using modeled suitable habitat as a surrogate to quantify incidental take of the species. Therefore, to quantify the level of incidental take associated with the PA, the Service anticipates that all San Joaquin kit foxes within the 55.90 acres of modeled suitable habitat identified in the DCP BA to be permanently or temporarily affected by the construction elements will be subject to incidental take in the form of harm, injury, and death. The amount of habitat disturbance is an appropriate way to measure the anticipated extent of incidental take because this habitat is likely to contain



features that San Joaquin kit fox use for feeding and sheltering (such as burrows and foraging habitat containing prey) and the anticipated take is caused by such disturbance activities. Injury and mortality are anticipated to be low because of the proposed *Conservation Measures* which include limiting noise and lighting impacts and avoidance of occupied dens. The Service will consider the amount or extent of incidental take to be exceeded if modeled suitable habitat is impacted beyond the 55.90 acres identified.

#### **15.1.2 Least Bell's Vireo**

The Service anticipates that incidental take of the least Bell's vireo will be difficult to detect due to their elusive nature and sensitivity to disturbance. Losses of this species may also be difficult to quantify due to a lack of project-specific species and habitat survey data, the long-term nature of the project, and seasonal/annual fluctuations in their numbers due to environmental or human-caused disturbances. For these reasons, it is not practical to express the amount or extent of anticipated take of this species or monitor take-related impacts in terms of individual least Bell's vireo. Due to the difficulty in quantifying the number of vireos that will be taken as a result of the PA, the Service is using modeled suitable habitat affected as a surrogate to quantify incidental take of the species. The amount of suitable habitat as a surrogate is an appropriate way to measure the anticipated extent of incidental take because this habitat is likely to contain features that vireos use for migrating, feeding, nesting, and sheltering and the anticipated take is caused by such disturbance activities. Therefore, to quantify the level of incidental take associated with the PA, the Service anticipates that all cuckoos within the 17.44 acres of modeled suitable habitat identified in the DCP BA to be permanently or temporarily affected by pre-construction and construction activities will be subject to incidental take in the form of harm, injury, or mortality. The Service will consider the amount or extent of incidental take to be exceeded if modeled suitable habitat is impacted beyond the 17.44 acres identified.

#### **15.1.3 Western Yellow-Billed Cuckoo**

The Service anticipates that incidental take of the western yellow-billed cuckoo will be difficult to detect due to their elusive nature and sensitivity to disturbance. Losses of this species may also be difficult to quantify due to a lack of project-specific species and habitat survey data, the long-term nature of the project, and seasonal/annual fluctuations in their numbers due to environmental or human-caused disturbances. For these reasons, it is not practical to express the amount or extent of anticipated take of this species or monitor take-related impacts in terms of individual western yellow-billed cuckoos. Due to the difficulty in quantifying the number of cuckoos that will be taken as a result of the PA, the Service is using modeled suitable habitat as a surrogate to quantify incidental take of the species. The amount of suitable habitat as a surrogate is an appropriate way to measure the anticipated extent of incidental take because this habitat is likely to contain features that cuckoos use for migrating, feeding, and sheltering and the anticipated take is caused by such disturbance activities. This is also likely an overestimate as DWR's modeled habitat and Action Area extend far beyond the actual project footprint. Therefore, to quantify the level of incidental take associated with the PA, the Service anticipates that all cuckoos within the 17.34 acres of modeled suitable habitat identified in the DCP BA to be permanently or temporarily affected by pre-construction and construction activities will be subject to incidental take in the form of harm, injury, or mortality. The Service will consider the

amount or extent of incidental take to be exceeded if modeled suitable habitat is impacted beyond the 17.34 acres identified.

#### **15.1.4 California Red-Legged Frog**

The Service anticipates that incidental take of the California red-legged frog will be difficult to detect due to their cryptic nature and wariness of humans. Losses of this species may also be difficult to quantify due to a lack of project-specific species and habitat survey data, the long-term nature of the project, and seasonal/annual fluctuations in their numbers due to environmental or human-caused disturbances. For these reasons, it is not practical to express the amount or extent of anticipated take of this species or monitor take-related impacts in terms of individual California red-legged frogs. Due to the difficulty in quantifying the number of California red-legged frogs that will be taken as a result of the PA, the Service is using modeled suitable habitat as a surrogate to quantify incidental take of the species. Therefore, to quantify the level of incidental take associated with the PA, the Service anticipates that all California red-legged frogs within the 421.57 acres of modeled suitable habitat identified in the BA to be permanently or temporarily affected by pre-construction and construction activities will be subject to incidental take in the form of harm, injury, or mortality. The amount of habitat disturbance is an appropriate way to measure the anticipated extent of incidental take because this habitat is likely to contain features that California red-legged frogs use for breeding, feeding, and sheltering (such as aquatic features and burrows) and the anticipated take is caused by such disturbance activities. Injury and mortality are anticipated to be low because of the proposed conservation measures which include confining activities to the dry season, limiting light disturbance, and providing escape ramps. The Service will consider the amount or extent of incidental take of California red-legged frog to be exceeded if modeled suitable habitat is impacted beyond the 421.57 acres identified.

#### **15.1.5 California Tiger Salamander**

The Service anticipates that incidental take of the Central California tiger salamander will be difficult to detect due to its cryptic and fossorial nature, and predominantly nocturnal behavior. Losses of this species may also be difficult to quantify due to a lack of project-specific species and habitat survey data, the long-term nature of the project, and seasonal/annual fluctuations in their numbers due to environmental or human-caused disturbances. For these reasons, it is not practical to express the amount or extent of anticipated take of this species or monitor take-related impacts in terms of individual Central California tiger salamanders. Due to the difficulty in quantifying the number of Central California tiger salamanders that will be taken as a result of the PA, the Service is using modeled suitable habitat as a surrogate to quantify incidental take of the species. Therefore, to quantify the level of incidental take associated with the PA, the Service anticipates that all Central California tiger salamanders within the 79.49 acres of modeled suitable habitat identified in the BA to be permanently or temporarily affected by the standard consultation elements will be subject to incidental take in the form of harm, injury, or mortality. The amount of habitat disturbance is an appropriate way to measure the anticipated extent of incidental take because this habitat is likely to contain features that California tiger salamanders use for breeding, feeding, and sheltering (such as aquatic features and burrows) and the anticipated take is caused by such disturbance activities. Injury and mortality are anticipated to

be low because of the proposed conservation measures which include confining activities to the dry season, limiting light disturbance, and providing escape ramps. The Service will consider the amount or extent of incidental take of Central California tiger salamander to be exceeded if modeled suitable habitat is impacted beyond the 79.49 acres identified.

#### **15.1.6 Giant Garter Snake**

The Service anticipates that incidental take of the giant garter snake will be difficult to detect due to their elusive nature, sensitivity to disturbance, and difficulty in detecting them in aquatic environments. Losses of this species may also be difficult to quantify due to a lack of project-specific species and habitat survey data, the long-term nature of the project, and seasonal/annual fluctuations in their numbers due to environmental or human-caused disturbances. For these reasons, it is not practical to express the amount or extent of anticipated take of this species or monitor take-related impacts in terms of individual giant garter snake. Due to the difficulty in quantifying the number of snakes that will be taken as a result of the PA, the Service is using modeled suitable habitat as a surrogate to quantify incidental take of the species. The amount of suitable habitat as a surrogate is an appropriate way to measure the anticipated extent of incidental take because this habitat is likely to contain features that snakes use for movement between habitats, feeding, breeding, and sheltering (brumation and aestivation) and the anticipated take is caused by such disturbance activities. Therefore, to quantify the level of incidental take associated with the PA, the Service anticipates that all snakes within the 132.47 acres of modeled suitable habitat identified in the DCP BA to be permanently or temporarily affected by pre-construction and construction activities will be subject to incidental take in the form of harm, injury, or mortality. The Service will consider the amount or extent of incidental take to be exceeded if modeled suitable habitat is impacted beyond the 132.47 acres identified.

Injury or mortality of giant garter snakes as a result of contact with construction equipment and/or vehicles on the roadways within the modeled suitable habitat can be quantified and monitored. The Service expects that no more than two (2) giant garter snakes will be killed or injured in a single construction year by contact with construction equipment and/or vehicles. The Service will consider the amount or extent of incidental take of giant garter snake to be exceeded if a total of three (3) or more giant garter snakes are killed or injured in a single construction year.

#### **15.1.7 Delta Smelt and Longfin Smelt**

The Service anticipates incidental take of delta and longfin smelt adults, juveniles, larvae, and/or eggs will be difficult to detect and quantify because of the species' small size and cryptic nature and therefore it is not possible to provide precise numbers of smelts that could be harmed, injured, or killed from construction. There are numerical limitations with respect to detecting individual smelts in the wild, for that reason, it is not practical to express the amount or extent of anticipated take of this species or monitor take-related impacts in terms of individual smelts. Due to the difficulty in quantifying the number of smelts that will be taken as a result of the PA, the Service is using habitat within the area of hydroacoustic effects to behavior (as described in the *Effects of the Action* section for impact pile-driving for cofferdams and bridge crossings) as a surrogate to quantify incidental take of the species. Therefore, to quantify the level of incidental

take associated with the construction-related activities, the Service anticipates that all smelts within approximately 240 acres of aquatic habitat near the intakes and bridge crossings will be subject to incidental take in the form of harm from interference or impairment of essential behavior patterns, injury, or mortality. Injury and mortality are anticipated to be low because of the in-water work window restrictions for the smelts. The Service will consider the amount or extent of incidental take of delta smelt to be exceeded if aquatic habitat is impacted beyond the 240 acres identified.

#### **15.1.8 Valley Elderberry Longhorn Beetle**

Valley elderberry longhorn beetles are small in size, and their life cycles and patchy habitats make detection difficult and the quantification of impacts to individual valley elderberry longhorn beetles impractical in addition to a lack of project-specific species and habitat survey data. Due to the difficulty in quantifying the number of valley elderberry longhorn beetles that will be subject to incidental take as a result of the PA, the Service is using modeled suitable habitat as a surrogate to quantify incidental take of the species. Therefore, to quantify the level of incidental take associated with the PA, the Service anticipates that all valley elderberry longhorn beetles within the 78.03 acres of modeled suitable habitat identified in the BA to be permanently or temporarily affected by pre-construction and construction activities will be subject to incidental take in the form of harm, harassment, and mortality. The amount of habitat disturbance is an appropriate way to measure the anticipated extent of incidental take because this habitat is likely to contain elderberry shrubs that valley elderberry longhorn beetle use for breeding, feeding, and sheltering and the anticipated take is caused by such disturbance activities. Injury and mortality are anticipated to be low because of the proposed conservation measures which include avoiding disturbance to (if possible) or transplanting elderberry shrubs and avoiding construction activities during the active season (if possible). The Service will consider the amount or extent of incidental take to be exceeded if modeled suitable habitat is impacted beyond the 78.03 acres identified.

#### **15.1.9 Vernal Pool Fairy Shrimp and Vernal Pool Tadpole Shrimp**

The Service uses habitat as a surrogate to quantify the amount of take when assessing the impacts of actions to both vernal pool fairy shrimp and vernal pool tadpole shrimp. The amount of habitat disturbance is an appropriate way to measure the anticipated extent of incidental take because this habitat is likely to contain the features that vernal pool fairy shrimp and vernal pool tadpole shrimp use for breeding, feeding, and sheltering and the anticipated take is caused by such disturbance activities. Both species of vernal pool crustaceans are small in size, and their complex life cycles and ephemeral habitats make detection difficult and the quantification of impacts to individual vernal pool fairy shrimp and vernal pool tadpole shrimp impractical. Due to the difficulty in quantifying the number of vernal pool fairy shrimp and vernal pool tadpole shrimp that will be taken as a result of the PA, the Service is quantifying incidental take of the fairy shrimp and tadpole shrimp in the form of harm, capture, collect, and mortality as all fairy and tadpole shrimp within the 15.06 acres of modeled suitable habitat identified in the BA to be permanently or temporarily affected by pre-construction and construction activities. The Service will consider the amount or extent of incidental take to be exceeded if modeled suitable habitat is impacted beyond the 15.06 acres identified.

#### **15.1.10 Northwestern Pond Turtle**

The Service anticipates that incidental take of the northwestern pond turtle will be difficult to detect due to their elusive nature, sensitivity to disturbance, and difficulty in detecting them in aquatic environments. Losses of this species may also be difficult to quantify due to a lack of project-specific species and habitat survey data, the long-term nature of the project, and seasonal/annual fluctuations in their numbers due to environmental or human-caused disturbances. For these reasons, it is not practical to express the amount or extent of anticipated take of this species or monitor take-related impacts in terms of individual northwestern pond turtle. Due to the difficulty in quantifying the number of turtles that will be taken as a result of the PA, the Service is using modeled suitable habitat as a surrogate to quantify incidental take of the species. The amount of suitable habitat as a surrogate is an appropriate way to measure the anticipated extent of incidental take because this habitat is likely to contain features that turtles use for movement between habitats, feeding, breeding, nesting, and sheltering (brumation and aestivation) and the anticipated take is caused by such disturbance activities. Therefore, to quantify the level of incidental take associated with the PA, the Service anticipates that all turtles within the 223.60 acres of modeled suitable habitat identified in the DCP BA to be permanently or temporarily affected by pre-construction and construction activities will be subject to incidental take in the form of harm, injury, or mortality. The Service will consider the amount or extent of incidental take of northwestern pond turtles to be exceeded if modeled suitable habitat is impacted beyond the 223.60 acres identified.

Injury or mortality of northwestern pond turtles as a result of contact with construction equipment and/or vehicles on the roadways within the modeled suitable habitat can be quantified and monitored. The Service expects that no more than two (2) northwestern pond turtles will be killed or injured in a single construction year by contact with construction equipment and/or vehicles. The Service will consider the amount or extent of incidental take of northwestern pond turtles to be exceeded if a total of three (3) or more northwestern pond turtles are killed or injured in a single construction year. Additionally, nest failure may occur from construction activities or nest relocation. The Service expects no more than eggs in one (1) nest will be killed in a single construction year. The Service will consider the amount or extent of incidental take of northwestern pond turtles to be exceeded if eggs in a total of two (2) nests or more are killed or injured in a single construction year.

#### **15.1.11 Western Spadefoot**

The Service anticipates that incidental take of the western spadefoot will be difficult to detect due to their cryptic nature and wariness of humans. Losses of this species may also be difficult to quantify due to a lack of project-specific species and habitat survey data, the long-term nature of the project, and seasonal/annual fluctuations in their numbers due to environmental or human-caused disturbances. For these reasons, it is not practical to express the amount or extent of anticipated take of this species or monitor take-related impacts in terms of individual western spadefoots. Due to the difficulty in quantifying the number of western spadefoots that will be taken as a result of the PA, the Service is using modeled suitable habitat as a surrogate to quantify incidental take of the species. Therefore, to quantify the level of incidental take associated with the PA, the Service anticipates that all western spadefoots within the 37.44 acres of modeled suitable habitat identified in the DCP BA to be permanently or temporarily affected



by pre-construction and construction activities will be subject to incidental take in the form of harm, injury, or mortality. The amount of habitat disturbance is an appropriate way to measure the anticipated extent of incidental take because this habitat is likely to contain features that western spadefoots use for breeding, feeding, and sheltering (such as aquatic features and burrows) and the anticipated take is caused by such disturbance activities. Injury and mortality are anticipated to be low because of the proposed conservation measures which include confining activities to the dry season, limiting light disturbance, and providing escape ramps. The Service will consider the amount or extent of incidental take of western spadefoots to be exceeded if modeled suitable habitat is impacted beyond the 37.44 acres identified.

#### **15.1.12 Monarch Butterfly**

The Service anticipates that incidental take of the monarch butterfly will be difficult to estimate since the number of individuals in each life stage could vary from a few individuals to hundreds. Losses of this species may also be difficult to quantify due to a lack of project-specific species and habitat survey data, the long-term nature of the project, and seasonal/annual fluctuations in their numbers due to environmental or human-caused disturbances. For these reasons, it is not practical to express the amount or extent of anticipated take of this species or monitor take-related impacts in terms of individuals. Due to the difficulty in quantifying the number of monarch butterflies that will be taken as a result of the PA, the Service is using modeled suitable habitat as a surrogate to quantify incidental take of the species. Therefore, to quantify the level of incidental take associated with the PA, the Service anticipates that all monarch butterflies (all life stages) within the 727.3 acres of modeled suitable habitat identified in the DCP BA to be permanently or temporarily affected by pre-construction and construction activities will be subject to incidental take in the form of harm, injury, or mortality. The amount of habitat disturbance is an appropriate way to measure the anticipated extent of incidental take because this habitat is likely to contain features that monarch butterflies use for their life cycle and the anticipated take is caused by such disturbance activities. The Service will consider the amount or extent of incidental take of monarch butterflies to be exceeded if modeled suitable habitat is impacted beyond the 727.3 acres identified.

### **15.2 Effect of the Take**

In the accompanying biological and conference opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the San Joaquin kit fox, least Bell's vireo, western yellow-billed cuckoo, California red-legged frog, California tiger salamander, giant garter snake, delta smelt, longfin smelt, valley elderberry longhorn beetle, vernal pool fairy shrimp, vernal pool tadpole shrimp, northwestern pond turtle, western spadefoot, and monarch butterfly.

### **15.3 Reasonable and Prudent Measures**

All necessary and appropriate measures to avoid or minimize effects on the San Joaquin kit fox, least Bell's vireo, western yellow-billed cuckoo, California red-legged frog, California tiger salamander, giant garter snake, delta smelt, longfin smelt, valley elderberry longhorn beetle, vernal pool fairy shrimp, vernal pool tadpole shrimp, northwestern pond turtle, western



spadefoot, and monarch butterfly resulting from construction of the DCP have been incorporated into the proposed conservation measures. Therefore, the Service believes the following reasonable and prudent measure is necessary and appropriate to minimize incidental take of the San Joaquin kit fox, least Bell's vireo, western yellow-billed cuckoo, California red-legged frog, California tiger salamander, giant garter snake, delta smelt, longfin smelt, valley elderberry longhorn beetle, vernal pool fairy shrimp, vernal pool tadpole shrimp, northwestern pond turtle, western spadefoot, and monarch butterfly:

1. All *Conservation Measures* and reporting, as described in the BA and appendices and restated/summarized here in the *Description of the Proposed Action* section of this biological opinion, shall be fully implemented and adhered to. Further, this reasonable and prudent measure shall be supplemented by the terms and conditions below.

#### 15.4 Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the Corps shall ensure DWR, as the applicant, complies with the following terms and conditions, which implement the reasonable and prudent measure described above. These terms and conditions are nondiscretionary.

1. The following Terms and Conditions implement Reasonable and Prudent Measure 1:
  - a. The Corps and/or DWR shall educate and inform personnel involved in the PA as to the *Conservation Measures* as referenced above and *Term and Condition* in this biological opinion and ensure compliance with this BiOp.
  - b. The Corps and/or DWR shall notify the Service at least 30 days in advance of commencement of in-water work associated with construction activities. This notification shall include details regarding timing, duration, location, and extent of activities.
  - c. At least 45 days prior to the onset of any construction-related activities, the Corps or DWR shall submit to the Service, for approval, the name(s) and credentials of biologist(s) it requests to conduct activities specified for this project. Information included in a request for authorization must include, at a minimum: (1) relevant education; (2) relevant training on species identification, survey techniques, handling individuals of different age classes, and handling of different life stages by a permitted biologist or recognized species expert authorized for such activities by the Service; (3) a summary of field experience conducting requested activities (to include project/research information and actual experience with the species); (4) a summary of biological opinions and/or informal consultations under which they were authorized to work with the listed species and at what level (such as construction monitoring versus handling), this should also include the names and qualifications of persons under which the work was supervised as well as the amount of work experience on the actual project including detail on whether the species was encountered or not; and (5) a list of Federal Recovery Permits [10(a)1(A)] if any, held or under which individuals are authorized to work with the species (to include permit number, authorized activities, and name of permit holder). No project

activities shall begin until DWR and/or the Corps has received written Service approval for biologists to conduct specified activities.

- d. The Corps and/or DWR shall provide the Service and appropriate agencies a draft of any Site Protection Instrument for review and approval. Any Site Protection Instrument for federally-listed species shall adhere to the Service's current guidance and policy regarding compensatory mitigation and shall include a management plan and financial assurances to manage the property in perpetuity.
- e. The Corps and/or DWR, shall ensure its contractors comply with the *Reporting Requirements* below.

### 15.5 Reporting Requirements

In order to monitor whether the amount or extent of incidental take anticipated from implementation of the PA is approached or exceeded, the Corps, through DWR and through DWR's contractors, shall adhere to the following reporting requirements. Should this anticipated amount or extent of incidental take be exceeded, the Corps must reinitiate formal consultation as per 50 CFR 402.16.

1. The Service must be notified within 24 hours of the finding of any injured or dead listed species or any unanticipated damage to its habitat associated with the PA. When an injured or dead individual of the listed species is found, the Corps shall follow the steps outlined in the *Salvage and Disposition of Individuals Taken* section below.
2. Sightings of any listed or sensitive animal species shall be reported to the Service and CNDDDB (<https://www.wildlife.ca.gov/Data/BIOS>).

### 15.6 Salvage and Dispositions of Individuals

Injured listed species must be cared for by a licensed veterinarian or other qualified person(s), such as the Service-approved biologist. Dead individuals must be sealed in a resealable plastic bag containing a paper with the date and time when the animal was found, the location where it was found, and the name of the person who found it, and the bag containing the specimen frozen in a freezer located in a secure site, until instructions are received from the Service regarding the disposition of the dead specimen. The Service contact person is the Assistant Field Supervisor of the Endangered Species Division at (916) 930-2664.

## 16. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a PA on listed species or critical habitat, to help implement recovery plans, or to develop information. The Service recommends the following actions:

1. Participate in recovery planning and implementation of conservation actions consistent with recovery planning documents.

2. Evaluate mitigation sites for long-term viability under projected climate change scenarios to ensure sustainable conservation outcomes.
3. Define measurable performance standards (e.g., habitat function, species presence) for all compensatory mitigation projects to assess ecological success effectively.
4. Foster partnerships with other agencies and entities to align mitigation efforts and reduce duplication or conflict.
5. Develop an Integrated Pest Management (IPM) approach for managing invasive species (e.g., bullfrogs, non-native fish, invasive plants) that degrade habitat quality for listed species as part of restoration designs for future projects. Coordinate with California Department of State Parks Division of Boating and Waterways to establish an IPM program for managing invasive plant species within restoration sites.
6. In support of monarch butterfly conservation, the Corps and DWR are encouraged to plant native milkweed and regionally appropriate nectar sources in non-operational or mitigation lands and along rights-of-way. Use of herbicides and insecticides should be avoided and minimized in these areas to reduce harm to pollinators.
7. To improve conservation outcomes, the agencies are encouraged to collaborate with the Service and local conservation partners on species and habitat monitoring efforts, data sharing, and adaptive management approaches that respond to observed trends.
8. The Corps and DWR are encouraged to design future studies and monitoring modifications to existing monitoring programs to maximize multi-species benefits, including integrating habitat, water quality, and biological metrics that can inform conservation and recovery efforts for multiple listed species and species of concern simultaneously.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

## **17. REINITIATION — CLOSING STATEMENT**

This concludes formal consultation and conference on the Delta Conveyance Project. You may ask the Service to confirm the conference opinion as a biological opinion issued through formal consultation if the northwestern pond turtle, or monarch butterfly, is listed. The request must be in writing. If the Service reviews the PA and finds that there have been no significant changes in the action as planned or in the information used during the conference, the Service will confirm the conference opinion as the biological opinion on the proposed project and no further section 7 consultation will be necessary. As provided in 50 CFR §402.16,

(a) Reinitiation of consultation is required and shall be requested by the Federal agency, where discretionary Federal involvement or control over the action has been retained or is authorized by law and:

- (1) If the amount or extent of taking specified in the incidental take statement is exceeded;
- (2) If new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered;
- (3) If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion or written concurrence; or
- (4) If a new species is listed or critical habitat designated that may be affected by the identified action.

(b) An agency shall not be required to reinitiate consultation after the approval of a land management plan prepared pursuant to 43 U.S.C. 1712 or 16 U.S.C. 1604 upon listing of a new species or designation of new critical habitat if the land management plan has been adopted by the agency as of the date of listing or designation, provided that any authorized actions that may affect the newly listed species or designated critical habitat will be addressed through a separate action-specific consultation. This exception to reinitiation of consultation shall not apply to those land management plans prepared pursuant to 16 U.S.C. 1604 if:

- (1) Fifteen years have passed since the date the agency adopted the land management plan prepared pursuant to 16 U.S.C. 1604; and
- (2) Five years have passed since the enactment of Public Law 115-141 [March 23, 2018] or the date of the listing of a species or the designation of critical habitat, whichever is later.

The incidental take statement provided in this conference opinion for the northwestern pond turtle, western spadefoot, and monarch butterfly does not become effective until the northwestern pond turtle, western spadefoot, or monarch butterfly is listed and the conference opinion is adopted as the biological opinion issued through formal consultation. At that time, the PA will be reviewed to determine whether any take of the northwestern pond turtle, western spadefoot, or monarch butterfly, has occurred or will occur. Modifications of the opinion and incidental take statement may be appropriate to reflect that take. No take of the northwestern pond turtle, western spadefoot, or monarch butterfly may occur between the listing of species and the adoption of the conference opinion through formal consultation, or the completion of a subsequent formal consultation.

Please address any questions or concerns regarding this biological opinion to Kim Squires, Section 7 Division Manager, at [Kim\\_Squires@fws.gov](mailto:Kim_Squires@fws.gov). Please refer to Service file number 2024-0029957-S7-001 in any future correspondence regarding this project.

Sincerely,

Heather Swinney  
Acting Field Supervisor

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UNITED STATES DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
NATIONAL MARINE FISHERIES SERVICE  
West Coast Region, California Central Valley Office  
650 Capitol Mall, Suite 5-100  
SACRAMENTO, CA 95814-4700

Refer to NMFS ECO #: WCRO-2025-03493

May 29, 2026

Michael S. Jewell  
Chief, Regulatory Division  
U.S. Army Corps of Engineers  
1325 J Street  
Sacramento, CA 95814

Re: Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens  
Fishery Conservation and Management Act Essential Fish Habitat Response for the Delta  
Conveyance Project

Dear Mr. Jewell:

Thank you for your letter, dated August 22, 2025, requesting initiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) for the Delta Conveyance Project.

This document transmits NMFS's final biological opinion (opinion) based on information provided in the U.S. Army Corps of Engineer's (Corps), and the applicant's, California Department of Water Resources (DWR), final biological assessment and associated attachments and appendices.

Thank you also for your request for essential fish habitat (EFH) consultation. NMFS also reviewed the proposed action for potential effects on EFH designated under the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1855(b)). This review was pursuant to section 305(b) of the MSA, implementing regulations at 50 CFR 600.920, and agency guidance for use of the ESA consultation process to complete EFH consultation. NMFS concluded that the action would adversely affect EFH designated under the Pacific Salmon Fishery Management Plan (FMP), and the Pacific Groundfish FMP. However, conservation recommendations were not provided since NMFS determined the proposed project adequately addressed, mitigated, or offset the adverse impacts. The results of EFH consultation are contained herein.

Based on the best scientific and commercial information, the biological opinion concludes that the proposed action as described in the Biological Assessment for the Delta Conveyance Project is not likely to jeopardize the continued existence of the federally listed: Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, California Central Valley steelhead, and the southern Distinct Population Segment of North American green



sturgeon; and is not likely to destroy or adversely modify their designated critical habitats. For the above species, NMFS has included an incidental take statement with reasonable and prudent measures and terms and conditions that are necessary and appropriate to avoid, minimize, or monitor incidental take of listed species associated with the proposed action. The Corps has informed NMFS of their analysis and “No Effect” determination for the Southern Resident killer whale. The Corps is not seeking consultation for killer whale and the species is therefore not included in the biological opinion.

Please contact me if you have any questions concerning this consultation, or if you require additional information.

Sincerely,

A handwritten signature in black ink that reads "A. Catharine Marcinkevage". The signature is written in a cursive, flowing style.

Cathy Marcinkevage  
Assistant Regional Administrator for  
California Central Valley Office

Enclosure

cc: To the file ARN 151422-WCR2024-SA00024  
Carolyn Buckman, DWR, [Carolyn.Buckman@water.ca.gov](mailto:Carolyn.Buckman@water.ca.gov)



**UNITED STATES DEPARTMENT OF COMMERCE**  
**National Oceanic and Atmospheric Administration**  
NATIONAL MARINE FISHERIES SERVICE  
West Coast Region, California Central Valley Office  
650 Capitol Mall, Suite 5-100  
SACRAMENTO, CA 95814

**Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Magnuson–Stevens  
Fishery Conservation and Management Act Essential Fish Habitat Response**

Delta Conveyance Project  
NMFS Consultation ECO Number: WCRO-2025-03493

Action Agency: U.S. Army Corps of Engineers

**Affected Species and NMFS' Determinations:**

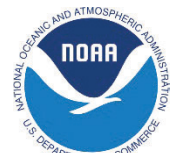
| ESA-Listed Species                                                                                     | Status     | Is Action Likely to Adversely Affect Species? | If likely to adversely affect, Is Action Likely to Jeopardize the Species? | Is Action Likely to Adversely Affect Critical Habitat? | If likely to adversely affect, is Action Likely to Destroy or Adversely Modify Critical Habitat? |
|--------------------------------------------------------------------------------------------------------|------------|-----------------------------------------------|----------------------------------------------------------------------------|--------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| Sacramento River winter-run Chinook salmon ( <i>Oncorhynchus tshawytscha</i> )                         | Endangered | Yes                                           | No                                                                         | Yes                                                    | No                                                                                               |
| Central Valley spring-run Chinook salmon ( <i>O. tshawytscha</i> )                                     | Threatened | Yes                                           | No                                                                         | Yes                                                    | No                                                                                               |
| Central Valley Steelhead ( <i>O. mykiss</i> )                                                          | Threatened | Yes                                           | No                                                                         | Yes                                                    | No                                                                                               |
| Southern Distinct Population Segment of North American green sturgeon ( <i>Acipenser medirostris</i> ) | Threatened | Yes                                           | No                                                                         | Yes                                                    | No                                                                                               |

| Fishery Management Plan That Identifies EFH in the Project Area | Does Action Have an Adverse Effect on EFH? | Are EFH Conservation Recommendations Provided? |
|-----------------------------------------------------------------|--------------------------------------------|------------------------------------------------|
| Pacific Coast Salmon                                            | Yes                                        | No                                             |
| Pacific Coast Groundfish                                        | Yes                                        | No                                             |

**Consultation Conducted By:** National Marine Fisheries Service, West Coast Region

**Issued By:** A. Catharine Marcinkevage  
Cathy Marcinkevage  
Assistant Regional Administrator for California Central Valley Office

**Date:** May 29, 2026



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## Acronym List

|             |                                                          |
|-------------|----------------------------------------------------------|
| ACID        | Anderson-Cottonwood Irrigation Dam                       |
| AMMs        | Avoidance and Minimization Measures                      |
| BA          | Biological Assessment                                    |
| BMPs        | Best Management Practices                                |
| CCV         | California Central Valley                                |
| CCWD        | Contra Costa Water District                              |
| CDFW        | California Department of Fish and Wildlife               |
| CESA        | California Endangered Species Act                        |
| CFR         | Code of Federal Regulations                              |
| cfs         | Cubic feet per second                                    |
| CMP         | Compensatory Mitigation Plan                             |
| COA         | Coordinated Operation Agreement                          |
| Corps/USACE | U.S. Army Corps of Engineers                             |
| CV          | Central Valley                                           |
| CVP         | Central Valley Project                                   |
| CVPIA       | Central Valley Project Improvement Act                   |
| CWT         | Coded Wire Tag                                           |
| dB          | Decibels                                                 |
| DCP         | Delta Conveyance Project                                 |
| Delta       | Sacramento-San Joaquin River Delta                       |
| DIDSON      | Dual-Frequency Identification Sonar                      |
| DPS         | Distinct Population Segment                              |
| DQA         | Data Quality Act                                         |
| DWR         | California Department of Water Resources                 |
| EFH         | Essential Fish Habitat                                   |
| EPA         | Environmental Protection Agency                          |
| ESA         | Endangered Species Act                                   |
| ESU         | Evolutionarily Significant Unit                          |
| FEIR        | Final Environmental Impact Report                        |
| FERC        | Federal Energy Regulatory Commission                     |
| FHWG        | Fisheries Hydroacoustic Working Group                    |
| FMP         | Fishery Management Plan                                  |
| FR          | Federal Register                                         |
| FRFH        | Feather River Fish Hatchery                              |
| HAPC        | Habitat Area of Particular Concern                       |
| ITP         | Incidental Take Permit                                   |
| LSNFH       | Livingston Stone National Fish Hatchery                  |
| LTO         | Long-term Operation                                      |
| MSA         | Magnuson–Stevens Fishery Conservation and Management Act |
| NEP         | Non-essential experimental population                    |
| NMFS        | National Marine Fisheries Service                        |
| NOAA        | National Oceanic and Atmospheric Administration          |
| NTU         | Nephelometric Turbidity Unit                             |
| μPa         | micropascal                                              |

|             |                                                            |
|-------------|------------------------------------------------------------|
| PA          | Proposed Action                                            |
| PAHs        | polycyclic aromatic hydrocarbons                           |
| PBF         | physical or biological features                            |
| PCB         | polychlorinated biphenyls                                  |
| PCE         | primary constituent element                                |
| PG&E        | Pacific Gas and Electric Company                           |
| Reclamation | U.S. Bureau of Reclamation                                 |
| RPM         | Reasonable and Prudent Measure                             |
| RTM         | Reusable Tunnel Material                                   |
| SAIL        | Salmon and Sturgeon Assessment of Indicators by Life Stage |
| SCARF       | Salmon Conservation and Research Facility                  |
| sDPS        | Southern Distinct Population Segment                       |
| SEL         | sound exposure level                                       |
| SEP         | Scientific Evaluation Process                              |
| SJRRP       | San Joaquin River Restoration Program                      |
| SR          | Sacramento River                                           |
| SRKW        | Southern Resident Killer Whale                             |
| SRWTP       | Sacramento Regional Wastewater Treatment Plant             |
| SWFSC       | Southwest Fisheries Science Center                         |
| SWP         | State Water Project                                        |
| TBM         | Tunnel Boring Machine                                      |
| USFWS       | U.S. Fish and Wildlife Service                             |
| WQCP        | Water Quality Control Plan                                 |

## **1. INTRODUCTION**

This Introduction section provides information relevant to the other sections of this document and is incorporated by reference into Sections 2 and 3, below.

### **1.1. Background**

The National Marine Fisheries Service (NMFS) prepared the biological opinion (opinion) and incidental take statement (ITS) portions of this document in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531 et seq.), as amended, and implementing regulations at 50 CFR part 402.

We also completed an essential fish habitat (EFH) consultation on the proposed action, in accordance with section 305(b)(2) of the Magnuson–Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801 et seq.) and implementing regulations at 50 CFR part 600.

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (DQA) (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The document will be available within 2 weeks at the NOAA Library Institutional Repository [<https://repository.library.noaa.gov/welcome>]. A complete record of this consultation is on file at the Sacramento NMFS Office.

### **1.2. Consultation History**

From January 2020 to the issuance of this consultation, DWR and the Corps convened a series of weekly and monthly multi-agency coordination and technical meetings to develop the final BA. The following section outlines key milestones in the consultation history for the DCP.

On May 19, 2022, the Corps and DWR requested agency review of their draft BA and other materials intended to support their Incidental Take Permit (ITP) application to the California Department of Fish and Wildlife (CDFW).

On June 8, 2022, NMFS provided preliminary, high-level, written comments via email to the Corps and DWR on relevant portions of the draft BA chapters and appendices.

On August 23, 2022, the Corps and DWR requested agency review of additional draft BA and ITP application sections.

On October 14, 2022, NMFS provided written comments via email to the Corps and DWR in response to the August 23, 2022, request for review. In addition, NMFS provided more detailed comments on the relevant chapters and appendices in response to the May 19, 2022, request for review.



On October 23, 2023, the Corps and DWR notified NMFS that their administrative draft BA for construction of DCP was available for review.

On December 8, 2023, NMFS provided written comments via email to the Corps and DWR on the administrative draft BA for construction of DCP.

On May 15, 2024, the Corps requested initiation of formal consultation for a Department of the Army permit application, Section 408 permission request, and real estate easement for DCP.

On June 14, 2024, NMFS requested the opportunity to discuss a mutually agreed upon extension of the consultation period with the Corps and DWR.

On February 21, 2025, NMFS provided written comments on the BA to the Corps and DWR and requested additional information.

From March 2025 through July 2025, the Corps and DWR held biweekly interagency discussions to address written comments and outline additional information to be provided in response to NMFS' February 21, 2025, request.

On July 22, 2025, NMFS requested that the Corps and DWR submit a revised BA that incorporates additional information and revisions responding to NMFS' written comments and clarifies the proposed consultation approach.

On August 22, 2025, the Corps and DWR provided NMFS with a revised BA. NMFS determined there was sufficient information to initiate consultation.

From October 1, 2025, through November 12, 2025, the consultation was held in abeyance for 43 days due to a lapse in appropriations and resulting government shutdown.

On February 6-11, 2026, NMFS recommended the Corps include SRKW in the consultation request. On February 17-18, 2026, the Corps informed NMFS that they determined the proposed action would have "No Effect" on SRKW and clarified they are not seeking ESA section 7 consultation for SRKW. Accordingly, NMFS has not included SRKW in this consultation (CCVO 2026<sup>1</sup>). The applicant, DWR, included an effects analysis and "not likely to adversely affect" (NLAA) determination for SRKW in the BA.

On March 30, 2026, in *Center for Biological Diversity v. Burgum*, No. 24-cv-04651 (N.D. Cal.), the U.S. District Court for the Northern District of California vacated aspects of four provisions from the 50 CFR part 402 regulations governing interagency consultation under section 7 of the Endangered Species Act and reinstated the provisions that were previously in effect. Consistent with the Court's ruling, these are the governing provisions for this consultation:

"Destruction or adverse modification means a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to

---

<sup>1</sup> California Central Valley Office (CCVO) staff. 2026. Memorandum to the Administrative Record for the Delta Conveyance Project through Cathy Macinkevage, Assistant Regional Administrator, CCVO, West Coast Region.

the conservation of a species or that preclude or significantly delay development of such features.” (50 CFR 402.02 (2018)).

“Effects of the action refers to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration.”<sup>2</sup> (50 CFR 402.02 (2018)).

50 CFR 402.14(g)(8): “In formulating its biological opinion, any reasonable and prudent alternatives, and any reasonable and prudent measures, the Service will use the best scientific and commercial data available and will give appropriate consideration to any beneficial actions taken by the Federal agency or applicant, including any actions taken prior to the initiation of consultation.” (50 CFR 402.14(g)(8) (2018)).

50 CFR 402.16(a): “(a) Reinitiation of consultation is required and shall be requested by the Federal agency or by the Service, where discretionary Federal involvement or control over the action has been retained or is authorized by law and . . . .” (50 CFR 402.16(a) (2023)).

### **1.3. Proposed Federal Action**

Under the ESA, “action” means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by federal agencies (see 50 CFR 402.02). We considered, under the ESA, whether or not the proposed action would cause any other interrelated or interdependent actions. “Interrelated actions” are those that are part of a larger action and depend on the larger action for their justification. “Interdependent actions” are those that have no independent utility apart from the action under consideration (50 CFR 402.02). NMFS has not identified any activities that are interrelated or interdependent with the proposed action as described in the BA.

Under the MSA, “federal action” means any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by a federal agency (see 50 CFR 600.910).]

This opinion is in response to the U.S. Army Corps of Engineers’ (Corps) request for formal consultation with the National Marine Fisheries Service (NMFS) on their issuance of a

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<sup>2</sup> This definition includes the second sentence of the definition of “effects of the action.” That sentence provided the definition of “environmental baseline” in effect as of 2018. In the 2019 rule amending the 50 CFR part 402 regulations, the Services established “environmental baseline” as a stand alone definition. 84 Fed. Reg. 44976, 45016 (August 27, 2019). In the 2024 rule, the Services made minor revisions to the “environmental baseline” definition. 89 Fed. Reg. 24268, 24298 (April 5, 2024). The Court’s ruling did not touch upon that definition of “environmental baseline,” and it therefore remains valid. The definition is also fully consistent with the definition of “effects of the action” from 2018.

Department of the Army permit application, Section 408 permission request, and real estate easement for the construction of California Department of Water Resources' (DWR) proposed Delta Conveyance Project (DCP/Proposed Action [PA]).

The Corps is proposing to issue permits to DWR for the construction of new facilities, including new points of diversion. These proposed new facilities would work in conjunction with and modify the existing State Water Project (SWP). Ultimately, modifications to and operation of the SWP would continue to be coordinated with the federal Central Valley Project (CVP) operated by the U.S. Bureau of Reclamation (Reclamation). Neither the SWP or CVP operations are within Corps jurisdiction. On December 6, 2024, NMFS issued an opinion for the Long-Term Operations of the CVP and SWP (2024 LTO opinion; NMFS 2024a) to Reclamation. NMFS also completed a separate consultation for essential fish habitat (EFH) under the MSA on April 14, 2025 (NMFS 2025). The 2024 LTO opinion included a framework-level programmatic component to evaluate the potential impacts of the proposed future operations of the DCP on federally listed species and designated critical habitat. As part of this framework, Reclamation committed to initiating additional consultations in the future to address both near-field and far-field effects of the DCP operations, providing detailed information at that time for site-specific analyses. This current consultation, proposed by the Corps, includes construction and pre-operations maintenance (i.e., the non-operational components), which were not included in the 2024 LTO opinion.

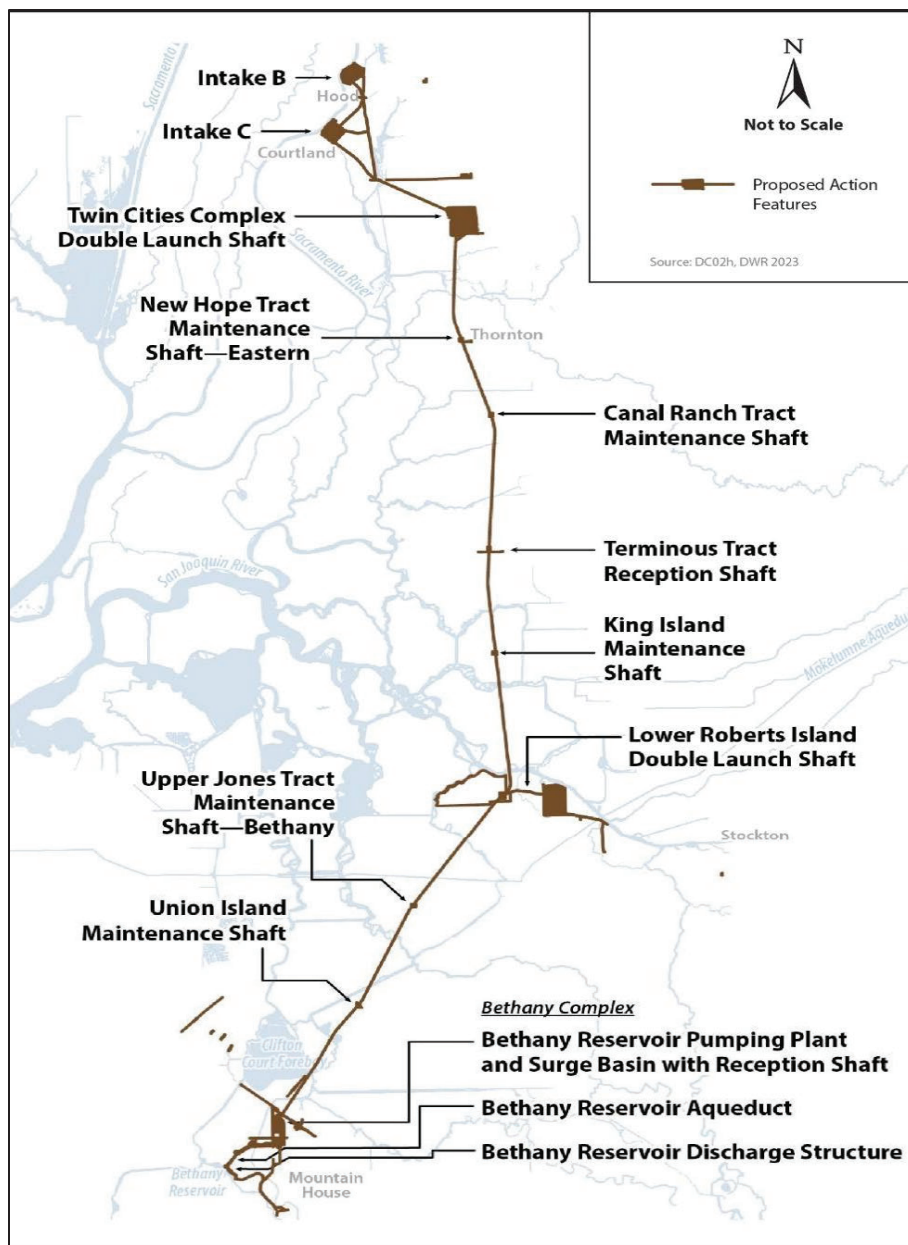
On February 14, 2025, the California Department of Fish and Wildlife (CDFW) issued an Incidental Take Permit (ITP) to DWR, pursuant to the California Endangered Species Act, for the construction and operation of the DCP (herein referred to as the 2025 ITP; CDFW 2025).

Construction for the proposed action (refer to Section 1.3 of this opinion) is anticipated to occur over approximately 13 years. Therefore, for the purposes of this consultation, project-specific effects associated with the construction of DCP facilities, including in-water work, as well as both temporary and permanent construction-related impacts, will be assessed in this biological opinion. Operations and maintenance-related effects which include near- and far-field effects within the Sacramento River, and potential associated effects to aquatic biological resources are evaluated within this opinion. However, this opinion does not provide exemption for incidental take prohibitions for effects associated with the north Delta diversion intake operations and maintenance. Before operation commences, incidental take for the operations and maintenance of the DCP will be assessed in a future ESA consultation which, as described in the programmatic 2024 LTO opinion, would be combined with or tiered off of that consultation. Once constructed, the DCP operations will be part of the SWP's integrated water delivery system and therefore would be considered within the SWP and CVP long-term operations as a part of the SWP Delta operations subject to the Reclamation and DWR Coordinated Operations Agreement (COA). In this opinion, NMFS evaluated the proposed action as a "mixed programmatic" action since it includes some framework-level action components that will be subject to subsequent future tiered project-level ESA section 7 consultation. For more details, refer to Section 3 Analytical Approach.

### **1.3.1. Summary of the Construction for the Proposed Action**

The DCP construction is described in the BA, Chapter 3 (ICF 2025), and is incorporated here by reference. The PA includes construction of water diversion Intakes B and C that would convey up to 3,000 cubic feet per second (cfs) individually, for a total of up to 6,000 cfs of water from the Sacramento River in the north Delta (Figure 1). From Intakes B and C (refer to Figure 1), the underground tunnel alignment would then follow a southernly route to:

- Twin Cities Complex double launch shaft
- New Hope Tract maintenance shaft
- Canal Ranch Tract maintenance shaft
- Terminus Tract reception shaft
- King Island maintenance shaft
- tunnel under Ridge Tract
- Lower Roberts Island double launch shaft
- Upper Jones Tract maintenance shaft
- tunnel under Lower Jones Tract
- tunnel under Victoria Island
- Union Island maintenance shaft
- tunnel under Coney Island, and
- Clifton Court Tract to the Bethany Complex's Surge Basin reception shaft



**Figure 1.** Overview of the Proposed Project facilities that will be constructed within the Sacramento- San Joaquin River Delta Figure from the BA (ICF 2025).

The proposed action includes constructing a new Bethany Reservoir Pumping Plant and Surge Basin located to the south of Clifton Court Forebay, and a new Bethany Reservoir Aqueduct that conveys flows to a new Bethany Reservoir Discharge Structure on the shore of Bethany Reservoir. The aqueduct would consist of four pipelines including tunneled segments under the existing Central Valley Project C. W. “Bill” Jones Pumping Plant (Jones Pumping Plant) discharge pipelines and existing conservation easements adjacent to Bethany Reservoir. Collectively, these facilities are called the Bethany Complex.



The tunnel from the intakes to the Bethany Complex would have an inside diameter of 36 feet and outside diameter of 39 feet and extend approximately 45 miles from the intakes to the surge basin at the Bethany Reservoir Pumping Plant. The Twin Cities double shaft will be used to bore one tunnel north to the intake shafts and one south to the Terminous Tract reception shaft. Lower Roberts Island would have a double launch shaft, which would allow one tunnel boring machine (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. New shaft pads would be constructed of soil excavated from either the shaft site or nearby shaft sites. Excess soil from excavation at the Twin Cities Complex would provide soil for the Twin Cities tunnel launch shaft pad and shaft pads at New Hope Tract, Canal Ranch Tract, Terminous Tract, and King Island. Similarly, soil from Lower Roberts Island would be used to construct Upper Jones Tract and Union Island shaft pads.

Delivery of tunnel segments, Tunnel Boring Machines (TBM), other soil materials, and equipment would occur by road. Rail lines would also be used to deliver tunnel segments to the Lower Roberts Island tunnel launch shaft site. Access roads would be modified to accommodate large construction vehicles as necessary.

The double launch shaft at Lower Roberts Island would require a shaft site to accommodate a double launch shaft with a figure eight configuration, reusable tunnel material (RTM) storage area, and corresponding access roads. Material excavated on-site would be used to construct the shaft pad. The RTM site would also house a rail-served materials depot. Rail access to Lower Roberts Island would be provided from existing tracks located on the Port of Stockton. Rail lines would be extended from one of the existing rail facilities in the Port of Stockton. Rail access would be extended over a new bridge crossing over Burns Cutoff and continue to the tunnel segment storage area near the RTM storage area.

Construction also includes interconnection facilities for Contra Costa Water District (CCWD). The facilities would consist of an interconnection pump station with water intake from the Union Island maintenance shaft on the main tunnel, and a new 1.6-mile conveyance pipeline extending from the pump station to connect to the existing CCWD Victoria Island Pipeline downstream of the CCWD's existing Middle River Intake and Pumping Plant. The interconnection pipeline would be installed in a trench with open cut and cover construction along existing roadways and within agricultural fields. The pipeline construction easement would be 100 feet wide for the entire length of the trench, including a 30-foot temporary construction easement around the 70-foot permanent easement. Dewatering may occur along the open trench, with flows collected, treated, and reused on-site. The portion of the interconnection pipeline that crosses Victoria Canal would be micro-tunneled.

Launch and retrieval pits, approximately 35 feet wide by 50 feet long, would be placed within the 100-foot open trench construction easement on Union Island and Victoria Island to launch and receive micro-tunneling equipment. A permanent 70-foot-wide easement would be maintained along the length of the pipeline in Union Island and Victoria Island. Air valves, blow-offs, and manway access points would be placed along the pipeline within the permanent easement. Pumped flow from the new Interconnection Pump Station would convey raw water from the Union Island shaft to CCWD's existing Transfer Pumping Station through the new conveyance pipeline and subsequently through CCWD's existing Victoria Island and Old River



Pipelines. During periods when CCWD's existing Middle River and Old River Pumping Plants are in simultaneous operation with the Interconnection Pump Station, a maximum combined pumped flow of up to 250 cfs could be conveyed through the Victoria Island Pipeline and a maximum combined flow of up to 320 cfs could be conveyed through the Old River Pipeline.

### **1.3.1.1 North Delta Intakes and Pre-Operation Maintenance**

The two new intake facilities (B and C) will be constructed along the east bank of the Sacramento River and act as new points of diversion in the north Delta. Intake B will be situated just north of Hood and Intake C between Hood and Courtland. The two intakes, operating alone or in combination, will have the capacity to convey up to a total of 6,000 cfs of water from the north Delta. The water would then be conveyed via a single tunnel that would terminate at the Bethany Complex. Intake components will include cylindrical tee fish screens, intake structures, sedimentation basins, sediment drying lagoons, flow control structures, tunnel inlet, and other inlet structures. For detailed information on the construction of the new intake facilities, we incorporate by reference section 3.2.2 of the BA. The fish screens installed on the new intake will follow NMFS fish screen criteria (NMFS 2022). Prior to operations, some maintenance for the new intakes may be required given the timeframe for construction. These pre-operation maintenance activities (referred to as "Maintenance during Construction") are described in the BA, section 3.3.5, and are incorporated here by reference.

### **1.3.1.2 Tunnels and Tunnel Shafts**

The tunnel from the intakes to the Bethany Complex would have an inside diameter of 36 feet and outside diameter of 39 feet and extend 45 miles from the intakes to the surge basin at the Bethany Reservoir Pumping Plant. 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 Bethany Complex. Because the TBM cutterhead would need inspection and maintenance, maintenance shafts would be located approximately every 4 to 6 miles between launch and reception shafts to provide access for TBM maintenance, repair, access or evacuation, and logistic support in a free-air (not pressurized) environment. All tunnel shafts would be maintained during operations to provide access, as needed. For more detailed information on the construction of the tunnels and tunnels shafts, we incorporate by reference sections 3.2.3 and 3.2.4 of the BA, respectively.

### **1.3.1.3 Bethany Complex**

The Bethany Complex would be constructed southeast of Clifton Court Forebay. 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. The Bethany Reservoir Aqueduct would extend approximately 2.8 miles from the pumping plant to a new discharge structure on the banks of Bethany Reservoir. The main tunnel from the intakes would terminate at a reception shaft within the surge basin on the north side of the Bethany Reservoir Pumping Plant. Water would enter the Bethany Reservoir Pumping Plant and be conveyed directly to Bethany Reservoir in a concrete-mortar-lined, welded steel aqueduct system. The Bethany Reservoir Pumping Plant would be a multilevel underground structure with twelve 500-cfs pumps, including two standby pumps, to achieve a total flow capacity ranging from a minimum

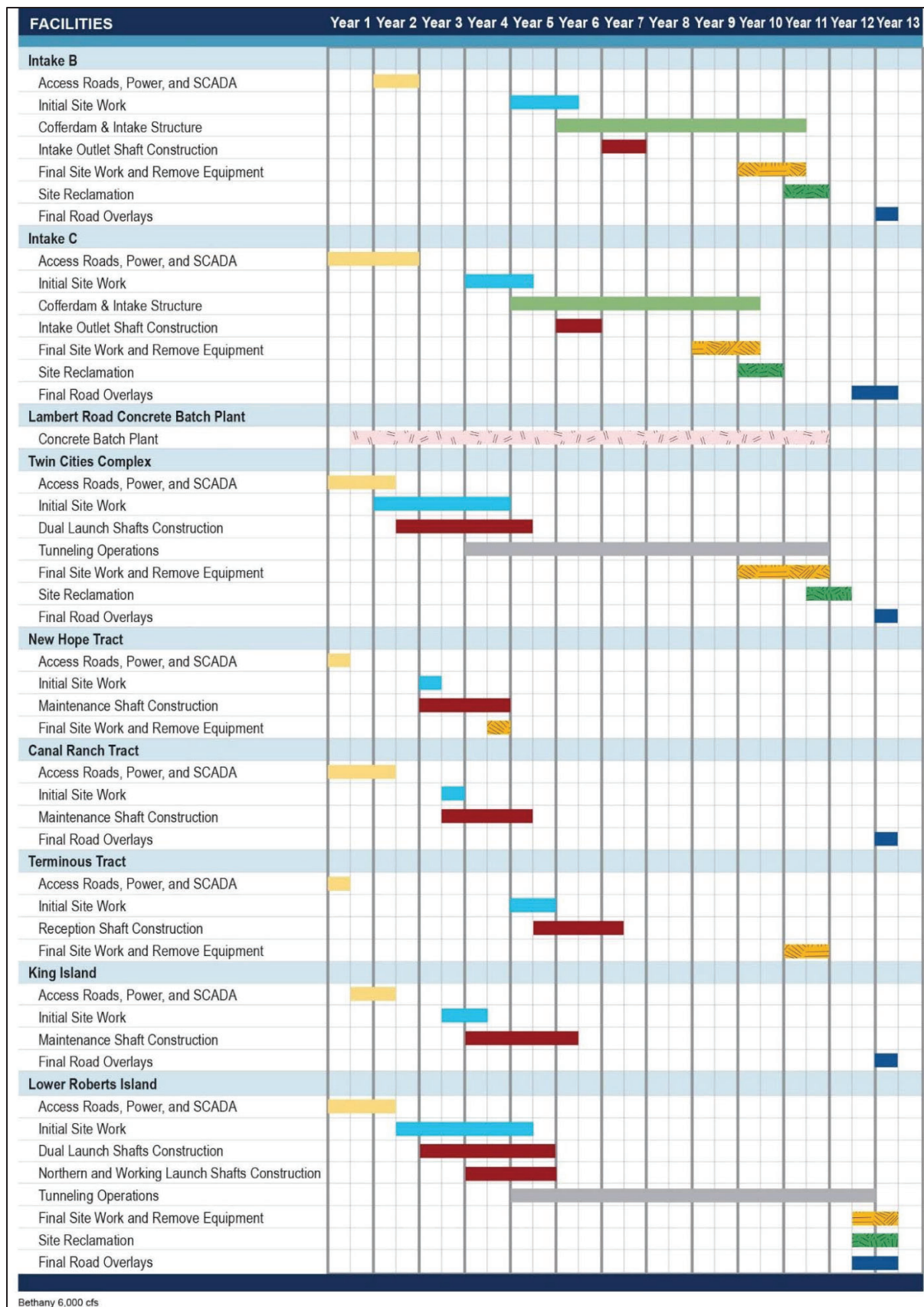
of 300 cfs to a maximum of 6,000 cfs. For more detailed information on the construction of the Bethany Complex, we incorporate by reference section 3.2.6 of the BA.

#### **1.3.1.4 Disposition of Reusable Tunnel Material (RTM)**

RTM would be generated at launch shafts as the TBMs bore the tunnel. RTM is the soil removed by the TBM boring the tunnel, mixed with conditioners, and lifted to the ground surface through the launch shaft. After RTM is removed from the tunnel, it would be tested for hazardous materials, managed on-site to dry naturally, then stockpiled and transported for reuse or permanently stored. Excavated RTM would be placed in temporary stockpile areas and tested 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. For more detailed information on the handling and disposition of RTM, we incorporate by reference section 3.2.5 of the BA.

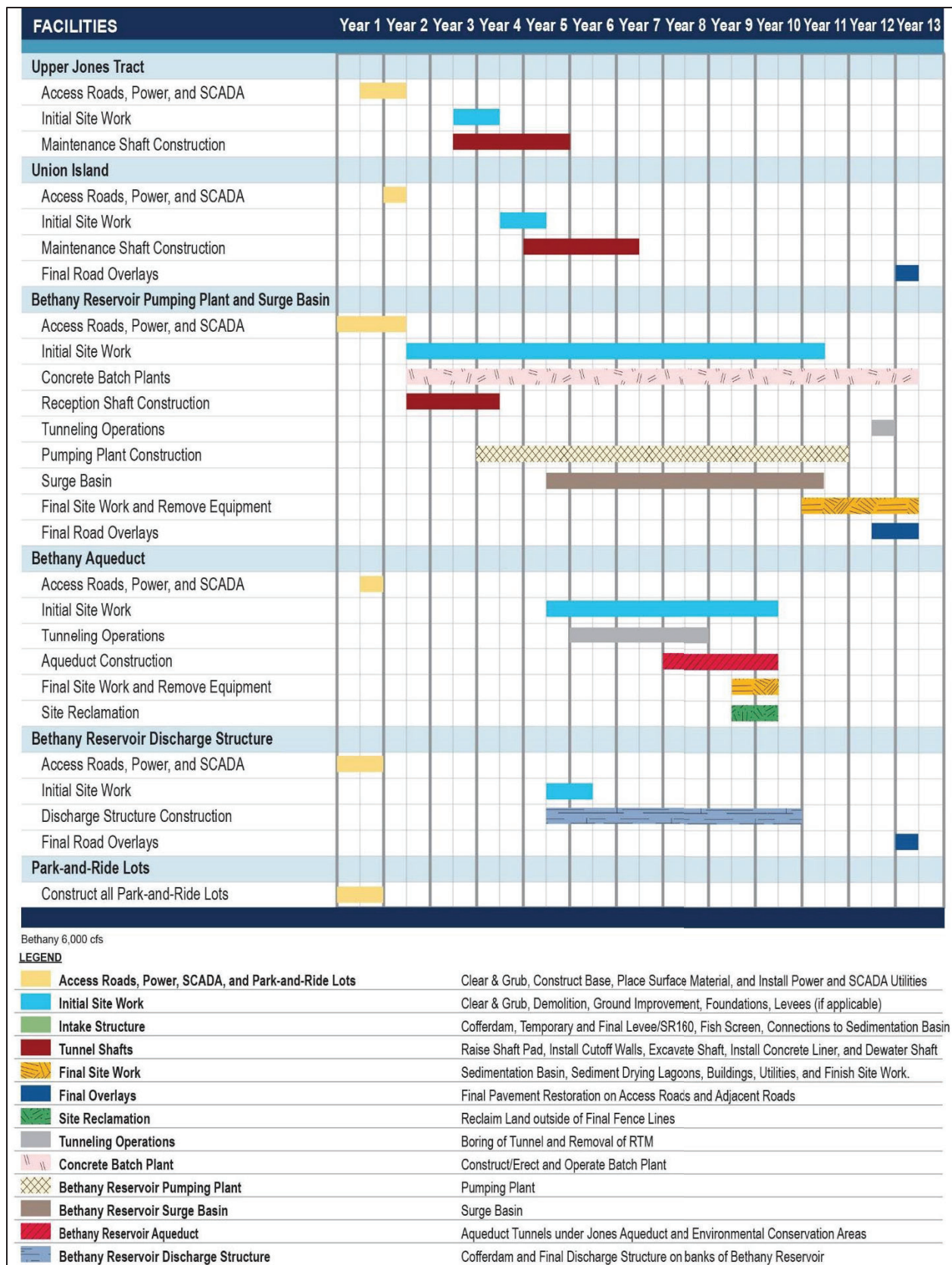
#### **1.3.1.5 Construction Schedule**

Construction for all components of the project is expected to take approximately 13 years to complete. In-water construction activities within the Sacramento River channel would be conducted during the in-water work window, from June 1-October 31, for approximately six years (refer to Figure 3) as described in the BA, Appendix 3A, section 3A.1.15, *AMM-14: Construction Best Management Practices for Biological Resources*, which is incorporated here by reference (ICF 2025). 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 launch shafts, then concurrent tunnel and facility construction, and finally proceeding to commissioning, site reclamation, and road overlays in the final years, as summarized in Figure 2 (ICF 2025). Underground tunnel boring is expected to require approximately 13 years for completion.



(Figure continues onto next page)





**Figure 2.** Overview of the estimated construction schedule from the BA, Chapter 3 (ICF 2025).

### 1.3.2. Conservation Measures

The Corps and DWR have included conservation measures intended to avoid, minimize, and offset effects of the proposed action on listed species and to provide for their conservation and management as part of the PA. The proposed conservation measures provide general avoidance and minimization measures (AMMs) that either prohibit an impact from occurring or reduce the severity of the effect if the impact cannot be avoided. AMMs are described in Appendix 3A of the BA and are incorporated here by reference.

### 1.3.3. Framework-Level component: Operations and Maintenance for the Proposed Action Summary

The north Delta intakes would operate in conjunction with the existing SWP intakes the south Delta. Operations of the existing SWP facilities, in coordination with CVP operations pursuant to the COA, will be governed by the applicable regulatory requirements specified under the State Water Resources Control Board (State Water Board) *Water Quality Control Plan for the San Francisco Bay/Sacramento–San Joaquin Delta Estuary* (Bay-Delta WQCP) and assigned to the SWP in the applicable water right decision, applicable biological opinions under ESA, applicable ITPs under the California Endangered Species Act (CESA), and the Corps’ Clifton Court diversion limits. The operations of the north Delta intakes are expected to remain consistent with these existing regulatory requirements since the project is a new point of diversion and not an expansion of water right quantity for diversion. In addition, diversions at the proposed north Delta intakes would be governed by new operational criteria specific to these intakes, such as the fish screen approach velocity requirements, bypass flow requirements, and pulse protections. These new criteria, in combination with screening criteria, are expected to provide additional protections to fish species in proximity to, and downstream from, the intakes. An overview of operational criteria is provided in the BA in Table 3.3-1, with additional detail for the north Delta intakes in the BA in Table 3.3-2 (ICF 2025), and is incorporated here by reference.

In addition to the Delta Conveyance Project operational and maintenance information presented in the BA, Section 3.3, refer to Appendix 3D, *Delta Conveyance Project Operations Plan*, for a description of the DWR commitments related to Delta Conveyance Project operations. These commitments have all previously been presented in public documents, including the Delta Conveyance Project Final Environmental Impact Report (FEIR), certified in December 2023, and the Delta Conveyance Project ITP Application submitted to CDFW in April 2024. Appendix 3D in the BA also includes operational refinements included in the ITP issued by CDFW on February 14, 2025.

Operational criteria and maintenance for the new Sacramento River intake in the north Delta are described in the BA, section 3.3, and are incorporated here by reference (ICF 2025). Operations of the new intakes in the Sacramento River would remain consistent with various existing requirements. Those requirements are described in the BA, section 3.3.2, and are incorporated here by reference (ICF 2025). The decision-making process for real-time operations are described in the BA, section 3.4, and are incorporated by reference (ICF 2025). An Operations Adaptive Management and Monitoring Plan is described in the BA, section 3.5, and is incorporated by reference (ICF 2025).

Fisheries monitoring studies for the operations and maintenance of the proposed action are generally described at a programmatic framework-level in the BA, Appendix 5B, and are incorporated here by reference (ICF 2025).

In addition, a Fisheries Tidal Habitat Mitigation Framework Compensatory Mitigation Plan (CMP) has been prepared that describes project-specific and programmatic actions that are intended to offset the impacts associated with the proposed action. For more detailed information on the proposed conservation measures and CMP, we incorporate by reference Appendix 3B of the BA. Since the specifics of the CMP are not known yet, individual projects under the CMP that are intended to avoid, minimize, or offset the adverse effects to designated critical habitat for listed anadromous fish are considered at a framework level and will undergo a separate tiered ESA consultation at a future date.



## **2. ENDANGERED SPECIES ACT: BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT**

The ESA establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat upon which they depend. As required by section 7(a)(2) of the ESA, each federal agency must ensure that its actions are not likely to jeopardize the continued existence of endangered or threatened species or to adversely modify or destroy their designated critical habitat. Per the requirements of the ESA, federal action agencies consult with NMFS, and section 7(b)(3) requires that, at the conclusion of consultation, NMFS provide an opinion stating how the agency's actions would affect listed species and their critical habitats. If incidental take is reasonably certain to occur, section 7(b)(4) requires NMFS to provide an ITS that specifies the impact of any incidental taking and includes reasonable and prudent measures (RPMs) and terms and conditions to minimize such impacts.

### **2.1. Analytical Approach**

This biological opinion includes both a jeopardy analysis and an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of “jeopardize the continued existence of” a listed species, which is “to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species” (50 CFR 402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

This biological opinion also relies on the regulatory definition of “destruction or adverse modification,” which “means a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species” (50 CFR 402.02).

The designations of critical habitat for CV spring-run Chinook salmon, CCV steelhead, and sDPS of North American green sturgeon included in this consultation uses the term primary constituent element (PCE) or essential features. The 2016 final rule (81 FR 7414; February 11, 2016) that revised the critical habitat regulations (50 CFR 424.12) replaced this term with physical or biological features (PBFs). The shift in terminology does not change the approach used in conducting a “destruction or adverse modification” analysis, which is the same regardless of whether the original designation identified PCEs, PBFs, or essential features. In this biological opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

We use the following approach to determine whether a proposed action is likely to jeopardize listed species or destroy or adversely modify critical habitat:

- Evaluate the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action.
- Evaluate the environmental baseline of the species and critical habitat.
- Evaluate the effects of the proposed action on species and their critical habitat using an exposure–response approach.
- Evaluate cumulative effects.

- In the integration and synthesis, add the effects of the action and cumulative effects to the environmental baseline, and, in light of the status of the species and critical habitat, analyze whether the proposed action is likely to: (1) directly or indirectly reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species; or (2) directly or indirectly result in an alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species.
- If necessary, suggest a reasonable and prudent alternative to the proposed action.

NMFS has evaluated the proposed action for this consultation as a “mixed programmatic” action as defined by 50 CFR 402.02 because it includes some action components for which no additional authorization will be necessary and others that are considered at a framework level (see Figure 1) and will be subject to future tiered consultations. Programmatic consultations allow the Services (NMFS and USFWS) to consult on the effects of programmatic actions such as: (1) multiple similar, frequently occurring, or routine actions expected to be implemented in particular geographic areas; and (2) a proposed program, plan, policy, or regulation providing a framework for future proposed actions. Proposed action components that are considered at a framework level are analyzed at a broad scale such that exemption from take prohibitions are not provided in the incidental take statement of this opinion. Once framework-level action components are further developed and sufficient detail is available to determine the amount and extent of incidental take, they will require additional ESA section 7 consultation before implementation; this subsequent consultation will include an incidental take statement for those components. Components that do not require additional authorization are analyzed in this opinion and exemptions from take prohibitions are provided in the incidental take statement of this opinion.

For components of the proposed action that lack specificity in their description that are otherwise required to analyze a particular effect in detail, NMFS applies the best scientific and commercial data available, accepted scientific techniques, and best professional judgment to analyze the range of effects that could result. We identify the lines of evidence to support NMFS’ conclusions in the Effects of the Action and Integration and Synthesis sections of this opinion.

### **2.1.1. Assumptions in the Analysis**

To address the uncertainties related to the proposed action components which require no additional authorization, NMFS established reasonable assumptions to provide information critical to our analysis of the effects of expected activities. General assumptions include the following:

- The level of impacts for construction activities that occur within the action area (refer to section 2.3.1 of this opinion) is assumed to be the same each year that construction occurs within the Sacramento River channel. The exception is that the impacts from fish handling due to fish rescue behind the cofferdams are assumed to occur one time for each intake construction area and are not assumed to occur again once the cofferdams are completed and the area behind them are dry.

## 2.2. Rangewide Status of the Species and Critical Habitat

This opinion examines the status of each species that is likely to be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' "reproduction, numbers, or distribution" for the jeopardy analysis. The opinion also examines the condition of designated critical habitat, evaluates the conservation value of the various watersheds and coastal and marine environments that make up the designated critical habitat, and discusses the function of the PBFs that are essential for the species' conservation.

### 2.2.1. Sacramento River (SR) Winter-Run Chinook Salmon

The SR winter-run Chinook salmon ESU includes SR winter-run Chinook salmon spawning naturally in the Sacramento River and its tributaries, as well as SR winter-run Chinook salmon that are part of the conservation hatchery program at the Livingston Stone National Fish Hatchery (LSNFH) (70 FR 37204). In 1989, NMFS listed SR winter-run Chinook salmon under the ESA and classified it as a threatened species (54 FR 32085; Table 1). This initial classification, as threatened, was reaffirmed in 1990 (55 FR 46515), but the species was subsequently uplisted to endangered in 1994 (59 FR 440).

**Table 1.** Summary of the listing history under the Endangered Species Act for the Sacramento River winter-run Chinook salmon Evolutionary Significant Unit.

| Salmonid Species                            | ESU/DPS Name                               | Original Listing                                                                                                           | Revised Listing(s)                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------------------|--------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Chinook Salmon<br>( <i>O. tshawytscha</i> ) | Sacramento River winter-run Chinook salmon | <b>FR Notice:</b> 54 FR 32085<br><b>Date:</b> August 4, 1989<br><b>Classification:</b> Threatened (emergency interim rule) | <b>FR Notice:</b> 55 FR 12191<br><b>Date:</b> April 2, 1990<br><b>Re-affirmation:</b> Threatened (emergency interim rule)<br><b>FR notice:</b> 55 FR 46515<br><b>Date listed:</b> November 5, 1990<br><b>Classification:</b> Threatened<br><b>FR notice:</b> 59 FR 440<br><b>Date:</b> January 4, 1994<br><b>Re-classification:</b> Endangered<br><b>FR notice:</b> 70 FR 37160<br><b>Date listed:</b> June 28, 2005<br><b>Classification:</b> reaffirmed classification as Endangered |

On July 22, 2014 (79 FR 42504), NMFS completed the Recovery Plan for the Evolutionarily Significant Units of Sacramento River Winter-run Chinook Salmon and Central Valley Spring-

run Chinook Salmon and the Distinct Population Segment of California Central Valley Steelhead (NMFS 2014). In the following (2016) 5-year review it was recommended that the SR winter-run Chinook should remain listed as endangered (81 FR 33468, NMFS 2016a). On February 2, 2024, in the agency's most recent 5-year review for SR winter-run Chinook salmon, NMFS again concluded that the species should remain listed as endangered (NMFS 2024c).

### **2.2.1.1 Life History**

SR winter-run Chinook salmon are unique among Central Valley salmonids because they spawn during summer months when air temperatures usually achieve their yearly maximum. As a result, SR winter-run Chinook salmon require stream reaches with cold water sources that will protect embryos and juveniles from the warm ambient conditions in summer. Adult SR winter-run Chinook salmon immigration and holding through the Delta and into the lower Sacramento River occurs from December through July, with a peak during January through April (USFWS 1995). SR winter-run Chinook salmon are sexually immature when upstream migration begins, and they must hold for several months in suitable habitat prior to spawning. SR winter-run Chinook salmon primarily spawn in the main stem Sacramento River between Keswick Dam (river mile 302) and the Red Bluff Diversion Dam (river mile 243). Spawning occurs between late-April and mid-August, with a peak in June and July as reported by CDFW annual carcass and redd surveys (Killam 2023). SR winter-run Chinook salmon embryo incubation in the Sacramento River can extend into October (Vogel and Marine 1991).

SR winter-run Chinook salmon fry rearing in the upper Sacramento River exhibit peak abundance during September, with fry and juvenile emigration past Red Bluff Diversion Dam primarily occurring from July through November (Poytress et al. 2014). Emigration of SR winter-run Chinook salmon juveniles past Knights Landing, located approximately 155.5 river miles downstream of the Red Bluff Diversion Dam, occurs between November and March, peaking in December, with some emigration continuing through May in certain years (Snider and Titus 2000, Roberts 2007).

### **2.2.1.2 Population Structure**

In the previous 5-year review (NMFS 2016a), NMFS defined the SR winter-run Chinook salmon ESU as being composed of all naturally spawned SR winter-run Chinook salmon originating from the Sacramento River and its tributaries, as well as SR winter run Chinook salmon from the artificial propagation program at the LSNFH (70 FR 37160). The addition of the artificial propagation program to the ESU represents NMFS' determination that the artificially propagated stock is no more divergent relative to the local natural population than would be expected between closely related natural populations within the ESU (70 FR 37204). This determination is supported by the fact the source of fish for both the captive broodstock program and the supplementation program is local, natural-origin SR winter-run Chinook salmon from the upper Sacramento River. Ultimately, the Hatchery Listing Policy helped to guide the NMFS analysis of whether individual hatchery programs should be included as part of the ESU and to support the 2020 Final Rule on Revisions to Hatchery Programs as Part of Pacific Salmon and Steelhead Species Listed under the Endangered Species Act (85 FR 81822).

In 2016, the description of the hatchery program at LSNFH was revised to add an additional captive broodstock component, which was restarted in 2015 after being implemented from 1991

to 2007 (85 FR 81822). Starting in 2017, efforts were initiated to establish a viable, self-sustaining, and locally adapted population of SR winter-run Chinook salmon in Battle Creek to add to the spatial diversity (i.e., spatial structure) and abundance of the SR winter-run Chinook salmon ESU (USFWS 2020). Although not an independently viable population yet, efforts are underway to restore the Battle Creek watershed and reintroduce salmon and steelhead to the historical habitats therein (ICF International 2016).

### **2.2.1.3 Viability Status and Trends**

#### **2.2.1.3.1 Spatial Structure and Diversity**

Spatial structure and diversity are two of the four core parameters of the viability of salmonid populations and ESUs (McElhany et al. 2000). The lack of population redundancy in the SR winter-run Chinook salmon ESU is the primary factor contributing to its high extinction risk. The “jumpstart” of the Battle Creek reintroduction efforts initiated in 2017 is a milestone towards the goal of establishing a second SR winter-run Chinook salmon spawning population (ICF International 2016, USFWS 2020), a priority recovery action identified in the recovery plan (NMFS 2014). The most recent returns of 942, 167, 127, and 11 (2020–2023) adult SR winter-run Chinook salmon to Battle Creek are another indication that reintroduction efforts are beginning to take hold (Azat and Killam 2025).

Geographically dispersed spatial structure also promotes life history diversity, which has been shown to improve the resilience of salmon populations (Schindler et al. 2010, Johnson et al. 2017). Diverse habitats provide variation in localized temperature and food resources, which influences growth and phenotypic diversity (size and timing of out-migration) in salmon populations. Recent work by Phillis et al. (2018) suggests that SR winter-run Chinook salmon may rely on more diverse rearing habitats than previously considered. This work identifies the influence of non-natal Sacramento River tributaries and the Delta on juvenile rearing and survival (Phillis et al. 2018).

During the 2012–2016 drought, LSNFH increased the number of adults used in the supplementation program from 120 (target) adults to 164, 388, 257, and 137 in 2013–2016, respectively (Azat and Killam 2025). This expanded production resulted in a significant increase in the proportion of hatchery-reared fish that returned to spawn (greater than 80 percent) in 2017 and 2018. The numbers of natural-origin spawners in 2017 and 2018 were low (153 and 461 individuals, respectively), resulting in a significant increase in the relative contribution of LSNFH hatchery-origin fish and potential reduction in genetic diversity during years of poor environmental conditions and high in-river mortality. Hatchery collection of adults was again increased to 191, 298, 482, and 507 to address drought impacts in 2020–2023.

Recent increases in hatchery influence emphasize the reliance on hatchery production to prevent a precipitous decline in overall abundance. However, hatchery influence and the potential loss of genetic diversity described by the percentage of hatchery spawners over the last four generations was greater than 30 percent, placing the population at a high risk of extinction. The long-term hatchery influence over seven generations (i.e., 21 years) is now at 20 percent. More recently, the decrease in hatchery influence in the 2019 returns supported by the return of a larger number of natural-origin adults (run = 5,000 individuals) indicates a potential for naturally spawning SR



winter-run Chinook salmon to rebuild during periods of favorable environmental conditions (Southwest Fisheries Science Center [SWFSC] 2023).

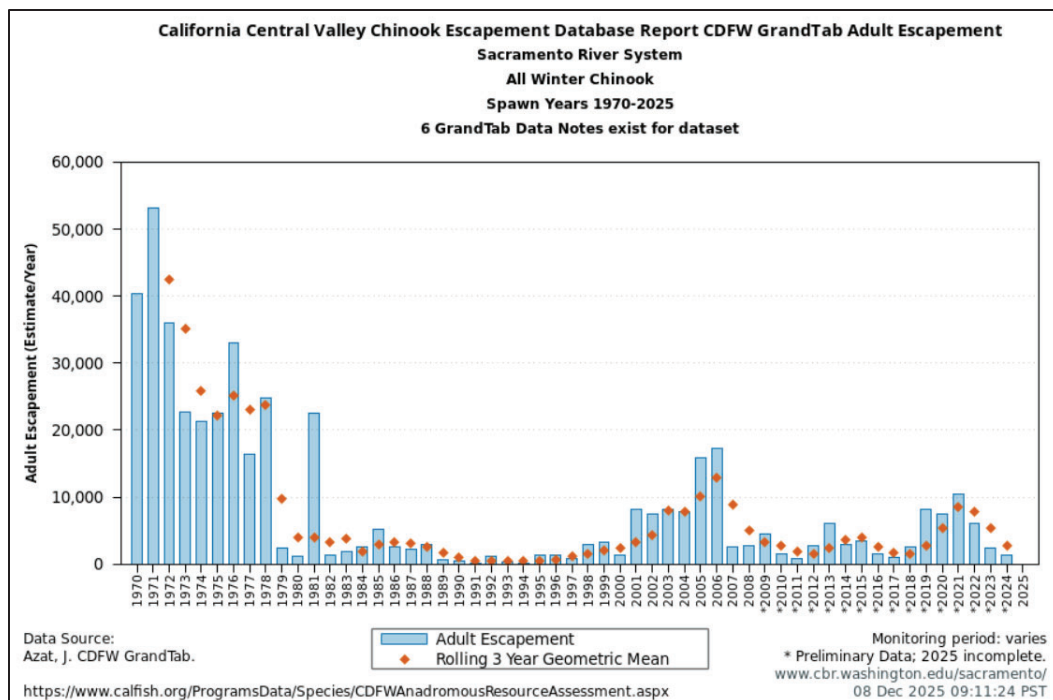
#### **2.2.1.3.2 Abundance and Productivity**

The abundance of the SR winter-run Chinook salmon ESU has declined during recent periods of unfavorable ocean conditions (2005–2006) and prolonged drought (2007–2009, 2012–2016, and 2020–2022), underscoring the risk posed by catastrophic events to a species reduced to a single population. Temperature conditions during egg development and fry emergence were harmful for much of SR winter-run Chinook salmon freshwater rearing in 2014 and 2015, reaching lethal levels in both years. The egg-to-fry survival estimate for brood year 2014 is five percent, which is a significant departure from the average of 26.4 percent for brood years 2002–2012 measured at Red Bluff Diversion Dam (Poytress et al. 2014, Johnson et al. 2017). Warm temperatures in both freshwater and ocean ecosystems likely contributed to the low numbers of natural-origin adults observed in 2017 and 2018. These two consecutive years of poor returns increased the vulnerability of the overall population. Despite the poor returns, water year 2017 was one of the wettest years on record and may have contributed to the high survival of SR winter-run Chinook salmon, including those returns observed in 2019 (Killam 2023).

In 2012, the Red Bluff Diversion Dam gates (river mile 243) were removed to provide unimpaired salmon passage year-round, an action recommended in the recovery plan (NMFS 2014). This modification also changed the ability to count SR winter-run Chinook salmon adults at the Red Bluff Diversion Dam fish ladders (Williams et al. 2016). Based on estimates and counts provided in the CDFW escapement data (Azat and Killam 2025), SR winter-run Chinook salmon abundance has declined since 2006 with recent decadal lows of 795 in-river spawners in 2017 (Figure 3). Escapement improved in 2018–2021 such that both the current total population size (sum of last 3 years [2020–2022];  $N$ : LSNFH = 971, Sacramento River = 21,640) and 3-year mean run sizes ( $N_e$ : LSNFH = 324, Sacramento River = 7,213) satisfy the low-risk abundance criterion ( $N > 2500$  or  $N_e > 500$ ).

The point estimate for the 10-year trend in 3-year mean run size is 3.28, suggesting a 3-fold increase in the 3-year average run size over the last 10 years, primarily bolstered by the relatively large escapement in 2019–2021 (average run size = 8,603; Figure 3). However, the recent maximum year-to-year decline in population size is 58.8 percent (2018). While the percent decline does not exceed the catastrophic decline criteria (greater than 90-percent decline in one generation or annual run size less than 500 spawners, Lindley et al. 2007), the 2012–2016 drought had a biologically significant effect on annual run sizes for natural-origin spawners in 2017 and 2018 (153 and 461 individuals, respectively) which would otherwise place the population at a moderate risk of extinction (SWFSC 2023).





**Figure 3.** Sacramento River winter-run Chinook salmon annual adult escapement. Source: SacPAS. Available at: <https://www.cbr.washington.edu/sacramento/cohort/>

#### 2.2.1.4 Recovery

Federal rules and regulations define “recovery” as “means improvement in the status of listed species to the point at which listing is no longer appropriate under the criteria set out in section 4(a)(a) of the [ESA]” (51 FR 19926). Section 4(a)(1) of the ESA directs NMFS to determine whether any species is threatened or endangered because of any of the following five limiting factors: (a) the present or threatened destruction, modification, or curtailment of its habitat or range; (b) overutilization for commercial, recreational, scientific, or educational purposes; (c) disease or predation; (d) the inadequacy of existing regulatory mechanisms; or (e) other natural or man-made factors affecting its continued existence. Therefore, the status of each listing factor provides the necessary context for evaluating the effects of an action to recovery of the species.

The NMFS Recovery Plan for Central Valley Salmon and Steelhead (Recovery Plan; NMFS 2014) developed watershed classifications to assess the potential for populations to contribute to species recovery. There are three categories Core 1, Core 2, and Core 3. The Recovery Plan also identifies primary, candidate and non-candidate watersheds for reintroduction to historical habitats. Primarily reintroduction watersheds have the highest reintroduction priority.

- Core 1 populations meet or have the potential to meet the long-term objective of low extinction risk. These populations possess the known ability or potential ability to support a viable population.
- Core 2 populations meet or have the potential to meet the biological recovery criteria for moderate risk of extinction. These populations have lower potential to support viable

populations due to lower abundance or amount and quality of habitat. They can contribute to increase diversity for a species and may provide resilience from catastrophic events that impact other populations.

- Core 3 populations are present in watersheds on an intermittent basis and require straying from other populations for their persistence. They can contribute to increased diversity for a species and may provide resilience from catastrophic events that impact other populations.

The SR winter-run population in the Basalt and Porous Lava Diversity Group is the only Core 1 population in the ESU. Battle Creek and the McCloud River are described in the Recovery Plan (NMFS 2014) as the primary reintroduction watersheds for establishing new populations. There are no designated Core 2 or Core 3 populations of SR winter-run Chinook salmon.

#### **2.2.1.5 Environmental Variability**

Crozier et al. (2019) conducted a recent assessment of environmental variability vulnerability for Pacific salmon species. It was found that several factors contribute to the overall ranking of the SR winter-run Chinook salmon ESU as “very highly vulnerable” to environmental variability (Crozier et al. 2019). The poor population viability of this single population spawning outside of its historical range was the greatest risk, as the ESU is not thriving under current environmental conditions which are expected to worsen. The SR winter-run Chinook salmon ESU was found sensitive to hydrologic regime changes, increases in stream temperature, and summer water deficits, such that the ESU is vulnerable to cumulative life cycle impacts over multiple life stages. Juveniles are also vulnerable to changes in flooding, as decreased stream flows and incidents of flooding may limit their ability to use productive floodplain habitat for rearing. Sea level rise is also expected to reduce the availability of tidal marsh habitats for rearing juveniles.

The marine stage of SR winter-run Chinook salmon was ranked moderately vulnerable to environmental variability impacts, with a high risk of exposure to changes in upwelling because of the unique migratory behavior of the ESU. These fish enter the ocean earlier than other Central Valley Chinook salmon and have a more southerly and nearshore marine distribution compared to other Central Valley ESUs. This contracted range may make the ESU more vulnerable to localized upwelling conditions compared to other Pacific salmon. Sacramento River winter-run Chinook salmon were ranked low in overall adaptive capacity because they are in the southernmost region of the range of Chinook salmon on the West Coast, and the California Central Valley offers the fewest opportunities for adaptive capacity of the Chinook salmon recovery domains. The limited phenotypic and genetic diversity remaining in the extant population is also likely to limit this ESU’s ability to adapt to future environmental variability (Crozier et al. 2019).

#### **2.2.1.6 Summary**

Overall, the SR winter-run Chinook salmon ESU remains at a high risk of extinction. Although abundance and productivity have shown modest improvement in the most recent years, the full effects of the 2020–2022 drought have yet to be fully understood of the species. Meanwhile, the spatial structure of the ESU remains limited to the single population found in the main stem Sacramento River, and the genetic and life history diversity of the ESU may have been negatively affected by the increased hatchery production implemented to address drought

conditions. The ESU also continues to face threats from disease; predation; habitat loss, alteration, and degradation; and is particularly susceptible to environmental variability and drought (NMFS 2024c).

### **2.2.2. Designated Critical Habitat for Sacramento River Winter-Run Chinook Salmon**

Critical habitat for SR winter-run Chinook salmon is defined as specific areas (listed below) that contain the PBFs considered essential to the conservation of the species. This designation includes the river water, river bottom (including those areas and associated gravel used by SR winter-run Chinook salmon as spawning substrate), and adjacent riparian zone used by fry and juveniles for rearing (58 FR 33212). NMFS limits “adjacent riparian zones” to only those areas above a stream bank that provide cover and shade to the near shore aquatic areas. Although the flood bypasses (e.g., Yolo, Sutter, and Colusa) are not designated critical habitat for SR winter-run Chinook salmon, NMFS recognizes that they may be used when inundated during flood flows and are important rearing habitats for juvenile SR winter-run Chinook salmon. Also, juvenile SR winter-run Chinook salmon use many of the tributaries of the Sacramento River for non-natal rearing (Phillis et al. 2018). Critical habitat also includes the estuarine water column and essential foraging habitat and food resources used by SR winter-run Chinook salmon as part of their juvenile out-migration or adult spawning migration. The action area for the proposed project includes critical habitat for SR winter-run Chinook salmon.

The following PBFs are considered essential for the conservation of SR winter-run Chinook salmon and a review of the status of the PBFs is discussed in 58 FR 33212:

- Access from the Pacific Ocean to appropriate spawning areas.
- The availability of clean gravel for spawning substrate.
- Adequate river flows for successful spawning, incubation of eggs, fry development and emergence, and downstream transport of juveniles: Water temperatures at 5.8°C to 14.1°C (42.5°F to 57.5°F) for successful spawning, egg incubation, and fry development.
- Habitat and adequate prey free of contaminants.
- Access downstream so that juveniles can migrate from the spawning grounds to San Francisco Bay and the Pacific Ocean.

#### **2.2.2.1 Summary of the Essential Features of Sacramento River Winter-Run Chinook Salmon Critical Habitat**

Critical habitat for SR winter-run Chinook salmon is composed of PBFs that are essential for the conservation of SR winter-run Chinook salmon, including upstream and downstream access, and the availability of certain habitat conditions necessary to meet the biological requirements of the species. Currently, many of these PBFs are degraded and provide limited high-quality habitat. Additional features that lessen the quality of the migratory corridor for juveniles include unscreened diversions, altered flows to and in the Delta, and the lack of accessible floodplain habitat. In addition, changing hydrology and water operations during periods of drought that limit the extent of cold water below Shasta Dam have reduced the available spawning habitat. Although the habitat for SR winter-run Chinook salmon has been highly degraded, the

importance of the remaining spawning habitat, migratory corridors, and rearing habitat is of high conservation value.

### 2.2.3. Central Valley Spring-Run Chinook Salmon

In 1999 (64 FR 50394), NMFS listed CV spring-run Chinook salmon under the ESA and classified it as a threatened species (Table 2). This initial classification was reaffirmed in 2005 when the Feather River Fish Hatchery (FRFH) population was added to the ESU (70 FR 37160). Critical habitat for CV spring-run Chinook salmon was later designated in 2005 (70 FR 52488).

On July 22, 2014 (79 FR 42504), NMFS completed the Recovery Plan for the Evolutionarily Significant Units of Sacramento River Winter-run Chinook Salmon and Central Valley Spring-run Chinook Salmon and the Distinct Population Segment of California Central Valley Steelhead (NMFS 2014). In the following (2016) 5-year review it was recommended that CV spring-run Chinook salmon should remain listed as threatened (81 FR 33468, NMFS 2016b).

**Table 2.** Summary of the listing history under the Endangered Species Act for the Central Valley spring-run Chinook salmon evolutionarily significant unit.

| Salmonid Species                            | ESU/DPS Name                             | Original Listing                                                                                      | Revised Listing                                                                                  | Critical Habitat Designations                                   |
|---------------------------------------------|------------------------------------------|-------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|
| Chinook Salmon<br>( <i>O. tshawytscha</i> ) | Central Valley spring-run Chinook salmon | <b>FR Notice:</b> 64 FR 50394<br><b>Date:</b> September 16, 1999<br><b>Classification:</b> Threatened | <b>FR Notice:</b> 70 FR 37160<br><b>Date:</b> June 28, 2005<br><b>Re-affirmation:</b> Threatened | <b>FR notice:</b> 70 FR 52488<br><b>Date:</b> September 2, 2005 |

#### 2.2.3.1 Life History

Generally, adult CV spring-run Chinook salmon migrate from the Pacific Ocean in a reproductively immature state and swim upstream into fresh water in the spring months (approximately March through June) using olfactory senses to locate their birth waters. The adult fish then hold over summer months (approximately June through September) and spawn in cold freshwater in the early fall months (approximately September through November). Larval fish, also known as alevins, hatch from eggs and emerge from their gravel nests throughout the fall and early winter months (approximately October through December). Juvenile fish then rear and feed in freshwater from late fall through spring (approximately October through June), or they may choose to rear for a full year (i.e., October to subsequent October to December) and become “yearling” juveniles when conditions are suitable.

As juvenile fish rear, they migrate downstream and eventually reach the Delta and then the San Francisco Bay estuary. Once juvenile fish have completed the physiological changes necessary to enter saltwater (called smoltification), they enter the Pacific Ocean and rear into adults over approximately 3 to 4 years. After 3 or 4 years old, they migrate back upstream to their natal freshwater stream to spawn.

In general, wetter water years result in higher survival of juveniles out-migrating during the spring of the same year they emerged. In 3 to 4 years, the juvenile cohort that experienced wetter out-migration conditions are more likely to result in a higher abundance of adults returning to freshwater to spawn. Drier water years generally result in low survival during spring outmigration and encourage a subset (roughly 10 percent) of juveniles to express the yearling life history strategy (Cordoleani et al. 2021). This results in a lower number of large juveniles out-migrating to the ocean much later in the year than during a wet or normal year. When the dry condition cohort returns to spawn, there are fewer adults because there was less survival during the spring out-migration. Therefore, the number of adult spawners is likely to be lower from a juvenile cohort that experienced drought conditions in freshwater during their out-migration in contrast to a juvenile cohort that experiences high river flows during a wet water year while out-migrating.

### 2.2.3.2 Population Structure

The CV spring-run Chinook salmon ESU includes all naturally spawned CV spring-run Chinook salmon originating from the Sacramento River and its tributaries (70 FR 37160). The ESU also includes CV spring-run Chinook salmon from the Feather River Fish Hatchery FRFH spring-run Chinook salmon program. In 2014, FRFH broodstock was used to actively reintroduce CV spring-run Chinook salmon into the mainstem San Joaquin River as an ESA 10(j) nonessential experimental population (NEP)(78 FR 79622)<sup>3</sup>. Since 2019, adults have been observed returning to the San Joaquin River and successfully spawning within the SJRRP Restoration Area.

The ongoing success of the SJRRP reintroduction activities has recently resulted in an increase in the number of adult CV spring-run Chinook salmon migrating into the San Joaquin River tributaries, outside of the SJRRP Area. Many of these adult fish originated as juveniles from the SJRRP Area and SCARF as identified through coded wire tag (CWT) recovery. These adults did not migrate back to the SJRRP Area and instead migrated into the lower San Joaquin River tributaries, thereby mixing with the residual population. Initial and ongoing data collection within the tributaries, including the Mokelumne, Stanislaus, Tuolumne, and Merced Rivers, indicates successful spawning within these rivers (Gutierrez et al. 2024). Continuing to monitor these populations will provide information to evaluate the status of CV spring-run Chinook salmon in the San Joaquin River and its tributaries. This monitoring would also provide a basis for evaluating whether the ESU boundary should be modified to account for CV spring-run Chinook salmon populations repopulating the San Joaquin river basin and/or in CV habitats upstream of currently impassable barriers (Gutierrez et al. 2024).

Wild-spawned juveniles in the San Joaquin River tributaries that originate outside of the area designated by the 10(j) (78 FR 79622) are not part of the NEP. However, these juveniles are

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<sup>3</sup> CV spring-run Chinook salmon are considered to be a nonessential experimental population (NEP) only when, and at such times as, they are found in the San Joaquin River from Friant Dam downstream to its confluence with the Merced River, delineated by a line between decimal latitude and longitude coordinates: 37.348930°N., 120.975174°W. and 37.349099°N., 120.974749°W., as well as all sloughs, channels, floodways, and waterways connected with the San Joaquin River within those coordinates that allow for CV spring-run Chinook salmon access, but excluding the Merced River. Also, Central Valley spring-run Chinook salmon when found in portions of the Kings River that connect with the San Joaquin River during high water years (78 FR 79622)



subject to the *de minimus* clause within the tributaries and the mainstem San Joaquin River until they migrate downstream past Mossdale County Park on the mainstem. Once they are observed or captured past Mossdale County Park (50 CFR 223.301 Section (b)(5)(i)) they are no longer subject to the *de minimus* clause and have full protection of their ESA status.

### **2.2.3.3 Viability Status and Trends**

#### **2.2.3.3.1 Abundance and Productivity**

The viability of CV spring-run Chinook salmon has deteriorated since the 2015 assessment with weakening of all independent CV spring-run Chinook salmon populations (Table 3). In fact, Mill, Deer, Battle, and Butte Creeks changed from a low/moderate to a high risk of extinction using one or more viability criteria (Table 3). The total estimated abundance of adult CV spring-run Chinook salmon for the Sacramento River watershed in 2019 was 26,553, approximately half of the population size in 2014 (N = 56,023). Also, population sizes have hit decadal lows, of approximately 14,000 individuals, as recently as the last 2 years (Azat and Killiam 2025). The Central Valley-wide abundance is driven largely by the annual variation in adults returning to Butte Creek.

The Butte Creek population is at a high risk of extinction based on viability analysis according to data through 2021. Pre-spawn mortality in 2021 was 92 percent, representing a biologically significant loss in spawning potential. However, given the robust spawning populations in 2019, the total population size (17,951) and average population size remain well above the criteria for low risk of extinction (greater than 2,500). Still, the rate of decline increased from 5 percent per year through 2019, to 19 percent over the most recent 10 years, indicating that the Butte Creek population is at a high risk of extinction (SWFSC 2023).

The Butte Creek CV spring-run Chinook salmon population is wholly dependent on the reliable, long-term import of cold water from the West Branch of the Feather River to spawning and holding habitat in Butte Creek. In February 2017, Pacific Gas & Electric Company (PG&E) submitted notice to FERC withdrawing their October 2007 application for a new license for the Project (FERC Project No. 803), citing declining power values and the anticipated cost of project operation associated with new license conditions. The Butte Creek CV spring-run population has been a stronghold for the CV spring-run Chinook salmon ESU due to its relatively large population size that has resulted from improvements in water temperature management, extensive fish passage restoration, and the accessibility of floodplain habitat in the Butte Sink and Sutter Bypass for juvenile rearing in the majority of years.

Most dependent CV spring-run Chinook salmon populations experienced continued, and in some cases drastic, declines. For example, while adults were observed in Big Chico Creek from 2014 to 2018, they likely did not survive to spawn due to high summer temperatures resulting in zeros (0) in the escapement estimates (Azat and Killiam 2025, SWFSC 2023). These results underscore the need for improved passage so that these dependent populations and habitats do not become sinks for CV spring-run Chinook salmon. Counteracting recent declines in adult abundance from dependent populations, CV spring-run Chinook salmon have continued to repopulate areas where they were once extirpated, including Battle and Clear Creeks and, more recently, the San Joaquin River. Each of these watersheds have the potential to support



independent and viable CV spring-run Chinook salmon populations (Lindley et al. 2004, NMFS 2014).

**Table 3.** Summary of Central Valley spring-run Chinook salmon extinction risk by population criteria described in Lindley et al. (2007) for the 2010, 2015, and 2020 viability assessment periods (Johnson et al. 2022) undated with the results from the mid-cycle assessment. Overall risk is determined by the highest risk score for any criterion.

| Population             | Extinction Risk for Viability Assessment Year 2010 | Extinction Risk for Viability Assessment Year 2015 | Extinction Risk for Viability Assessment Year 2020 | Extinction Risk for Viability Assessment Year 2022 (mid-cycle) |
|------------------------|----------------------------------------------------|----------------------------------------------------|----------------------------------------------------|----------------------------------------------------------------|
| <b>Mill Creek*</b>     | High                                               | Moderate                                           | High                                               | High                                                           |
| <b>Deer Creek*</b>     | High                                               | Moderate                                           | High                                               | High                                                           |
| <b>Butte Creek*</b>    | Low                                                | Moderate                                           | Moderate                                           | High**                                                         |
| <b>Battle Creek*</b>   | High                                               | Moderate                                           | High                                               | High                                                           |
| Clear Creek            | High                                               | Moderate                                           | High                                               | Moderate                                                       |
| Feather River Hatchery | High                                               | High                                               | High                                               | High                                                           |

\* Mill, Deer, Butte, and Battle Creeks are independent populations.

\*\*The point estimate for the decline in population abundance over the most recent 10 years is 19% per year, placing the population at a high risk of extinction (Lindley et al. 2007). The viability criteria for population decline (<10% per year) are based on the point estimate with no guidance on interpreting confidence intervals. The confidence intervals for Butte Creek overlap '0' which means that the slope is not statistically different from '0'. We apply the Lindley et al. 2007 decline criteria as it stands but note that new criteria perhaps in a Bayesian framework would provide a clearer ability to assess the probability of extinction given observed declines.

CV spring-run Chinook salmon populations have experienced a series of droughts over the past decade. From 2007 to 2009, 2012 to 2015, and 2020 to 2022, the Central Valley experienced drought conditions and low river and stream discharges, which are strongly associated with lower survival of Chinook salmon. The impacts of the recent drought series and warm ocean conditions on the juvenile life stage seems to have manifested in the low run sizes in 2015–2018 for most CV spring-run Chinook salmon populations (SWFSC 2022). The 2007–2009 and 2012–2015 droughts impacted CV spring-run Chinook salmon adults on Butte Creek, which experienced lethal temperatures in holding habitats during the summer. Prespawn mortality was observed during drought years, affecting 1,054, 903, and 232 individuals in 2008, 2013, and 2014, respectively (Garman 2016). In 2015, late-arriving adults observed in sections of Butte Creek near the City of Chico experienced exceptionally warm June air temperatures coupled with the PG&E flume shutdown, resulting in a fish mortality event. These conditions likely influenced juvenile production that resulted in low adult returns in 2015–2018.

Fortunately, the favorable hydroclimatic conditions in 2017 appear to have bolstered juvenile survival leading to high adult returns on Butte Creek to approximately 15,000 adults. At the ESU level, the spatial diversity of CV spring-run Chinook salmon is increasing, and CV spring-run Chinook salmon are present (albeit at low numbers in some cases) in all diversity groups. The reestablishment of CV spring-run Chinook salmon to Battle and Clear Creeks starting in the late 1990s and early 2000s, along with the increasing abundance of CV spring-run Chinook salmon on Clear Creek observed in some years, is benefiting the viability of CV spring-run Chinook salmon. Similarly, CV spring-run Chinook salmon have been documented on the San Joaquin River tributaries and may be the beginning of natural dispersal processes into rivers where they were once extirpated<sup>4</sup>.

#### **2.2.3.3.2 Spatial Structure and Diversity**

Spatial diversity of CV spring-run Chinook salmon ESU is trending in a positive direction towards achieving at least two populations in each of the four historical diversity groups, but the new populations are not well monitored and likely dependent on emigration for their persistence (NMFS 2014). Active reintroduction efforts, like that downstream of Friant Dam on the mainstem San Joaquin River, are necessary to move CV spring-run Chinook salmon towards recovery and additional reintroduction opportunities are being explored on the Yuba River upstream of Englebright Dam, on the Sacramento River upstream of Shasta Dam, on the Tuolumne River upstream of Don Pedro Dam, and on the Feather River upstream Oroville Dam.

In addition, the number of Mill and Deer Creek spawners in 2020 was low (SWFSC 2023) and preliminary genetic results from the 2021 carcass surveys in these streams lacked the genetic signals specific to the Mill and Deer Creek populations (SWFSC 2023). It is therefore possible that consecutive years of very low returns has resulted in extirpation of this unique genetic lineage. More research and analysis are currently being conducted to determine the extent of the damage to this population (SWFSC 2023).

#### **2.2.3.4 Recovery**

The rationale for recovery (NMFS 2014) is based on two key principles: it is necessary to have functioning, diverse, and interconnected habitats for population viability, and viability is based on spatial structure, diversity, productivity, and abundance (McElhany et al. 2000). The greatest opportunities for advancing CV spring-run Chinook salmon recovery are to preserve current populations and reintroduce populations into their historical habitat.

Specific recovery goals are: (1) securing adequate flows and temperatures for holding adults and yearling juveniles; (2) improving rearing habitat and increasing survival for out-migrating juveniles; (3) completing major fish passage projects on CV spring-run Chinook salmon habitat on the Sacramento and San Joaquin Rivers and their tributaries; and (4) operating water conveyance and diversion facilities while maintaining and enhancing the function of migration corridors and freshwater and estuarine rearing habitats. Moving towards these goals will create a functioning ecosystem.

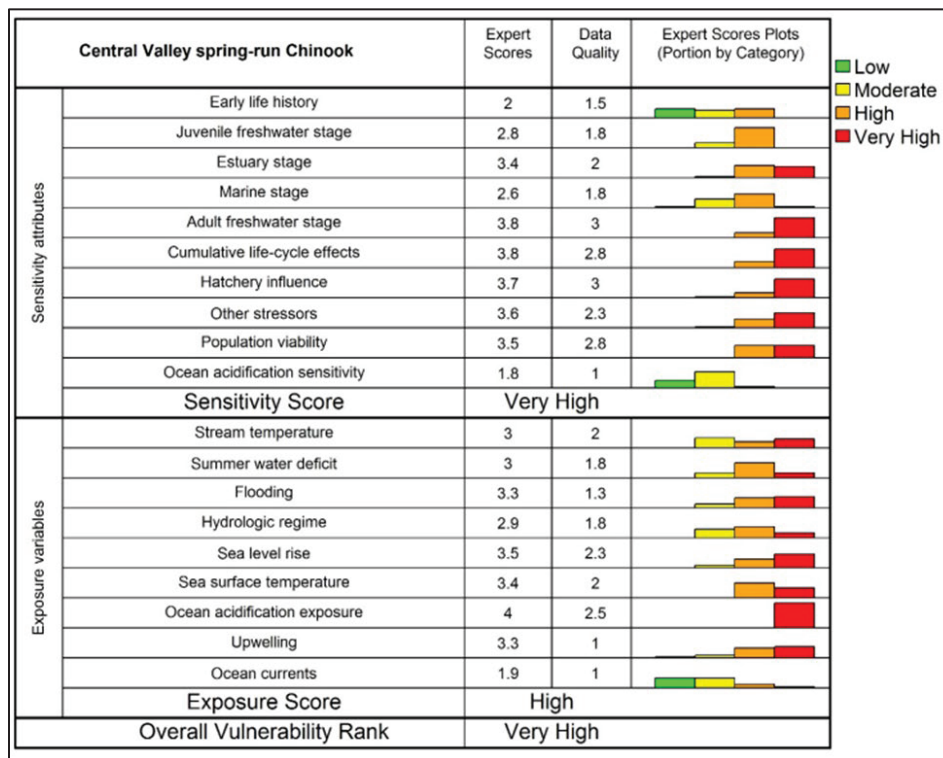
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<sup>4</sup> Data for coded wire tag (CWT) recoveries is publicly available at: <https://www.rmpec.org/>

### 2.2.3.5 Environmental Variability

Several factors contributed to the ranking of this ESU as very highly vulnerable to environmental variability. The increasingly poor population viability of the remaining extant populations is a significant risk, as the ESU is not thriving under current climate conditions which are expected to worsen. Both adult and juvenile life stages are vulnerable to hydrologic regime changes, increases in stream temperature, and summer water deficits and are therefore also vulnerable to cumulative life cycle impacts over multiple life stages. Juveniles are also vulnerable to changes in spring flooding and snow melt, as decreased stream flows and incidents of flooding may limit their ability to access and occupy productive floodplain habitat for rearing. Sea level rise may also reduce the availability of tidal marsh habitats for rearing juveniles.

CV spring-run Chinook salmon were ranked highly sensitive (Figure 4) because they are in the southernmost region of the range of Chinook salmon on the West Coast, and the California Central Valley offers the fewest opportunities for adaptive capacity of the Chinook salmon recovery domains. The limited phenotypic and genetic diversity remaining in the extant populations combined with the currently inaccessible historical habitat is also likely to limit this ESU's ability to adapt to future environmental variability.



**Figure 4.** Central Valley spring-run Chinook salmon Climate Variability Effects Exposure and Vulnerability. Source: (Crozier et al. 2019)

CV spring-run Chinook salmon evolved multiple life history strategies in response to the hydrologic variability of California's Central Valley. The preservation of these life history strategies is dependent on the preservation of the natural hydrograph and functional freshwater

habitats that support survival throughout the juvenile migration timeframe (both early [young-of-year] and late migrating [yearlings]). In some years, the early out-migration life history strategy may be more advantageous for juvenile survival due to certain environmental conditions (i.e., wetter hydrologic conditions). In other years, the late out-migration life history strategy may be more advantageous for juvenile survival, such as in drier hydrologic conditions (Cordoleani et al. 2021). This variation in juvenile life history strategies creates multiple generations of adults returning to spawn in freshwater. Multiple age classes of spawning adults are necessary to ensure the overall survival of Chinook salmon against drastic annual hydrologic variations.

However, the effects of environmental variability impact the entire salmonid watershed, from freshwater to saltwater and will likely make survival more difficult during both the juvenile and adult migration timeframes. As discussed above, environmental variability will alter hydrologic conditions throughout the Central Valley and has the potential to significantly reduce or eliminate life history strategies across multiple generations of Chinook salmon. The combined factors of environmental variability, highly managed and unnatural hydrographs, disconnected floodplains, and the lack of passage to historical upper watershed habitats pose a significant and severe threat to the survival of CV spring-run Chinook salmon.

Environmental variability will continue to be a threat towards the recovery of CV spring-run Chinook salmon (NMFS 2014, SWFSC 2023). More frequent and longer duration droughts in the southern Sierra-Nevada Mountain Range will have a significant impact on water supply and reliability for both people and fish. Increased drought frequency, combined with an overall decrease in snow pack, will decrease the quantity of cold water. Lack of access to high elevation spawning and rearing habitats due to impassable dams will result in decreased survival and abundance for both the juvenile and adult life stages of salmon in the San Joaquin River.

#### **2.2.3.6 Summary**

The viability of the CV spring-run Chinook salmon ESU has deteriorated since it was added to the ESA (NMFS 2016b, SWFSC 2023). The largest proximate impacts are likely due to the 2012–2015 and 2020–2022 freshwater drought conditions and unusually warm ocean conditions experienced by these cohorts, resulting in weakening viability metrics and greater risks of extinction to most of the CV spring-run Chinook salmon along with reduced access to historical and floodplain habitat.

Overall, the SWFSC’s viability assessment (SWFSC 2023) concluded that the viability of CV spring-run Chinook salmon (through 2021) has declined since the prior viability assessment in 2016 and that the ESU’s extinction risk may have increased. This ESU continues to face significant, unyielding threats that are likely to be exacerbated by the impacts of future climate change. Significant habitat and flow improvement actions are urgently needed to recover the species.

#### **2.2.4. Designated Critical Habitat for Central Valley Spring-run Chinook Salmon**

Critical habitat was designated for CV spring-run Chinook salmon on September 2, 2005 (70 FR 52488). Critical habitat for the CV spring-run Chinook salmon includes stream reaches of the Feather, Yuba, and American rivers; Big Chico, Butte, Deer, Mill, Battle, Antelope, and Clear Creeks; and the Sacramento River, as well as portions of the northern Delta. Critical habitat

includes the stream channels in the designated stream reaches (70 FR 52488). Critical habitat for CV spring-run Chinook salmon is defined as specific areas that contain the PCEs and physical habitat elements essential to the conservation of the species. The following are the PCEs for CV spring-run Chinook salmon. The action area for the proposed project include critical habitat for CV spring-run Chinook salmon.

#### *Spawning Habitat*

Freshwater spawning sites are those with sufficient water quantity and quality conditions and substrate supporting spawning, incubation, and larval development. Most spawning habitat in the Central Valley for Chinook salmon is located in areas directly downstream of dams containing suitable environmental conditions for spawning and incubation. Spawning habitat for CV spring-run Chinook salmon occurs on the mainstem Sacramento River between the Red Bluff Diversion Dam and Keswick Dam and in tributaries such as Mill, Deer, and Butte Creeks, as well as the Feather and Yuba Rivers and Big Chico, Battle, Antelope, and Clear Creeks. Even in degraded reaches, spawning habitat has a high conservation value as its function directly affects the spawning success and reproductive potential of listed salmonids.

#### *Freshwater Rearing Habitat*

Freshwater rearing sites are those with water quantity and floodplain connectivity to form and maintain physical habitat conditions supporting juvenile growth and mobility; water quality and forage supporting juvenile salmonid development; and natural cover such as shade, submerged and overhanging large woody material, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks. Both spawning areas and migratory corridors comprise rearing habitat for juveniles, which feed and grow before and during their out-migration. Non-natal, intermittent tributaries also may be used for juvenile rearing. Rearing habitat conditions are strongly affected by habitat complexity, food supply, and the presence of predators of juvenile salmonids. Some complex, productive habitats with floodplains remain in the system (e.g., the lower Cosumnes River, Sacramento River reaches with setback levees [i.e., primarily located upstream of the City of Colusa]) and flood bypasses (i.e., Yolo and Sutter bypasses). However, the channelized, leveed, and riprapped river reaches and sloughs that are common in the Sacramento-San Joaquin system typically have low habitat complexity, low abundance of food organisms, and offer little protection from piscivorous fish and birds. Freshwater rearing habitat also has a high intrinsic conservation value even if the current conditions are significantly degraded from their natural state.

#### *Freshwater Migration Corridors*

Ideal freshwater migration corridors are free of migratory obstructions, with water quantity and quality conditions that enhance migratory movements. They contain natural cover such as riparian canopy structure, submerged and overhanging large woody objects, aquatic vegetation, large rocks and boulders, side channels, and undercut banks which augment juvenile and adult mobility, survival, and food supply. Migratory corridors are downstream of the spawning areas and include the lower main stems of the Sacramento and San Joaquin rivers and the Delta. These corridors allow upstream passage of adults and the downstream emigration of juveniles. Migratory habitat conditions are strongly affected by the presence of barriers, which can include dams (i.e., hydropower, flood control, and irrigation flashboard dams), unscreened or poorly screened diversions, degraded water quality, or behavioral impediments to migration. For successful survival and recruitment of salmonids, freshwater migration corridors must function



sufficiently to provide adequate passage. The stranding of adults has been known to occur in flood bypasses and associated weir structures (Vincik and Johnson 2013) and several challenges exist on many tributary streams. For juveniles, unscreened or inadequately screened water diversions throughout their migration corridors and a scarcity of complex in-river cover have degraded this PCE. However, since the primary migration corridors are used by numerous populations and are essential for connecting early rearing habitat with the ocean, even the degraded reaches are considered to have a high intrinsic conservation value to the species.

#### *Estuarine Areas*

Estuarine areas, such as the San Francisco Bay and the downstream portions of the Delta, free of migratory obstructions with water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between freshwater and saltwater are included as a PCE. Natural cover such as submerged and overhanging large woody material, aquatic vegetation, and side channels are suitable for juvenile and adult foraging.

The remaining estuarine habitat for these species is severely degraded by altered hydrologic regimes, poor water quality, reductions in habitat complexity, and competition for food and space with exotic species. Regardless of the condition, the remaining estuarine areas are of high conservation value because they provide factors which function to provide predator avoidance, rearing habitat, and as an area of transition to the ocean environment.

#### **2.2.5. California Central Valley Steelhead**

The CCV steelhead DPS includes naturally spawned anadromous *O. mykiss* originating downstream of natural and manmade impassable barriers from the Sacramento and San Joaquin Rivers and their tributaries and excludes such fish originating from the San Francisco and San Pablo Bays and their tributaries (70 FR 37160). This DPS includes CCV steelhead from the Coleman National Fish Hatchery, FRFH, and the Mokelumne River Hatchery (85 FR 81822). In 1998, NMFS listed CCV steelhead under the ESA and classified it as a threatened species (Table 4). In 2006, following the development of NMFS' Hatchery Listing Policy (70 FR 37204), NMFS re-evaluated the status of this DPS and determined the DPS continued to warrant listing as a threatened species. Furthermore, we determined the Coleman National Fish Hatchery and FRFH stocks of CCV steelhead should be part of the DPS (Table 4). In 2020, NMFS added the Mokelumne River Hatchery to the CCV steelhead DPS because fish in this program are genetically most similar to FRFH Program steelhead, which are included in the DPS (85 FR 81822).



**Table 4.** Summary of the listing history under the Endangered Species Act for the CCV steelhead DPS.

| Salmonid Species                         | ESU/DPS Name                        | Original Listing                                                                              | Revised Listing(s)                                                                          |
|------------------------------------------|-------------------------------------|-----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
| <b>Steelhead</b><br>( <i>O. mykiss</i> ) | California Central Valley Steelhead | <b>FR Notice:</b> 63 FR 13347<br><b>Date:</b> 03/19/1998<br><b>Classification:</b> Threatened | <b>FR Notice:</b> 71 FR 834<br><b>Date:</b> 01/05/2006<br><b>Re-affirmation:</b> Threatened |

On July 22, 2014 (79 FR 42504), NMFS completed the Recovery Plan for the Evolutionarily Significant Units of Sacramento River Winter-run Chinook Salmon and Central Valley Spring-run Chinook Salmon and the Distinct Population Segment of California Central Valley Steelhead (NMFS 2014). In the most recent 5-year review, it was recommended the CCV steelhead DPS should remain listed as threatened (81 FR 33468, NMFS 2024d).

### 2.2.5.1 Life History and Distribution

*O. mykiss* exhibit a diverse life history (Moyle 2002). Members of this species can be anadromous or freshwater residents, and, under some circumstances, members of one form can yield offspring of another form (Zimmerman et al. 2008). CCV steelhead adult migration from the ocean to spawning grounds occurs during much of the year, with peak migration occurring in the fall or early winter (Moyle 2002). CCV steelhead generally begin spawning in December, continuing through March/April (Moyle 2002). CCV steelhead spawn downstream of dams on every major tributary within the Sacramento and San Joaquin River systems. Due to water development projects, most spawning is now confined to lower stream reaches below dams. In a few streams, such as Mill and Deer Creeks, CCV steelhead still have access to many historical spawning areas (McEwan and Jackson 1996).

CCV steelhead spawning occurs mainly in gravel substrates (particle size ranges from about 0.2 to 2.2 inches (Stanislaus River Scientific Evaluation Process (SEP) Team 2019). Adults tend to spawn in shallow areas (6 to 24 inches deep) with moderate water velocities (about 1 to 3.6 feet per second, Hannon and Deason 2008). Unlike Chinook salmon, CCV steelhead may not die after spawning (McEwan and Jackson 1996). Some may return to the ocean and repeat the spawning cycle for two or three years. The percentage of adults surviving spawning is generally thought to be low for CCV steelhead but varies annually and between stocks. Acoustic tagging of CCV steelhead kelts from the Coleman National Fish Hatchery indicates survival rates can be high, especially for CCV steelhead reconditioned by holding and feeding at the hatchery prior to release. Some return immediately to the ocean and some remain and rear in the Sacramento River (Null et al. 2013). Kelts may remain in freshwater for an entire year after spawning (Teo et al. 2011) but that most return to the ocean (Null et al. 2013).

CCV steelhead preferred water temperatures for spawning and egg incubation are approximately 3.8°C and 11°C (39°F and 52°F), and egg mortality likely begins at 13°C (56°F), respectively (CDFG 1996, McEwan 2001, Reiser and Bjornn 1979). After hatching, the young fish (alevins) remain in the gravel for an extra two to six weeks before emerging from the gravel and taking up

residence in the shallow margins of the stream. CCV steelhead embryo incubation generally occurs from December through June in the Central Valley and their eggs reportedly have the highest survival rates at water temperature ranges of 7°C to 10°C (44.6°F to 50.0°F) (Myrick and Cech Jr 2001). A sharp decrease in survival has been reported for *O. mykiss* embryos incubated above 14°C (57.2°F) (Kamler and Kato 1983). After hatching, alevins remain in the gravel for an additional two to five weeks while absorbing their yolk sacs and then emerge in spring or early summer (Barnhart 1986). Newly emerged juveniles move to shallow, protected areas associated within the stream margin (McEwan and Jackson 1996). Productive juvenile rearing habitat is characterized by complexity, primarily in the form of cover, which can be deep pools, woody debris, aquatic vegetation, or boulders. Cover is an important habitat component for juvenile CCV steelhead both as velocity refugia and as a means of avoiding predation (Meehan and Bjornn 1991). Older juveniles use riffles and larger juveniles may also use pools and deeper runs (Barnhart [1986] as cited in McEwan and Jackson [1996]). An upper water temperature limit of 18°C (65°F) is preferred for growth and development of Sacramento River and American River juvenile steelhead (NMFS 2002, Bratovich et al. 2005) and temperatures below 15.5°C (60°F) can reduce the risk of pathogen virulence for steelhead rearing and out-migration while still allowing for strong growth (McCullough 1999, Carter 2005). Most juvenile steelhead spend one to three years in fresh water before emigrating to the ocean as smolts (Shapovalov and Taft 1954). The primary period of CCV steelhead smolt out-migration from rivers and creeks to the ocean generally occurs from January to June (NMFS 2009).

#### 2.2.5.2 Viability Status and Trends

Good et al. (2005) found the CCV steelhead DPS was in danger of extinction, with a minority of the Biological Review Team viewing the DPS as likely to become endangered. The Biological Review Team's major concerns were the low abundance of natural-origin anadromous *O. mykiss*, the lack of population-level abundance data, and the lack of any information to suggest that the decline in CCV steelhead abundance evident from 1967 to 1993 dam counts had stopped. Lindley et al. (2007) found that data through 2005 were insufficient to determine the viability of any of the naturally-spawning populations of CCV steelhead, except for those spawning in rivers adjacent to hatcheries, which were likely to be at high risk of extinction due to extensive spawning of hatchery-origin fish in natural areas.

The proportion of hatchery-origin fish in the Battle Creek returns averaged 29 percent over the 2002–2010 period, elevating the level of hatchery influence to a moderate risk of extinction. The Chipps Island midwater trawl dataset of USFWS indicated the decline in the natural production of CCV steelhead had continued unabated through 2010, with the proportion of adipose fin-clipped CCV steelhead reaching 95 percent. In 2015, population trend data showed significant increases in abundance of Coleman National Fish Hatchery and FRFH populations, but data are still lacking to estimate trends in natural populations.

The Central Valley Salmon and Steelhead Recovery Plan (NMFS 2014) includes biological recovery criteria based on the VSP concept. The Central Valley Salmon and Steelhead Recovery Plan include the following DPS-level recovery criteria:

- One population in the Northwestern California Diversity Group at low risk of extinction
- Two populations in the Basalt and Porous Lava Diversity Group at low risk of extinction

- Four populations in the Northern Sierra Diversity Group at low risk of extinction
- Two populations in the Southern Sierra Diversity Group at low risk of extinction
- Maintain multiple populations at moderate risk of extinction

To meet the recovery criteria for this DPS and thereby delist the species, there must be at least nine populations at a low risk of extinction distributed throughout the Central Valley as outlined above, as well as additional populations at a moderate risk of extinction (NMFS 2014).

Currently, no CCV steelhead populations satisfy the low extinction risk criteria. For the 17 populations evaluated in the SWFSC's 2022 viability assessment, 11 are at high extinction risk and six are at moderate extinction risk (SWFSC 2023). Twelve of the populations are at high or moderate extinction risk based on population size, indicating low abundance of natural-origin CCV steelhead (SWFSC 2023).

#### **2.2.5.2.1 Abundance and Productivity**

Population trend data remain limited for the CCV steelhead DPS. The total hatchery populations from Coleman National Fish Hatchery, FRFH, and Mokelumne River Hatchery have significantly increased since the 2010 and 2015 viability assessments. In fact, Coleman National Fish Hatchery returns have steadily increased 15 percent per year over the last decade.

The American River steelhead population has experienced a precipitous decline since 2003, resulting in a moderate risk of extinction. A significant proportion of steelhead redds on the American River are made by Nimbus Hatchery steelhead, which are not part of the DPS, and declined eight percent per year over the last decade. Chipps Island midwater trawl data provide information on the trend in abundance for the CCV steelhead DPS. Updated through 2025, the trawl data indicate the production of natural-origin CCV steelhead remains low relative to hatchery production. The lack of improved natural production as estimated by juvenile migrants exiting the river systems at Chipps Island and low abundances coupled with large hatchery influence are cause for concern.

Catch per unit effort has fluctuated and generally increased over the past decade, but the proportion of the catch that is adipose fin-clipped (100 percent of hatchery CCV steelhead production have been adipose fin-clipped starting in 1998) has increased steadily, exceeding 90 percent in recent years and reaching 96 percent during the drought in 2015. This suggests the majority of CCV steelhead out-migrating from the Delta are of hatchery origin.

#### **2.2.5.2.2 Spatial Structure and Diversity**

This DPS includes CCV steelhead populations spawning in the Sacramento and San Joaquin Rivers and their tributaries. Populations upstream of migration barriers remain excluded from this DPS. Hatchery stocks within the DPS include Coleman National Fish Hatchery, FRFH, and Mokelumne River Hatchery. Genetic analysis showed the steelhead stock propagated in the Mokelumne River Hatchery was genetically similar to the steelhead broodstock in the FRFH (Pearse and Garza 2015), consistent with documentation on the recent transfers of eggs from the FRFH for broodstock at the Mokelumne River Hatchery. The Nimbus Hatchery steelhead remain genetically divergent from the Central Valley DPS lineages, consistent with their founding from coastal steelhead stocks, and remain excluded from the DPS (Pearse and Garza 2015).

As overall data remains limited for the CCV steelhead DPS, it is difficult to ascertain if their spatial distribution has changed. From recent monitoring data, CCV steelhead are not noted to have had any substantial changes in spatial distribution or diversity. Hatchery influence continues to be a high threat to diversity of the DPS, and the out-of-basin stock at Nimbus Hatchery poses significant genetic threat to CCV steelhead (SWFSC 2023).

#### **2.2.5.2.3 Summary of California Central Valley Steelhead Viability**

Based upon the information available, the overall viability of the CCV Steelhead DPS appears to be unchanged since the NMFS' 2015 5-year review. However, the majority (11 of 16) of populations for which there are data are at a high risk of extinction based on abundance and/or hatchery influence, with no population considered to be at a low risk of extinction. Lack of improved natural production estimates and low abundances coupled with large hatchery influence are causes for continued concern (SWFSC 2023).

#### **2.2.5.3 Recovery**

NMFS is directing CCV steelhead recovery efforts at populations that need viability improvement according to DPS-, Diversity Group-, and population-level recovery criteria; the best available scientific information concerning DPS status; the role of the independent populations in meeting DPS and Diversity Group viability; limiting factors and threats; and the likelihood of action effectiveness to guide our recommendations for future actions. NMFS is coordinating with the federal, state, tribal, and local implementing entities to ensure that risk factors and actions are addressed that were identified in the Central Valley Salmon and Steelhead Recovery Plan (NMFS 2014).

#### **2.2.5.4 Environmental Variability**

In California, there have been observed changes in air temperatures, annual precipitation, runoff, and sea levels over the past century (Anderson et al. 2008). Regional-scale climate models for California are in broad agreement that temperatures in the future will warm significantly, total precipitation may decline, and snowfall will decline significantly (Lindley et al. 2007). Literature suggests that by 2100, mean summer temperatures in the Central Valley may increase by 2°C to 8°C, precipitation will likely shift to more rain and less snow, with significant declines in total precipitation possible, resulting in changed hydrographs, especially in the southern Sierra Nevada mountains. This information suggests that environmental variation poses an additional risk to the survival of salmonids in the Central Valley. As with their ocean phase, CCV steelhead will be more thermally stressed by stream warming at the southern ends of their ranges.

The distribution of CCV steelhead today is greatly reduced from the historical distribution. Dams and water diversions limit CCV steelhead access to less than 20 percent of their historical spawning and rearing areas in the Central Valley (Yoshiyama et al. 2001, Lindley et al. 2006). Environmental variation will further restrict access to cool water streams. The diversity and variability of their life history complicate management, yet this same attribute reduces their vulnerability to environmental variation. Additionally, low flows during juvenile rearing and out-migration are associated with poor survival through the Delta (Kjelson and Brandes 1989, Baker P.F. and Morhardt 2001, Newman and Rice 2002) and poor returns in subsequent years (Speed 1993). Environmental variation also may impact Central Valley salmonids through community

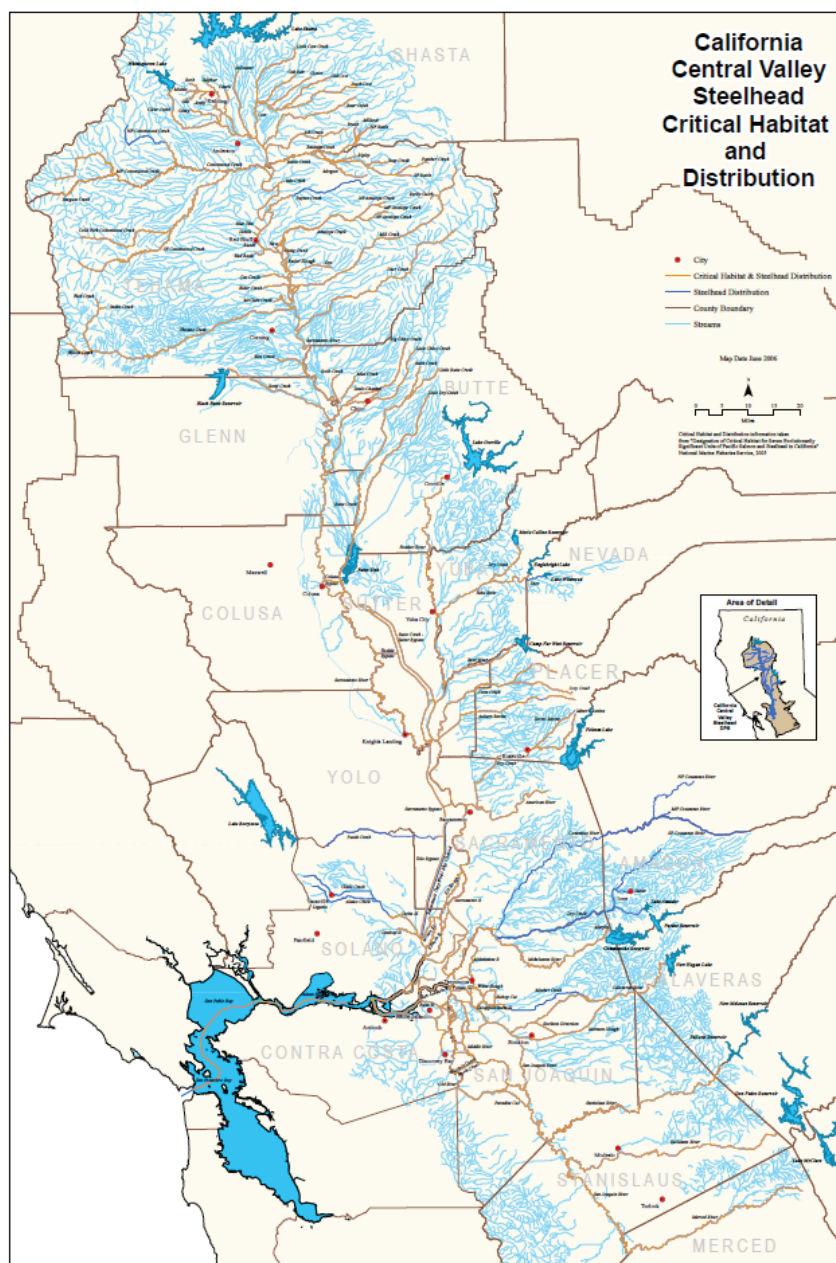
effects. For example, warming may increase the activity and metabolic demand of predators, reducing the survival of juvenile salmonids (Vigg and Burley 1991).

Based upon the information available, the overall viability of the CCV steelhead DPS appears to be unchanged since the NMFS 5-year review (NMFS 2023). However, the majority (11 of 16) of populations for which data exists are at a high risk of extinction based on abundance and/or hatchery influence. No population is currently considered to be at a low risk of extinction. The lack of improved natural production estimates, and low abundances coupled with large hatchery influence are causes for continued concern (NMFS 2023).

#### **2.2.6. Designated Critical Habitat for California Central Valley Steelhead**

The geographic extent of designated critical habitat includes, but is not limited to, the following: Sacramento, Feather, and Yuba rivers; Clear, Deer, Mill, Battle, and Antelope Creeks in the Sacramento River basin; the San Joaquin River, including its tributaries; and the waterways of the Delta (Figure 5). The proposed action area includes designated critical habitat for CCV steelhead.





**Figure 5.** Designated critical habitat for California Central Valley steelhead Distinct Population Segment.

The critical habitat for CCV steelhead lists the essential PBFs (70 FR 52488), which include:

1. Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation, and larval development.
2. Freshwater rearing sites with (i) water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; (ii) water quality and forage supporting juvenile development; and (iii) natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.



3. Freshwater migration corridors free of obstruction and excessive predation with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.
4. Estuarine areas free of obstruction and excessive predation with: (i) water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between freshwater and saltwater; (ii) natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels; and (iii) juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation.

Historically, CCV steelhead spawned in many of the headwaters and upstream portions of the Sacramento River and San Joaquin River basin. Similar to SR winter-run and CV spring-run Chinook salmon, passage impediments have contributed to substantial reductions in the number of populations by isolating them from most of their historical spawning habitat. The PBFs of freshwater spawning sites have been degraded within the action area due to high water temperatures, redd dewatering, and loss of spawning gravel recruitment in reaches below Keswick Dam (Wright and Schoellhamer 2004, Good et al. 2005, NMFS 2009, Jarrett and Killam 2014).

Freshwater rearing and migration PBFs have been degraded from their historical condition within the action area. In the Sacramento and San Joaquin Rivers, bank armoring has significantly reduced the quantity of floodplain rearing habitat for juvenile salmonids and has altered the natural geomorphology of the river (National Marine Fisheries Service 2014b). Levee construction involves the removal of riparian vegetation, resulting in reduced habitat complexity and shading, making juveniles more susceptible to predation. Additionally, loss of riparian vegetation reduces aquatic macroinvertebrate recruitment, resulting in decreased food availability for rearing juveniles (Anderson and Sedell 1979, Pusey and Arthington 2003).

CCV steelhead can only access large floodplain areas, such as the Yolo Bypass, under certain hydrologic conditions, typically normal and wet water years. The Yolo Bypass Restoration Salmonid Habitat Restoration and Fish Passage Implementation Plan include notching the Fremont Weir (California Department of Water Resources and U.S. Bureau of Reclamation 2016), which now provides access to floodplain habitat for juvenile CCV steelhead over a longer period.

Although the current conditions of CCV steelhead critical habitat are significantly degraded, the spawning habitat, migratory corridors, and rearing habitat that remain in the Sacramento-San Joaquin River watershed and the Delta are considered to have high intrinsic value for the conservation of the species due to the role these areas have in critical portions of this species' life history.

#### **2.2.7. Southern Distinct Population Segment of Green Sturgeon**

North American green sturgeon include a Northern DPS consisting of populations originating from coastal watersheds northward of and including the Eel River (i.e., the Klamath and Rogue rivers) and a Southern DPS consisting of populations originating from coastal watersheds south

of the Eel River, with the only known spawning population in the Sacramento River Basin (74 FR 52300, October 9, 2009).

The sDPS of green sturgeon was listed as a threatened species under the ESA on April 7, 2006 (71 FR 17757, Table 5). The Northern DPS is not listed under the ESA. NMFS designated critical habitat for the sDPS green sturgeon on October 9, 2009 (74 FR 52300), as well as an updated ESA 4(d) ruling publishing final ESA protective regulations on June 2, 2010 (75 FR 30714).

**Table 5.** Summary of the listing history under the Endangered Species Act for the Southern Distinct Population Segment of green sturgeon.

| <b>Sturgeon Species</b>                            | <b>ESU/ DPS Name</b>                                                  | <b>Original Listing</b>                                                                                  | <b>Revised Listing(s)</b>                                                                                  | <b>Critical Habitat Designation</b>                                                                                          |
|----------------------------------------------------|-----------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| Green Sturgeon<br>( <i>Acipenser medirostris</i> ) | Southern Distinct Population Segment of North American green sturgeon | <b>FR notice:</b> 71 FR 17757<br><br><b>Date:</b> April 7, 2006<br><br><b>Classification:</b> Threatened | <b>FR Notice:</b> 75 FR 30714<br><br><b>Date:</b> June 2, 2010<br><br><b>Classification:</b> ESA 4(d) rule | <b>FR Notice:</b> 74 FR 52300<br><br><b>Date:</b> October 9, 2009<br><br><b>Classification:</b> Critical habitat designation |

On July 29, 2015, NMFS published a 5-year review for the sDPS green sturgeon which concluded that the status of the sDPS green sturgeon should remain “threatened” (NMFS 2015). NMFS finalized a Recovery Plan for sDPS green sturgeon with strategies and actions to support recovery of the species on August 8, 2018 (NMFS 2018). The most recent 5-year review was published on October 26, 2021, which determined no change to the species status (NMFS2021).

### 2.2.7.1 Population Structure

The California Central Valley green sturgeon includes the genetically isolated sDPS that naturally spawns in the Sacramento River and its tributaries (71 FR 17757). This listing does not include the Northern DPS of green sturgeon that spawn north of the Russian River. The sDPS of green sturgeon are genetically unique from the Northern DPS due to their isolated breeding behavior endemic solely to the Sacramento river basin. The sDPS of green sturgeon is composed of a single, independent population, which principally spawns in the mainstem Sacramento River (Israel et al. 2009), though spawning has now been documented in both the Feather and Yuba Rivers as well (NMFS 2018).

### 2.2.7.2 Life History

The sDPS of green sturgeon enter the San Francisco Bay Delta Estuary in late winter/early spring and migrate upstream to their spawning grounds in the Sacramento, Feather, and Yuba Rivers. Since sDPS green sturgeon spawn during the summer months (from late April through late July, peaking in May), mature adults must reach upper areas of the Sacramento river basin where cooler temperatures persist during the hottest months (Moser and Lindley 2007). The sDPS of green sturgeon predominantly spawn between (1) the Glenn-Colusa Irrigation Dam area

(river kilometer 332.5) to Cow Creek (river kilometer 451) on the Sacramento River, (2) from the Fish Barrier Dam (river kilometer 108.5) to the Thermalito Afterbay Outlet (river kilometer 109) on the Feather River, and (3) at the base of the Daguerre Point Dam (river kilometer 19) on the Yuba River (NMFS 2018).

Eggs require water temperatures around 15°C (59°F) to hatch successfully, and within 10 days the larvae hatch and rapidly move downstream. It is unknown how long juveniles remain in upriver rearing habitats after metamorphosis. Based on length distribution data from salvage and recent upstream surveys, juveniles typically enter the Delta as sub-yearlings or yearlings to rear prior to ocean entry (NMFS 2018). After reaching sub-adult sizes (approximately 91 centimeters), sDPS green sturgeon will migrate into the ocean, traveling along the North American West Coast for up to 15 years or until they reach sexual maturity (Erickson and Hightower 2007, Lindley et al. 2008, Lindley et al. 2011). Adult sDPS green sturgeon will spawn every two to six years on average, with higher returns upriver during high precipitation years (Benson et al. 2007, Erickson and Webb 2007, Heublein et al. 2009, Poytress et al. 2011, 2012).

### **2.2.7.3 Viability Status and Trends**

Although McElhany et al. (2000) specifically addresses viable populations of salmonids, the science behind the concepts and viability parameters is applicable to sDPS green sturgeon. Since there were no reliable estimates of historical or current sDPS green sturgeon abundance, adult abundance criteria were developed using the best available information from general principles in conservation biology relating population viability to abundance (NMFS 2018). Multiple monitoring methods are needed to track sDPS green sturgeon spawning populations into the future, including continued annual surveys using DIDSON devices, egg mat surveys, subsampling of adult population for individual health, and acoustic tagging efforts.

#### **2.2.7.3.1 Spatial Structure and Diversity**

Under current conditions, all sDPS green sturgeon spawn in the Sacramento river basin. There is not enough scientific evidence to distinguish individual spawning subgroups. In general, sub-adult (from the age of ocean entry to age of first spawning) and adult North American green sturgeon spend most of their lives in oceanic environments where they occupy nearshore coastal waters from the Bering Sea, Alaska (Colway and Stevenson 2007) to Baja California, Mexico (Rosales-Casián and Almeda-Jauregui 2009). Telemetry data and genetic analyses suggest that sDPS green sturgeon generally occur from Graves Harbor, Alaska to Monterey Bay, California (Moser and Lindley 2007, Lindley et al. 2008, Lindley et al. 2011), traversing depths shallower than 110 meters (Erickson and Hightower 2007).

The rapid anthropomorphic shifting in Californian landscape from wetland to agriculture in the early 20th century likely had a negative impact on sDPS green sturgeon numbers. Historical sDPS green sturgeon spawning habitat may have extended up into the three major branches of the upper Sacramento River above the current location of Shasta Dam—the Little Sacramento River, Pit River, and McCloud River (NMFS 2009). Additional spawning habitat likely existed upstream of Oroville Dam on the Feather River (National Marine Fisheries Service 2009a). According to NMFS (2009a), reduction of sDPS green sturgeon spawning habitat to only one reach on the Sacramento River between Keswick Dam and Hamilton City has increased the vulnerability of this spawning population to catastrophic events.

Successful spawning of sDPS green sturgeon in other accessible habitats in the Central Valley (i.e., the Feather and Yuba Rivers) is limited, in part, by late spring and summer warm water temperatures and water flow. Currently, no documentation of historical spawning in the San Joaquin River basin has been documented but this is likely a consequence of major habitat alterations prior to potential observations being recorded by early ichthyologists or other observers. Similar to salmonids in the Central Valley, sDPS green sturgeon spawning in the major lower river tributaries to the Sacramento River are likely to be further limited if water temperatures increase over time. Dams and other barriers causing fragmentation and blocking access to suitable spawning grounds for migrating sturgeon is the leading threat in the decline of many sturgeon populations (Rochard et al. 1990, Auer 1996). Since 2014, NMFS has specifically identified the Daguerre Point Dam on the Yuba River and Sunset Pumps boulder weir on the Feather River as key barriers limiting sDPS green sturgeon recovery.

The VSP concept identifies a variety of traits that exhibit diversity within and among populations, and this variation has important effects on population viability (McElhany et al. 2000). For the sDPS of green sturgeon, traits include, but are not limited to fecundity, age at maturity, physiology, and genetic characteristics. Spawning habitat is used as a proxy for diversity because diversity is closely tied with abundance, distribution, and productivity.

Within the sDPS of green sturgeon, diversity is not yet well documented. Little is known about how current levels of diversity (e.g., genetic, life history) compare with historical levels. Further inquiry is needed to determine what, if any, genetic separation exists between those fish spawning within the Sacramento River and those spawning elsewhere. Since the previous review, available spawning habitat has not increased; therefore, the recovery criteria of “no net loss in diversity” was not met.

#### **2.2.7.3.2 Abundance and Productivity**

Recovery criteria for abundance requires the adult sDPS green sturgeon census population to remain at or above 3,000 for three generations (this equates to a yearly running average of at least 813 spawners for approximately 66 years). In addition, the effective population size must be at least 500 individuals in any given year and each annual spawning run must comprise a combined total, from all spawning locations, of at least 500 adult fish in any given year.

Due to sparse monitoring data for juvenile, sub-adult, and adult life stages in the Sacramento River and Delta, there are significant data gaps to describe the ecology of this species throughout their distribution range. Juveniles have been detected in the rivers on a yearly basis, with fluctuations of captured juveniles highly dependent upon water years (Thomas et al. 2014, Poytress et al. 2015, Mora et al. 2018). Yearly returns were calculated from 2007 to 2018, and no significant change in abundance trends has been determined for the population as a whole. Yearly adult spawner return estimates fluctuate between 336 to 1,236 individuals dependent upon annual precipitation percentages, for example, with wetter years being generally associated with higher returns (Mora et al. 2018).

The NMFS 2021 5-year review concluded no abundance and productivity-related recovery criteria have been met (NMFS 2021). The estimated total population of sDPS green sturgeon is 17,548 individuals, with an estimated 2,106 adults (Mora et al. 2018). Therefore, the adult

population does not meet the criteria of a yearly average of 3,000 adults. Reported annual spawner counts have also been less than 500 in the Sacramento River (Mora et al. 2018). Currently, there are no reliable estimates for spawner counts for the Feather and Yuba Rivers.

Parameters of sDPS growth rate and carrying capacity in the Sacramento basin are poorly understood. Larval count data from incidental bycatch in rotary screw traps collected since the mid-1990s at Red Bluff Diversion Dam and near the Glenn Colusa Irrigation District diversion show large variability between years. The highest count and density on record was over 30 sDPS green sturgeon per acre-feet of water volume sampled at Red Bluff in 2016, an order of magnitude higher than other years (USFWS 2016). In general, sDPS green sturgeon year class strength appears highly variable, with overall abundance dependent upon a few successful spawning events (75 FR 30714 2010). Other indicators of productivity, such as data for cohort replacement ratios and spawner abundance trends, are not available for sDPS green sturgeon.

#### **2.2.7.4 Recovery**

Recovery plan actions and research priorities were developed to achieve recovery criteria listed above and described in Green Sturgeon Recovery Plan (National Marine Fisheries Service 2018e). Each action and research priority are defined as follows:

- Priority 1: action that must be taken to prevent extinction or to identify those actions necessary to prevent extinction;
- Priority 2: an action that must be taken to prevent a significant decline in population numbers, habitat quality, or other significant negative impacts short of extinction; and
- Priority 3: all other actions necessary to provide for full recovery of the species (NMFS 2018).

Each action and research priority falls into six threat categories concerning passage, water flow and temperature, entrainment, take, contaminants, and environmental variation. Undertaking actions in these areas is expected to have the biggest impact in terms of sDPS green sturgeon recovery (NMFS 2018).

There are five criteria for recovery stated in the sDPS green sturgeon 5-year review, and each criterion is determined by successful goal parameters met on a yearly basis (NMFS 2018, 2021): (1) adult population yearly average of 3,000 mature adults, with 500 spawners present in the rivers in any given year for at least 66 years; (2) yearly successful spawning in at least two rivers within their historical range, determined by consistent presence of larvae for at least 20 years; (3) a net positive trend in juvenile and sub-adult abundance for at least 20 years; (4) a population characterized by a broad distribution of class sizes representing multiple cohorts that are stable over the long term for at least 20 years; and (5) no net loss of sDPS green sturgeon diversity from current levels. As of 2026, these criteria have not been met on a yearly basis, reaffirming that the status of sDPS green sturgeon remains listed under the ESA as threatened.

The 2021 5-year review analyzed the five major threat-based recovery criteria to sDPS green sturgeon: (1) altered habitat, (2) overutilization, (3) disease/predation, (4) inadequacy of regulatory mechanisms, and (5) other natural/man-made factors (NMFS 2021). There has been



no change in the analysis of these threat-based recovery criteria from the previous 5-year review, and none of the threat-based recovery criteria have been met.

#### **2.2.7.5 Environmental Variability**

Threats from altered trends in environmental variability are considered “high” or “very high” in many criteria involved with sDPS green sturgeon recovery. These trends include: (1) changes in flow rates from varying yearly precipitation levels; (2) salinity intrusion into freshwater habitats from rising sea levels (projected 33 percent increase in the 21st century); (3) loss in habitat due to various environmental/anthropogenic factors; (4) altered prey base due to shifting habitat conditions; (5) increased water temperatures from higher frequencies of dry years, reduced spring snowpack, and reduced spring flows; (6) increased threat from harmful algal blooms within the San Francisco Bay Delta Estuary and Sacramento-San Joaquin inland delta; and (7) other altered environmental characteristics from increased/continued anthropogenic actions (Knowles and Cayan 2002, CH2M HILL 2014, NMFS 2018, NMFS 2021). Additional studies are needed to understand the trends in changing environmental conditions in order to determine best managerial practices for the future.

#### **2.2.7.6 Summary**

Evaluation of new information during the most recent 5-year status review did not suggest a significant change in the status of sDPS green sturgeon and NMFS concluded sDPS green sturgeon remains at a moderate to high risk of extinction (NMFS 2021). Recovery criteria have not been met on a yearly basis as of the latest 5-year review, and the fact that the vast majority of sDPS green sturgeon spawning occurs in the mainstem Sacramento River leaves the species highly susceptible to catastrophic events during spawning season.

The sDPS of green sturgeon remains at substantial risk of future population decline (NMFS 2021). The principal threat is the reduction in available spawning habitat due to dams on Central Valley rivers. The potential threats include enhanced vulnerability due to the reduction of spawning habitat into one reach on the Sacramento River, lack of good empirical population data, vulnerability of long-term cold-water supply for egg incubation and larval survival, loss of juvenile sDPS green sturgeon due to entrainment at the project fish collection facilities in the South Delta and agricultural diversions within the Sacramento River and the Delta, alterations of food resources due to changes in the Sacramento River and Delta habitats, and exposure to various sources of contaminants throughout the basin to juvenile, subadult, and adult life stages.

Viability is defined as an independent population having a negligible risk of extinction due to threats from demographic variation, local environmental variation, and genetic diversity changes over a 100-year timeframe (McElhany et al. 2000). Evaluation of new information during the most recent 5-year status review did not suggest a significant change in the status of sDPS green sturgeon and NMFS concluded the sDPS remains at a moderate to high risk of extinction (NMFS 2021).

### **2.2.8. Designated Critical Habitat for Southern Distinct Population Segment of Green Sturgeon**

The geographical range of designated critical habitat includes the following:



- In freshwater;
  - The Sacramento River from the Sacramento I-Street Bridge to Keswick Dam, including the Sutter and Yolo bypasses and the Lower American River from the confluence with the mainstem Sacramento River upstream to the highway 160 bridge.
  - The Feather River from its confluence with the Sacramento River upstream to the Fish Barrier Dam.
  - The Yuba River from the confluence with the Feather River upstream to Daguerre Point Dam.
  - The Sacramento-San Joaquin Delta (as defined by California Water Code section 12220, except for listed excluded areas).
- In coastal bays and estuaries; the geographical range includes:
  - San Francisco, San Pablo, Suisun, and Humboldt Bays in California.
  - Coos, Winchester, Yaquina, and Nehalem Bays in Oregon.
  - Willapa Bay and Grays Harbor in Washington.
  - The lower Columbia River estuary from the mouth to river mile 46.

The action area for the proposed project includes designated critical habitat for the sDPS of green sturgeon. The designated critical habitat for sDPS green sturgeon lists the essential PBFs (74 FR 52300), which include the following for freshwater riverine and estuarine habitats:

*Freshwater Riverine Habitats:*

- 1) Food resources. Abundant prey items for larval, juvenile, subadult, and adult life stages.
- 2) Substrate type or size (i.e., structural features of substrates). Substrates suitable for egg deposition and development (e.g., bedrock sills and shelves, cobble and gravel, or hard, clean sand, with interstices or irregular surfaces to “collect” eggs and provide protection from predators, and free of excessive silt and debris that could smother eggs during incubation), larval development (e.g., substrates with interstices or voids providing refuge from predators and from high water flow), and feeding of juveniles, subadults, and adults (e.g., sand/mud substrates).
- 3) Water flow. A flow regime (i.e., the magnitude, frequency, duration, seasonality, and rate-of-change of fresh water discharge over time) necessary for normal behavior, growth, and survival of all life stages.
- 4) Water quality. Water quality, including temperature, salinity, oxygen content, and other chemical characteristics necessary for normal behavior, growth, and viability of all life stages.
- 5) Migratory corridor. A migratory pathway necessary for the safe and timely passage of all life stages within riverine habitats and between riverine and estuarine habitats (e.g., an unobstructed river or dammed river that still allows for safe and timely passage).
- 6) Depth. Deep (greater than or equal to five meters) holding pools for both upstream and downstream holding of adult or subadult fish with adequate water quality and flow to maintain the physiological needs of the holding adult or subadult fish.

- 7) Sediment quality. Sediment quality (i.e., chemical characteristics) necessary for normal behavior, growth, and viability of all life stages.

*Estuarine Habitats:*

- 1) Food resources. Abundant prey items within estuarine habitats and substrates for juvenile, subadult, and adult life stages.
- 2) Water flow. Within bays and estuaries adjacent to the Sacramento River (i.e., the Sacramento-San Joaquin Delta and the Suisun, San Pablo, and San Francisco bays), sufficient flow into the bay and estuary to allow adults to successfully orient to the incoming flow and migrate upstream to spawning grounds.
- 3) Water quality. Water quality, including temperature, salinity, oxygen content, and other chemical characteristics necessary for normal behavior, growth, and viability of all life stages.
- 4) Migratory corridor. A migratory pathway necessary for the safe and timely passage of all life stages within estuarine habitats and between estuarine and riverine or marine habitats.
- 5) Depth. A diversity of depths necessary for shelter, foraging, and migration of juvenile, subadult, and adult life stages.
- 6) Sediment quality. Sediment quality (i.e., chemical characteristics) necessary for normal behavior, growth, and viability of all life stages.

Physical and biological features for sDPS green sturgeon in the lower reaches of the Sacramento River and the Delta have been significantly altered from their historical condition. Green sturgeon exhibit very different life history characteristics from those of salmonids and therefore use habitat within the action area differently. They are thought to exhibit rearing behavior in the lower reaches of the Sacramento River and the Delta as juveniles and subadults prior to migrating to the ocean, though little is known about the behavior of these life stages in the Delta (Radtke 1966, NMFS 2015). Loss of riparian habitat complexity in the Sacramento River and Delta has likely posed less of a threat because these life stages are benthically oriented. However, it is likely that reverse flows generated by Delta water exports affect the sDPS green sturgeon juvenile and subadult life stages to some degree as evidenced by juvenile captures at CVP and SWP salvage facilities during high water years (California Department of Fish and Wildlife 2026).

Currently, many of the PBFs of sDPS green sturgeon are degraded and provide limited high quality habitat. Factors that lessen the quality of migratory corridors for juveniles include unscreened or inadequately screened diversions, altered flows in the Delta, and presence of contaminants in sediment. Although the current conditions of their designated critical habitat are significantly degraded, the spawning habitat, migratory corridors, and rearing habitat that remain in both the Sacramento River watershed, the Delta, and nearshore coastal areas are considered to have high intrinsic value for the conservation of the species.

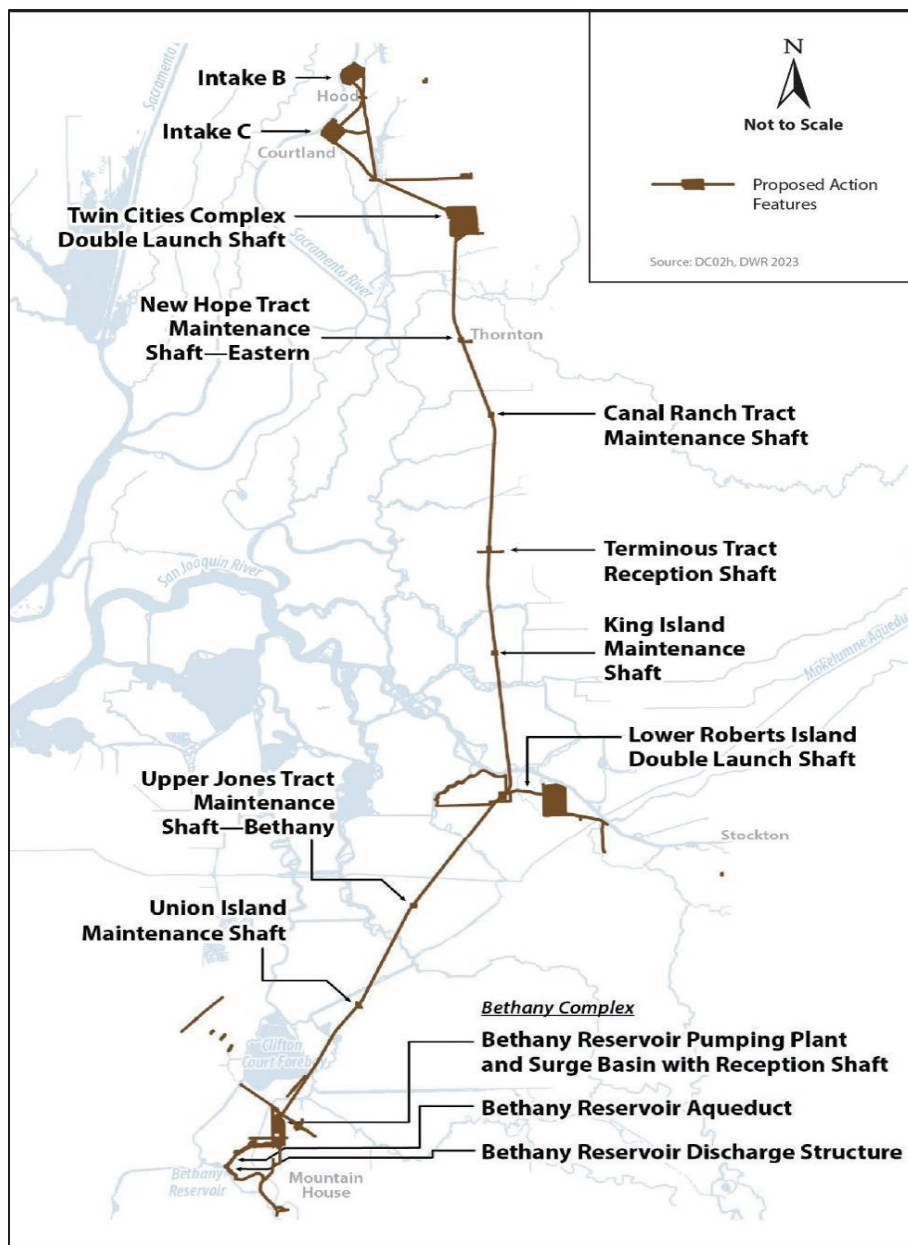
## **2.3. Action Area**

“Action area” means all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action (50 CFR 402.02). The Action Area for the proposed action is based on the elements described in section 1.3, Proposed Federal Action, of this opinion.

### **2.3.1. Construction-related Activities for the Proposed Action**

The proposed action’s construction of the two new intake facilities would provide new points of diversion in the north Delta along the Sacramento River (refer to Figure 1, which is in section 1.3 and copied below again for convenience). The action area also includes land between Clifton Court Forebay and Bethany Reservoir, where the Bethany Complex and associated features will be constructed. Further details on the proposed action area are found in the BA, Chapter 3, *Description of the Proposed Action*, Section 3.1.3, *Summary of Proposed Action* (ICF 2025).

ESA-listed species, designated critical habitat, and MSA-managed species and habitat under NMFS authorities primarily occur within the Sacramento River channel portion of the action area. Aspects of the proposed action, such as tunneling, occur underneath other waterways and habitat areas for anadromous fish and may be impacted by acoustics effects. Therefore, the action area includes the footprint for those construction activities and facilities as well (Figure 1). In summary, the action area consists of the footprint of the proposed facilities, and includes construction of the intakes within the Sacramento River channel, and 1,000 feet of the river-channel downstream of in-channel construction that are expected to be affected by construction activities (Figure 6, Figure 7).



**Figure 1 (again).** Overview of the Proposed Project facilities that will be constructed within the Sacramento- San Joaquin River Delta Figure from the BA (ICF 2025).

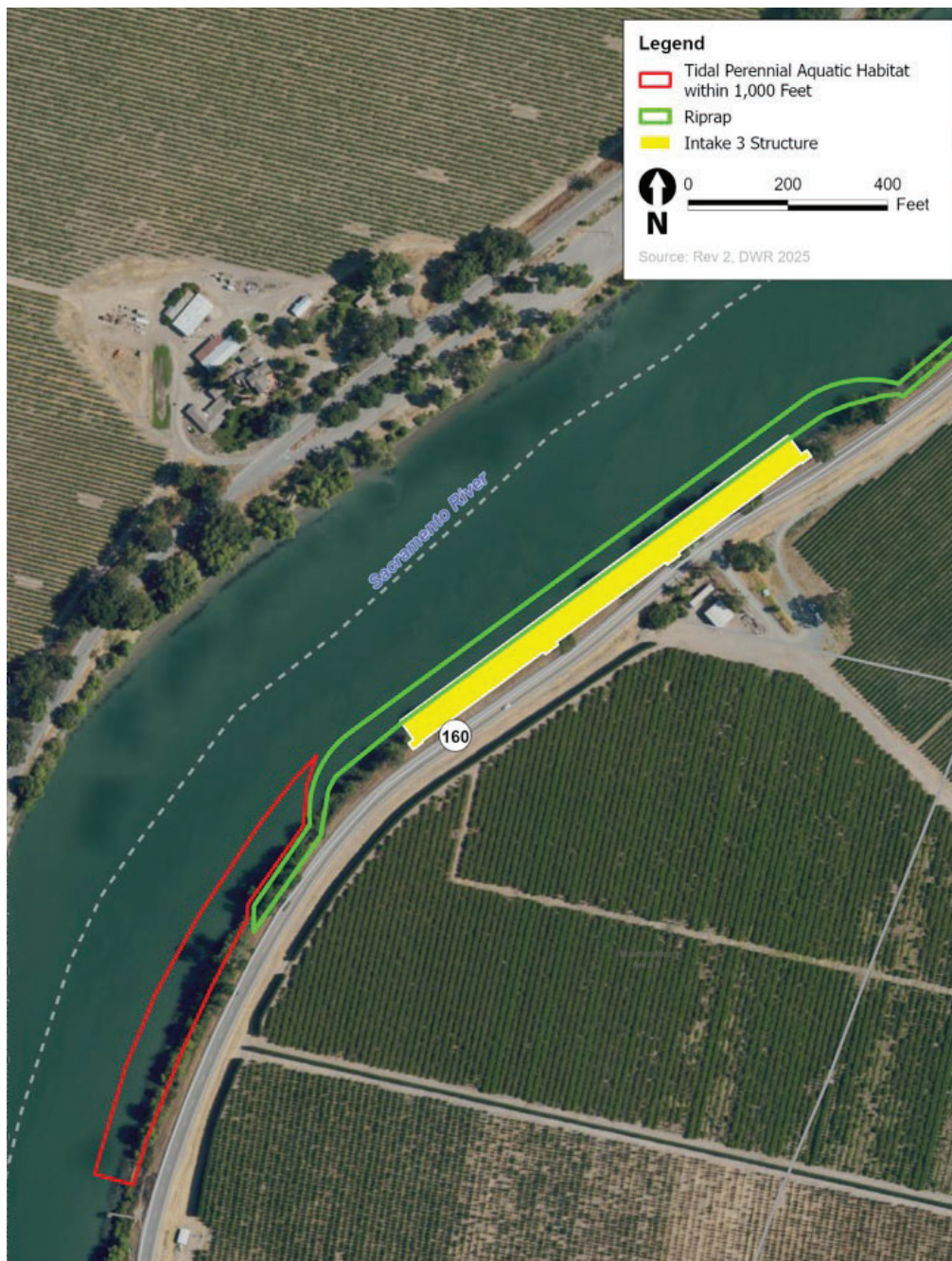
### 2.3.2. Framework-Level Component: Operations and Maintenance associated with DCP

The proposed action includes the future operations and maintenance of the DCP in coordination with current SWP facilities and some CVP facilities. Based on available information for the proposed action under the framework programmatic approach, we expect the action area for the proposed action to also include the following:

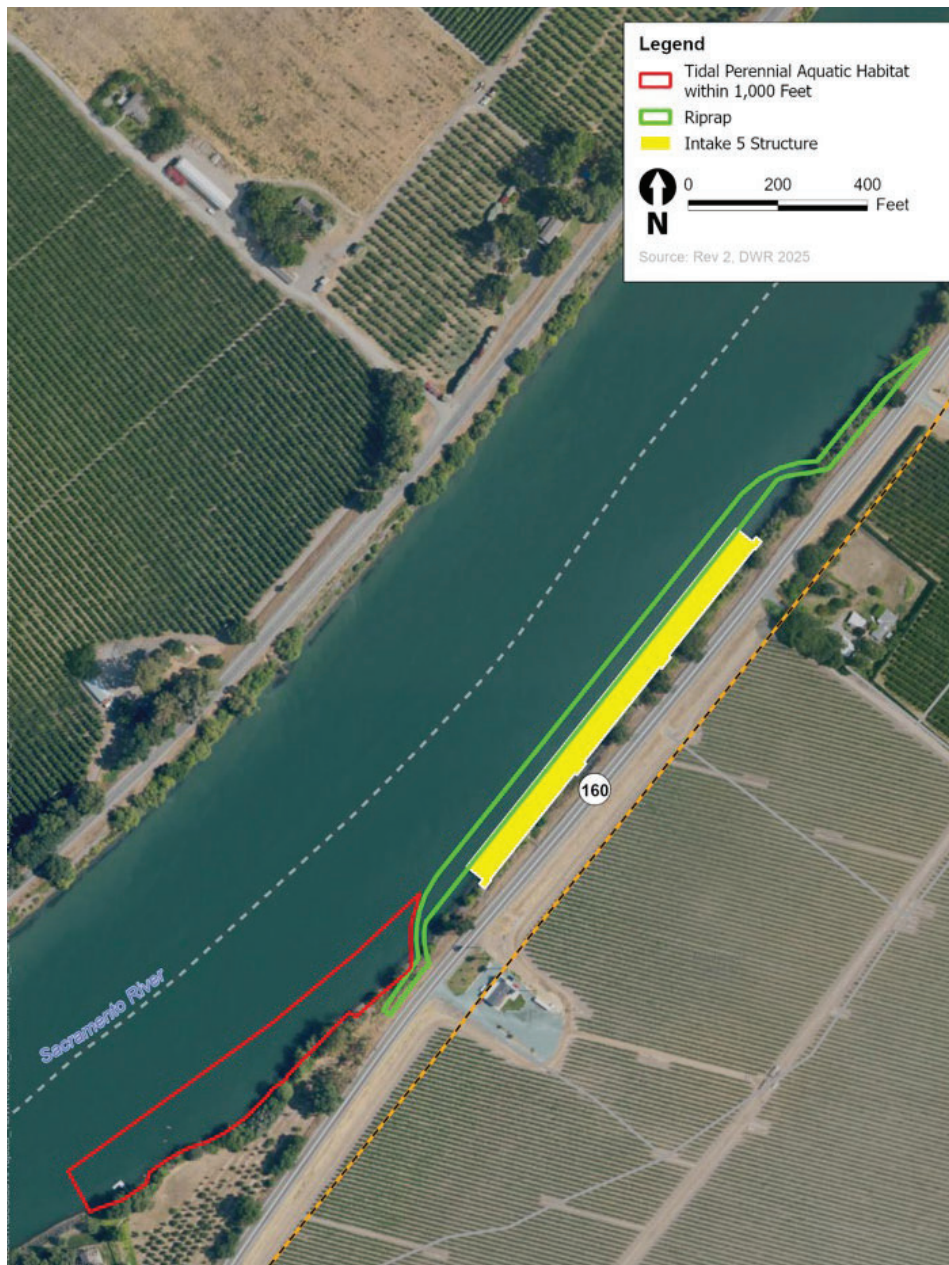
- (1) Shasta and Keswick reservoirs, and the Sacramento River from Keswick Reservoir downstream to and including the Sacramento-San Joaquin Delta; (2) San Francisco Bay and Suisun Marsh. and (3) the nearshore Pacific Ocean coastal area off California.



For future ESA consultations that analyze and exempt incidental take of ESA-listed anadromous species for the operations and maintenance of the DCP facilities, the action area may be re-assessed based on updated information and operational details.



**Figure 6.** Close up view of the Sacramento River channel with the footprint of Intake B (yellow polygon), proposed riprap area (green outline), and 1,000 feet downstream of the construction area (red outline) where water quality impacts may occur due to construction activities. Figure from DWR and ICF.



**Figure 7.** Close up view of the Sacramento River channel with the footprint of Intake C (yellow polygon), proposed riprap area (green outline), and 1,000 feet downstream of the construction area (red outline) where water quality impacts may occur due to construction activities. Figure from DWR and ICF.

## 2.4. Environmental Baseline

The “environmental baseline” refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed federal projects in the action area that have already undergone formal or early section 7 consultations, and the impact of State or private actions



which are contemporaneous with the consultation in process. The impacts to listed species or designated critical habitat from federal agency activities or existing federal agency facilities that are not within the agency's discretion to modify are part of the environmental baseline (50 CFR 402.02).

In this opinion, the effects of past CVP and SWP operations are also part of the environmental baseline. Effects of those actions have been analyzed through past consultation and contributed to the current condition of the species and critical habitat in the action area. Other past, present, and ongoing impacts of human and natural factors (including proposed federal projects that have already undergone ESA section 7 consultation) contributing to the current condition of the species and critical habitat in the action area are also included in the environmental baseline. With respect to the analysis of extant dams and their effects on the proposed action, the existence of the CVP and SWP dams and their past operations are part of the baseline contributing to the status of the species. In the 2024 LTO opinion, NMFS considers in the proposed action's effects analysis the future daily, monthly, seasonal, and discretionary operational decisions. These decisions include whether to store or release water from CVP and SWP reservoirs and can have effects downstream and through the Delta, relative to a future baseline condition. Depending on flow, quality (e.g., temperature), timing, and location of the water released, as well as life stage and species affected, these effects can be beneficial and adverse.

Since Euro-American settlement of the Central Valley in the mid-1800s, populations of native Chinook salmon, steelhead, and green sturgeon have declined dramatically, largely due to factors that completely reshaped the aquatic ecosystem. These factors include dam construction, water management, hydropower facilities, levee construction, gold mining, urbanization, and conversion of landscapes to agriculture. Many of these changes eliminated or blocked access to important habitats and reduced the abundance, productivity, and distribution of Central Valley salmonids and sturgeon. Habitat simplification, fishing, hatchery impacts, and other stressors led to the loss of genetic and phenotypic (life history, morphological, behavioral, and physiological) diversity in Central Valley salmonids, reducing their capacity to cope with a variable and changing climate (Herbold et al. 2018). Land use changes to support and protect California's rapidly increasing human population combined with substantial and widespread water development, including the construction and operation of the CVP and SWP, have been accompanied by significant declines in nearly all species of native fish (State Water Resources Control Board 2017). The freshwater and estuarine environment has been so dramatically altered by habitat loss and water management that the anadromous life history strategy may no longer be sustainable for Central Valley salmon (Michel 2018).

Central Valley listed fish species are also culturally significant, as many tribes relied on the presence of a healthy ecosystem supporting these fish for their livelihood and for food, cultural, and ceremonial practices. Reduction of salmonid and sturgeon populations and landscape alterations have contributed to the detrimental impacts experienced by California tribes following Euro-American colonization.

Altogether, dams, levees, land conversion to agriculture, urbanization, water management, and gold mining are the main landscape-scale factors that have altered the Central Valley environment to its current condition, with environmental variation providing additional impacts. These landscape-scale factors and their impact on Central Valley listed species and their

designated critical habitat are discussed below, followed by a section on more localized, but also important, factors adversely affecting listed species in the Central Valley.

#### **2.4.1. Central Valley Project and State Water Project Operations and Existing Structures**

Operations of dams across the Central Valley have resulted in major alteration of water temperatures and flows throughout the year. Large amounts of water are exported throughout the Central Valley to support agricultural, and to a lesser extent industrial and urban demands. Reclamation and DWR implement the coordinated operation of the CVP and SWP to maximize water supply delivery and optimize power generation consistent with applicable laws, contractual obligations, and agreements. Coordinated operations increase operational flexibility by focusing on non-operational measures to avoid significant adverse effects based on the conditions estimated to occur through 2030 (NMFS 2024a). Reclamation and DWR store, divert, and convey water in accordance with existing water contracts and agreements, including water service and repayment contracts, settlement contracts, exchange contracts, and refuge deliveries, consistent with water rights and applicable laws and regulations.

The CVP and SWP combined are one of the world's largest water storage and conveyance systems with both the federal and the state portions of the projects capable of storing, diverting upstream, and exporting millions of acre-feet of water away from the Delta each year. The large volumes exported through the South Delta, combined with the location of the pumps in the South Delta, result in significantly modified hydrologic and biological systems (Cummins et al. 2008).

The Environmental Baseline includes the past and current operation of the CVP and SWP and the presence of existing structures such as dams, reservoirs, export and fish salvage facilities, canals, and other related infrastructure. Since the early 1990s, NMFS has evaluated past and current operations for effects of NMFS listed species through previous ESA consultations. The biological opinions resulting from these consultations include many protective actions required through reasonable and prudent measures and terms and conditions. These actions are also part of the Environmental Baseline (NMFS 2004, 2009, 2019, 2024a).

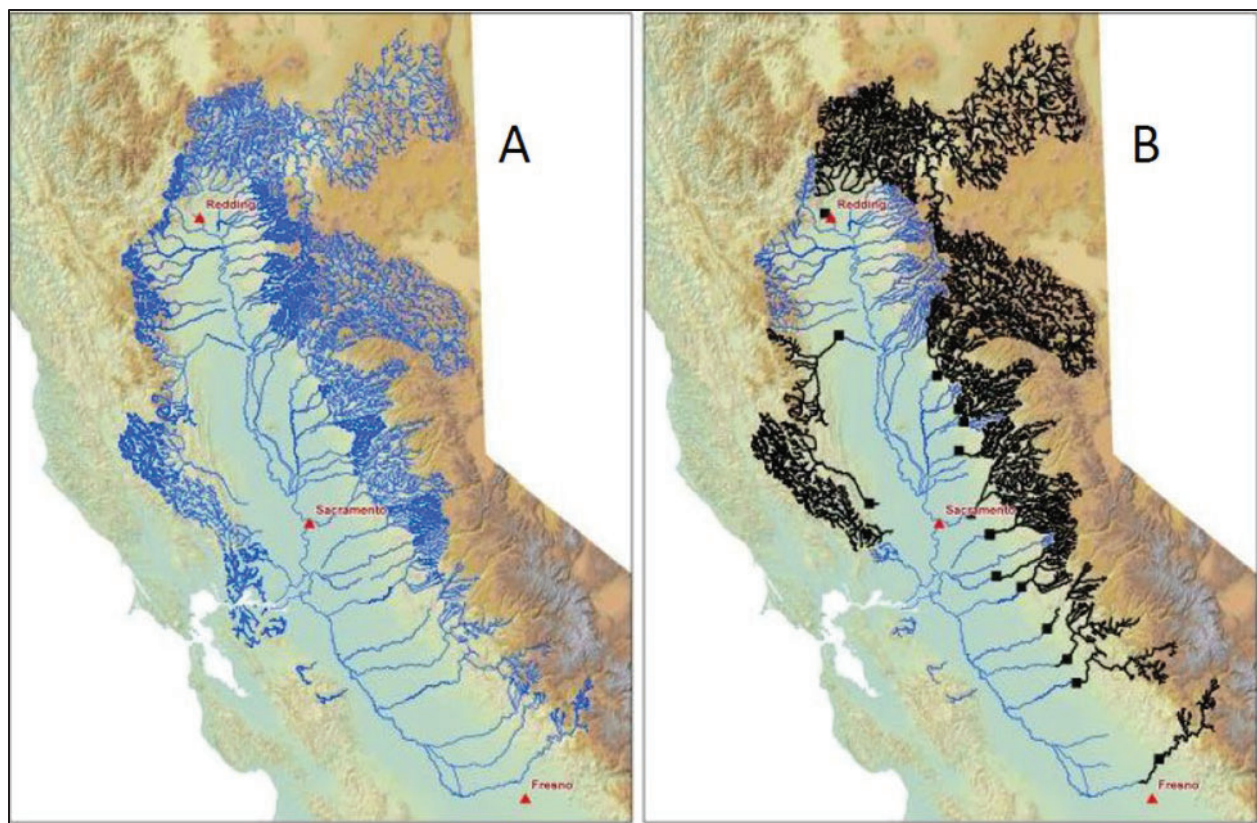
#### **2.4.2. Impacts of Dams and Other Passage Impediments**

Construction of dams and other structures in the Central Valley has blocked anadromous salmonids from most of their historical spawning and initial rearing habitat, eradicating most populations of SR winter-run Chinook salmon, CV spring-run Chinook salmon, and CCV steelhead that were present prior to Euro-American contact. Between 72 to 100 percent of the original Chinook salmon spawning and holding habitat in the Central Valley drainage is no longer accessible due to dam construction (Figure 8; Yoshiyama et al. 2001, Cummins et al. 2008, NMFS 2014). SR winter-run Chinook salmon lost three of its four historical spawning populations following construction of Keswick and Shasta Dams. Approximately 15 of the 18 or 19 historical populations of CV spring-run Chinook salmon are extirpated, with their historical spawning habitats located upstream of impassable dams (Lindley et al. 2007). Currently, impassable dams block access to 80 percent of historically available habitat and block access to all historical spawning habitat for about 38 percent of the historical populations of CCV steelhead (Lindley et al. 2006). Modeling by Mora et al. (2009) indicates about nine percent of historical sDPS green sturgeon habitat is blocked by dams. Impassable barriers are considered the main threat to sDPS green sturgeon because migration corridors are blocked and migration

cues (water flow) are altered (NMFS 2018). These impassable barriers have significant adverse effects to the overall viability of the various ESU and DPS’.

Prior to 2012, seasonal closure of Red Bluff Diversion Dam limited sDPS green sturgeon spawning to habitats that were likely unsuitable for egg incubation in some years. With the permanent decommissioning of Red Bluff Diversion Dam gates, sDPS green sturgeon have access to suitable spawning and incubation areas on the Sacramento River under all conditions (e.g., droughts). ACID (Anderson-Cottonwood Irrigation Dam), approximately five miles downstream of Keswick Dam (river mile 302), remains a potential passage barrier to spawning sDPS green sturgeon on the Sacramento River. The percentage of the sDPS green sturgeon spawning run using the uppermost five miles of the Sacramento River between ACID and Keswick Dam is unknown, but is currently estimated to be small based on the absence of acoustic tag detections in this reach.

Flood control weirs of the Yolo and Sutter bypasses can serve as barriers to salmon, CCV steelhead, and sDPS green sturgeon migration during high water events (Thomas et al. 2013). During some high flow events, these fish enter the Yolo and Sutter bypasses and become stranded when the water recedes. In some cases, adult sturgeon remain stranded in small, isolated bypass ponds through the summer or fall, making them vulnerable to poaching and other sources of mortality. In 2011, 24 sDPS green sturgeon individuals were rescued from the Yolo and Sutter bypasses (Thomas et al. 2013). Since relocation efforts cannot prevent all mortality associated with stranding, and the loss of even a few adult fish periodically should be avoided, it is important to construct structures at these weirs that allow volitional passage of upstream migrating sDPS green sturgeon.



**Figure 8.** Historical habitat accessible to salmonids (A, in blue) and lost upstream habitat (B, in black) from construction of impassable dams (black squares). Remaining anadromous salmon habitat is confined to the valley floor (B, in blue).

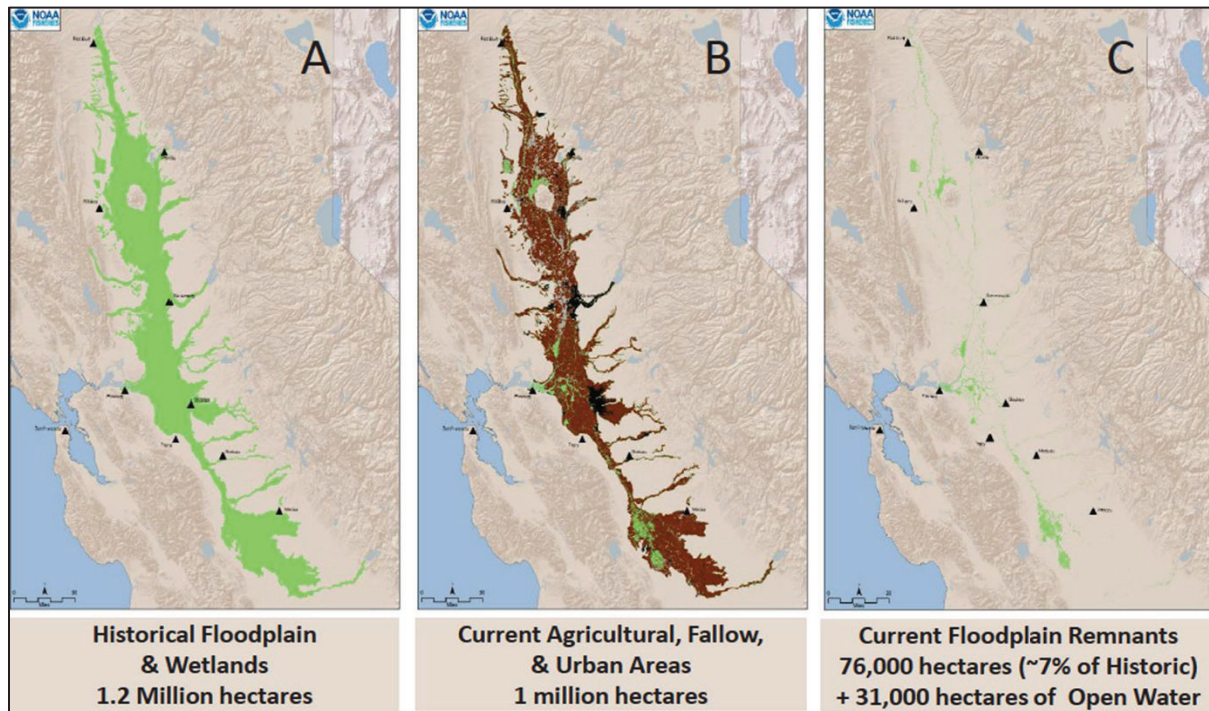
### 2.4.3. Levees

Levee construction throughout the Sacramento and San Joaquin River watersheds has resulted in a landscape where less than five percent of the native wetland, riparian, and floodplain habitats remain (Whipple et al. 2012). Ninety-three percent of historical floodplain rearing habitat is no longer accessible due to levee construction (Figure 9, Herbold et al. 2018). The shallow water habitats historically providing food-rich areas for rearing salmonids have been almost entirely replaced by urban and agricultural landscapes (Herbold et al. 2018). Because juvenile salmon grow faster when they have access to inundated floodplain habitat than in adjacent river channels (Sommer et al. 2001, Jeffres et al. 2008), it is likely overall salmonid productivity has been diminished with the majority of Sacramento and San Joaquin Rivers confined by levees in all but the wettest years.

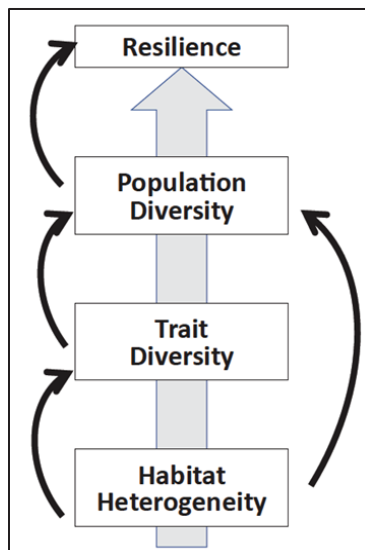
Central Valley salmonids evolved with access to a diverse suite of shallow water habitats, which promotes resilience to a variable climate. Now adaptations to historical conditions are mismatched with the current simplified river systems. Important sources of habitat diversity for juvenile salmonids in the current system are Yolo and Sutter flood bypasses, where salmonids can access food rich floodplain habitat under high flows. Still, with so little freshwater habitat now available in the Central Valley, habitat heterogeneity has decreased, and salmonid



population diversity and resilience has decreased (Figure 10) and vulnerability to climate variability and change has increased since the pre-dam period (Herbold et al. 2018).



**Figure 9.** (A) Historical floodplain and Delta wetlands habitat; (B) remnant floodplain and wetland habitat currently in agricultural lands, fallow lands, or urban areas; and (C) floodplain and wetland remnants.



**Figure 10.** Conceptual model of how habitat heterogeneity creates trait and phenotypic diversity to promote population resilience. Source: (Herbold et al. 2018)

#### 2.4.4. Environmental Variability

A major factor affecting the range-wide status of the threatened and endangered anadromous fish in the Central Valley and aquatic habitat at large is environmental variability. The globally-averaged combined land and ocean surface temperature data, as calculated by a linear trend, show a warming of approximately 1°C (1.8°F) from 1901 through 2016 (Jay et al. 2018). The *IPCC Special Report on the Impacts of Global Warming* (IPCC 2023) noted that human-induced warming reached a global surface temperature of 1.1°C (2.0°F) above pre-industrial levels by 2020, and global surface temperature has increased faster since 1970 than in any other 50-year period over at least the last 2000 years.

Annual average temperatures have increased by 1.8°C (3.2°F) across the contiguous United States since the beginning of the 20<sup>th</sup> century, with Alaska warming faster than any other state and twice as fast as the global average since the mid-20<sup>th</sup> century (Jay et al. 2018). Warming across the globe has led to more frequent heat waves in most land regions and an increase in the frequency and duration of marine heatwaves (IPCC 2023). Average warming across the globe up to 1.5°C (2.7°F) as compared to pre-industrial levels is expected to lead to regional changes in extreme temperatures and increases in the frequency and intensity of precipitation and drought (IPCC 2023).

From 2012 to 2016, California experienced the most extreme drought since instrumental records began in 1895. A growing body of evidence suggests that environmental variability has increased the likelihood of extreme droughts in California (California Department of Water Resources 2018). California experienced well below average precipitation during the 2012-2016 drought, as well as record high surface air temperatures in 2014 and 2015 and record low snowpack in 2015 (Williams et al. 2016). Paleoclimate reconstructions suggest the 2012-2016 drought was the most extreme in the past 500 to 1000 years (Williams et al. 2016, Williams et al. 2020, Williams et al. 2022). Anomalously high surface temperatures substantially amplified annual water deficits during 2012-2016. California entered another period of drought from 2020-2022. These drought periods are now likely part of a larger drought event (Williams et al. 2022). Recent multi-year drought periods, as well as the increased incidence and magnitude of wildfires in California, have likely been exacerbated by environmental variability (Diffenbaugh et al. 2015, Williams et al. 2019, Williams et al. 2020, Williams et al. 2022).

Warmer temperatures associated with environmental variability reduce snowpack and alter the seasonality and volume of seasonal hydrograph patterns (Cohen et al. 2000). Central California has shown trends toward warmer winters since the 1940s (Dettinger and Cayan 1995). An altered seasonality results in runoff events occurring earlier in the year due to a shift in precipitation falling as rain rather than snow (Roos 1991, Dettinger et al. 2004). Specifically, the Sacramento river basin annual runoff amount for April to July has been decreasing since about 1950 (Roos 1987, Roos 1991). Increased temperatures influence the timing and magnitude patterns of the hydrograph and strain the ability of reservoir water managers to provide cold water releases for salmonids.

The magnitude of snowpack reductions is subject to annual variability in precipitation and air temperature. Large spring-snow-water-equivalent percentage changes, late in the snow season, are due to a variety of factors including reduction in winter precipitation and temperature increases that rapidly melt spring snowpack (Vanrheenen et al. 2004). Factors modeled by



Vanrheenen et al. (2004) show that melt season shifts to earlier in the year, leading to a large percent reduction of spring snow-water-equivalent (up to 100 percent in shallow snowpack areas). Additionally, an air temperature increase of 2.1°C (3.8°F) is expected to result in a loss of about half of the average April snowpack storage (Vanrheenen et al. 2004). The decrease in spring-snow-water-equivalent (as a percentage) would be greatest in the region of the Sacramento River watershed where snowpack is shallower than in the San Joaquin River watersheds to the south.

Warming attributed to environmental variability is expected to affect Central Valley anadromous salmonids and sDPS green sturgeon in the future. Because Central Valley salmon, CCV steelhead, and sDPS green sturgeon runs are restricted to low elevations as a result of impassable dams, if the climate warms by 5°C (9°F), it is questionable whether any Central Valley Chinook salmon and sDPS green sturgeon populations can persist (Williams 2006, NMFS 2018). Based on an analysis of multiple climate models and emission scenarios over a reference temperature from 1951 to 1980, the most plausible projection for warming over Northern California is 2.5°C (4.5°F) by 2050 and 5°C by 2100, with a modest decrease in precipitation (Dettinger 2005). Chinook salmon in the Central Valley are at the southern limit of their range, and warming will shorten the period that low elevation habitats can support salmonid life stages. Projected 33 percent salinity increases in the Sacramento river basin in the 21st century due to environmental variability may result in declining habitat quality and food web productivity; and could potentially alter the salinity and prey base in sDPS green sturgeon juvenile rearing habitat and adult migration corridors (CH2M HILL 2014, NMFS 2018).

There is a high threat posed by altered water temperatures due to environmental variability. In the Sacramento River basin, environmental variability models predict increased air temperatures in the Central Valley and surrounding mountains (Ficklin et al. 2012), altered precipitation patterns with a higher frequency of dry years, reduced spring snowpack, and reduced spring flows (Knowles and Cayan 2002, CH2M HILL 2014). Water temperatures in the Sacramento River basin could also increase (CH2M HILL 2014). A warming climate with continued changes in precipitation patterns may influence reservoir operations and thus influence water temperature and flow that fish experience in the Central Valley.

Growth and survival rates of salmon in the California Current off the Pacific Northwest can be linked to fluctuations in ocean conditions related to Pacific Decadal Oscillation and the El Niño-Southern Oscillation conditions and events, as well as the recent northeast Pacific marine warming phenomenon (also known as “the blob”; Peterson et al. 2006, Wells et al. 2008). Evidence suggests early marine survival for juvenile salmon is a critical phase in their survival and development into adults. In marine environments, ecosystems and habitats important to juvenile and adult salmonids are likely to experience changes in temperatures, circulation, water chemistry, and food supplies (Feely et al. 2004, Doney et al. 2009, Osgood 2008, Turley 2008, Abdul-Aziz et al. 2011, Doney et al. 2012). Some of these changes, including an increased incidence of marine heat waves, are likely already occurring, and are expected to increase (Frölicher et al. 2018).

The correlation between various environmental indices that track ocean conditions and salmon productivity in the Pacific Ocean, both on a broad and a local scale, provides an indication of the role they play in salmon survival in the ocean. Moreover, when discussing the potential extinctions of salmon populations, climate patterns would not likely be the sole cause, but could

certainly increase the risk of extinction when combined with other factors, especially in ecosystems under stress from humans (Francis and Mantua 2003).

#### **2.4.5. Invasive Species/Food Web Disruption**

During development of the Central Valley Chinook Salmon and Steelhead Recovery Plan (NMFS 2014), invasive species/food web disruption was identified as a primary stressor affecting the recovery of the species. This threat primarily affects the juvenile rearing and out-migration life stage of these species through the Delta and bays.

Invasive species include plants and animals and most were introduced to the Delta unintentionally through ship ballast water. However, some species have been introduced intentionally by resource agencies for sportfishing or forage. Invasive aquatic plants have become established in many areas of the Delta. Establishment of invasive aquatic plants can harm or kill native aquatic species because they form dense mats that block sunlight and deplete oxygen supplies. Most of these aquatic weeds were introduced to the Delta unintentionally and include water hyacinth (*Eichhornia crassipes*), hydrilla (*Hydrilla verticillata*), and egeria (*Egeria densa*). Within the Delta, the construction of levees and the conversion of adjacent riparian communities to other land uses have substantially changed the ecosystem. These changes have stressed native aquatic flora and fauna allowing infestation of invasive aquatic weeds. Invasive weeds flourish in the disturbed environment and may reduce food web productivity, potentially harming fish and wildlife (CALFED Bay-Delta Program 2000).

The majority of clams, worms, and bottom-dwelling invertebrates currently inhabiting the Delta are non-native species. Non-native species also comprise an increasing proportion of the zooplankton and fish communities in the Bay-Delta system. It is estimated that a new non-native species is identified in the Bay-Delta every 15 weeks (CALFED Bay-Delta Program 2000). Many fish known to prey on juvenile anadromous salmonids were introduced by resource agencies to provide sportfishing. These fish include striped bass, American shad (*Alosa sapidissima*), and largemouth bass (*Micropterus salmoides*). Introductions have been detrimental to many native species, many of which have declined precipitously or become extinct through predation and competition for resources (CALFED Bay-Delta Program 2000). At the same time, some non-native species are performing vital ecological functions, such as serving as primary consumers of organic matter or as a food source for native fish and other wildlife populations (CALFED Bay-Delta Program 2000).

One of the most important habitat attributes of the riverbed to listed anadromous fish species in the action area is the production of food resources for rearing and migrating juveniles, such as drifting and benthic invertebrates, forage fish, and fish eggs. Benthic invertebrates, such as oligochaetes and chironomids (dipterans), are the predominant juvenile salmonid and sDPS green sturgeon food items produced in the silty and sandy substrates of the action area. Although specific information on food resources for sDPS green sturgeon within freshwater riverine systems is lacking, they are presumed to be generalists and opportunists that feed on similar prey to other sturgeons (Israel and Klimley 2008), such as the population of white sturgeon (*Acipenser transmontanus*) present and coexisting with sDPS green sturgeon in the Sacramento River basin. Seasonally abundant drifting and benthic invertebrates have been shown to be the major food items of white sturgeon in the lower Columbia River (Muir et al. 2000). As sturgeon

grow, they begin to feed on oligochaetes, amphipods, smaller fish, and fish eggs as represented in the diets of white sturgeon (Muir et al. 2000).

Historically, the San Joaquin River was an important source of nutrients to the Delta. Most of the San Joaquin River is now diverted from the South Delta by CVP and SWP operations. The loss in nutrients has contributed to an overall decrease in fertility of the Delta, limiting its ability to produce food (NMFS 1997). Additionally, pumping operations may result in a loss of zooplankton, reducing their abundance in the Delta. Poor food supply may limit the rearing success of SR winter-run Chinook salmon. Extensive areas of the Delta are below mean high tide, but because of levees and flap gates installed throughout the Delta, these areas are no longer subject to tidal action. This effectively reduces the volume of water subject to tidal mixing and the size of the Delta floodplain. Reduced residence time of Delta water and associated nutrients restricts the development of food web organisms (CALFED Bay-Delta Program 2000).

The Salmon and Sturgeon Assessment of Indicators by Life Stage (SAIL) synthesis teams (Windell et al. 2017) found predation by non-native species affected SR winter-run Chinook salmon (but also CV spring-run Chinook salmon and CCV steelhead) egg survival, timing, and condition and juvenile survival, residence time/migration, and growth.

#### **2.4.6. Loss of Riparian Habitat and Instream Cover**

The Central Valley Chinook Salmon and Steelhead Recovery Plan (NMFS 2014) identified loss of riparian habitat and instream cover as a primary stressor affecting the recovery of the species. This threat primarily affects the juvenile rearing and out-migration life stage of these species, from the upper reaches of their watershed of origin through the Delta. Effects of the action that contribute to the loss of riparian habitat and instream cover are likely to result in a probable change in fitness from reduced growth and or survival probability.

Loss of riparian habitat and instream cover is the process where access to riparian habitat and instream cover is lost either by the construction of river features (i.e., levees or flood control structures) or river channelization that disconnect the river from its historical floodplain. Construction of river features involves rip-rapping the river bank and removing vegetation along the bank and upper levees removes instream and overhead cover in nearshore areas. This has negative effects on riparian habitat because riparian species, seedlings, as well as woody debris to deposit elsewhere are no longer naturally recruited. Woody debris and overhanging vegetation within shaded riverine aquatic habitat provide escape cover for juvenile salmonids from predators as well as thermal refugia. Aquatic invertebrates are dependent on the organic material provided by a healthy riparian habitat, and many terrestrial invertebrates also depend on this habitat. Studies have demonstrated a significant portion of the juvenile Chinook salmon diet is composed of terrestrial insects, particularly aphids, which are dependent on riparian habitat (NMFS 1997).

The SAIL synthesis teams identified relevant pathways by which loss of riparian habitat and instream cover is likely to affect SR winter-run Chinook salmon (and similar conceptual models can apply to CV spring-run Chinook salmon and CCV steelhead), as well as how it is likely to interact with other stressors. Specifically, (Windell et al. 2017) focused on the growth and condition of juveniles as being affected by access to riparian habitats. Habitats that provide refuge from high water velocity or predators, without depleting food supply, function to increase

growth rates by reducing energy demand to obtain a given food supply. Growth rate may then influence migration timing and success, where a higher growth rate is associated with earlier smoltification and faster downstream migration (Beckman et al. 2007). However, the inability of a juvenile in a particular habitat to supply its metabolic demand and achieve some threshold growth rate may also serve as a strong cue to leave that habitat and migrate downstream, and a satisfactory food supply may induce a juvenile to remain in the habitat for a longer duration of time to rear.

#### **2.4.7. Loss of Natural River Morphology and Function**

The Central Valley Chinook Salmon and Steelhead Recovery Plan (NMFS 2014b) identified loss of natural river morphology and function as a primary stressor affecting the recovery of the species. This threat primarily affects the juvenile rearing and out-migration life stage of these species from the upper reaches of their watershed of origin through the Delta.

Loss of natural river morphology and function is the result of river channelization and confinement, decreasing riverine habitat complexity, which then leads to a decrease in the quantity and quality of juvenile rearing habitat. The SAIL synthesis teams also identified relevant pathways by which loss of natural river morphology and function is likely to impact SR winter-run Chinook salmon (and similar conceptual models can apply to CV spring-run Chinook salmon and CCV steelhead) as well as how it is likely to interact with other stressors. Specifically, (Windell et al. 2017) focused on the impact of channelized, leveed, and rip-rapped reaches potentially having low habitat complexity, low abundance of food organisms, and offering little protection from predators—factors which juveniles are dependent on for growth and successful survival.

Water depth modification caused by non-point source sediment was ranked in the Recovery Plan as a high threat to sDPS green sturgeon adults within the Sacramento river basin and a medium threat to other life stages in the Sacramento River basin (NMFS 2018). Impoundments and mitigation and restoration efforts were also considered as contributing to the water depth modification threat to all life stages in the basin. Non-point source sediment includes runoff from urban areas, agriculture, forests, irrigated lands, landfills, livestock, mining operations, nurseries, orchards, etc. Removal of riparian vegetation results in increased erosion and input of fine grain material into the water. Sediment from these sources can be deposited in pools. The sDPS of green sturgeon require deep pools for spawning and holding. Large impoundments (e.g., Oroville and Shasta reservoirs) that reduce the frequency of high flow events may limit pool scouring and result in a reduction of pool depth. Survival and development of early life stages may also be impacted by non-point source sediments through altered turbidity and substrate composition. At the time the Recovery Team conducted its assessment, the high threat ranking for adults was attributed, in part, to the impact of water depth modification on the quantity and habitat quality of deep pools. Mora (2016) indicates 50 to 125 areas with greater than 5-meter depth available on the mainstem Sacramento River depending upon the year. It is uncertain as to whether all of these pools supply sufficient habitat for spawning and holding in terms of depth and substrate.

#### **2.4.8. Loss of Floodplain Habitats**

Loss of floodplain habitat and loss of wetland function have been identified as primary stressors affecting the recovery of Central Valley salmonid species (NMFS 2014b) and sDPS green

sturgeon (NMFS 2018). This threat primarily affects the juvenile rearing and out-migration life stage of these species from the upper reaches of their watershed of origin through the Delta.

Although riverine floodplains support high levels of biodiversity and productivity, they are also among the most converted and threatened ecosystems globally (Opperman et al. 2010). In California, more than 90 percent of wetlands have been lost since the mid-1800s (Garone 2011, Hanak et al. 2011). Loss of floodplain habitat in the Central Valley is a result of controlled flows and decreases in peak flows which have reduced the frequency of floodplain inundation resulting in a separation of the river channel from its natural floodplain. Channelizing the rivers and Delta has also resulted in a loss of river connectivity with the floodplains that otherwise provide woody debris and gravels that aid in establishing a diverse riverine habitat and that provide juvenile salmonid rearing habitat.

The importance of connectivity for juvenile Chinook salmon to floodplain rearing habitat has been observed in several river systems. Research on the Yolo Bypass, the primary floodplain on the Lower Sacramento River, indicates that floodplains are key juvenile rearing habitats supporting significantly more drift invertebrate consumption and therefore faster growth rates (Sommer et al. 2001a, Katz et al. 2017). Otolith microstructure studies near the City of Chico recorded increased CV fall-run Chinook salmon growth, higher prey densities, and warmer water temperatures in off-channel ponds and non-natal seasonal tributaries compared to the main-channel Sacramento River (Limm and Marchetti 2009). Research of juvenile Chinook salmon on the Cosumnes River noted that ephemeral floodplain habitats supported higher growth rates for juvenile Chinook salmon than more permanent habitats in either the floodplain or river (Jeffres et al. 2008). This growth is important to first-year and estuarine survival, factors which may be key influences of a Chinook cohort's success (Kareiva et al. 2000).

As with other stressors, the SAIL synthesis teams referenced the relevant pathways by which loss of floodplain habitat could SR winter-run Chinook salmon (and similar conceptual models can apply to CV spring-run Chinook salmon and CVCV steelhead) as well as how it may interact with other stressors. However, instead of describing the negative effects caused by a loss of floodplain habitat, Windell et al. (2017) examined the benefit of juvenile rearing on floodplains as it relates to survival, residence time and migration, and fish condition. The SAIL report notes the interaction with higher flows that activate accessible floodplains and secondary channels, which thereby expand the availability of low-velocity refuge habitat. The SAIL report also identifies inundated floodplains in the Central Valley as being particularly successful habitat for fish growth because it provides optimum water temperature, lower water velocity, higher food quality and density, and reduced predator and competitor density relative to the main channel (Windell et al. 2017).

#### **2.4.9. Physical Habitat Alteration**

The Central Valley Chinook Salmon and Steelhead Recovery Plan (NMFS 2014) identified physical habitat alteration as a primary stressor affecting the recovery of the species. This threat primarily affects the spawning life stage of these species in the upper reaches of their watershed of origin.

Physical habitat alteration includes loss of natural river morphology and function. Flood control measures, regulated flow regimes, and river bank protection measures have all had an adverse



effect on riparian and instream habitat in the lower Sacramento River. Levees constructed in this reach are built close to the river to maximize land usage, NMFS. Additionally, nearshore aquatic areas have been deepened and sloped to a uniform gradient, such that variations in water depth, velocity, and direction of flow are replaced by consistent moderate to high velocities. Gravel sources from the banks of the river and floodplain have also been substantially reduced by levee and bank protection measures. Levee and bank protection measures restrict the meandering of the river, which would normally release gravel into the river through natural erosion and deposition processes.

Chinook salmon spawn in clean, loose gravel, in swift, relatively shallow riffles, or along the margins of deeper river reaches where suitable water temperatures, depths, and velocities favor redd construction and oxygenation of incubating eggs. Construction of dams and resultant controlled flows and extensive gravel mining affect spawning habitat. Chinook salmon require clean, loose gravel from 0.75 to 4.0 inches in diameter for successful spawning (NMFS 1997). Juvenile Chinook salmon prefer slow and slack water velocities for rearing and the channelization of the river has removed most of this habitat type. Dams in the Upper Sacramento River and its tributaries have eliminated the major source of suitable gravel recruitment to many reaches of the river downstream of Keswick Dam.

The threat of altered sediments to sDPS green sturgeon due to impoundments is high. Upstream dams and impoundments reduces sediment delivery to bays and estuaries. This impacts sDPS green sturgeon feeding habitat quality and quantity through changes in sediment deposition and composition and subsequent changes in prey resources or through changes in turbidity that could impact habitat use and predation by sight-predators.

#### **2.4.10. Water Quality**

Current land use in the Sacramento river basin and Delta has seen a large increase in urbanization, industrial activity, and agriculture in the last century. In a basin-wide study, areas with relatively high concentrations of agricultural activity as well as areas that had previously experienced mining activity showed increased concentrations of dissolved solids and nitrite plus nitrate (Domagalski et al. 2000). Varying concentrations of mercury and methylmercury have been found throughout the Sacramento river basin (Domagalski et al. 2000). Concentrations of these contaminants were greatest downstream of previous mining sites (primarily Cache Creek). Both studies showed lower concentrations of contaminants in the American River as compared to other sites sampled in the basin.

Multiple studies document high levels of contaminants in the Delta such as polychlorinated biphenyls (PCBs), organochlorine pesticides, polycyclic aromatic hydrocarbons (PAHs), selenium, and mercury, among others (Stewart et al. 2004, Leatherbarrow et al. 2005, Brooks et al. 2012). This suggests that fish are exposed to these contaminants. The inability to characterize concentrations and loading dynamics makes it difficult to quantify transport and total contaminant loading in the system (Johnson et al. 2010). Additionally, numerous discharges of treated wastewater from sanitation wastewater treatment plants (e.g., Cities of Tracy, Stockton, Manteca, Lathrop, Modesto, Turlock, Riverbank, Oakdale, Ripon, Mountain House, and the town of Discovery Bay) and the untreated discharge of numerous agricultural wasteways are emptied into the waters of the San Joaquin River and the channels of the South Delta. This leads to cumulative additions in thermal effluent loads as well as cumulative loads of potential



contaminants (i.e., selenium, boron, endocrine disruptors, pesticides, biostimulatory compounds, etc.).

Metals, PCBs, and hydrocarbons (typically oil and grease) are common urban contaminants that are introduced to aquatic systems via nonpoint-source stormwater drainage, industrial discharges, and municipal wastewater discharges. Many of these contaminants readily adhere to sediment particles and tend to settle out of solution relatively close to the primary source of contaminants. PCBs are persistent, adsorb to soil and organic matter, and accumulate in the food web. Lead and other metals will adhere to particulates and can bioaccumulate to levels sufficient to cause adverse biological effects. Mercury is also present in the Sacramento River and could be sequestered in riverbed sediments. Hydrocarbons biodegrade over time in an aqueous environment and do not tend to bioaccumulate or persist in aquatic systems.

Chinook salmon contain higher levels of some contaminants than other salmon species, however levels can vary considerably among populations. Mongillo et al. (2016) reported data for salmon populations along the west coast of North America, from Alaska to California, and found marine distribution was a large factor affecting persistent pollutant accumulation. They found higher concentrations of persistent pollutants in Chinook salmon populations that feed near land-based sources of contaminants. There is some information available for contaminant levels of Chinook salmon in inland waters (i.e., Krahn et al. 2007, O'Neill and West 2009, Veldhoen et al. 2010, Mongillo et al. 2016).

Harmful algal blooms also occur in the Delta and, although toxic exposure of estuarine fish has been documented, the extent of their impacts to the aquatic food web is unknown (Lehman et al. 2010). More recently, concerns have been raised about ammonia levels in the Delta (Davis et al. 2018). The largest source of dissolved ammonium is the Sacramento Regional Wastewater Treatment Plant. Upgrades to the facility were completed in the spring of 2023, so that the facility will now remove 99 percent of ammonia and 89 percent of nitrogen from the wastewater. Within a few years, the upgrades will help to show how important ammonium ratios are in limiting diatom production in the Bay-Delta. The Central Valley Regional Water Quality Control Board is working with researchers at San Francisco State University and University of California, Davis, to evaluate the impact of ammonia in the Delta (Connon et al. 2011). All the waters within the Delta are listed as impaired by at least one factor, either due to the presence of unacceptable levels of pollutants or lack of maintaining conditions such as adequate dissolved oxygen levels (EPA 2011a).

Pesticides are found in the water and bottom sediments throughout the Delta. The more persistent chlorinated hydrocarbon pesticides are consistently found at higher levels than the less persistent organophosphate compounds. Sediments in the western Delta have high pesticide content. Pesticides, such as polychlorinated biphenyls (PCBs), organochlorine pesticides, polycyclic aromatic hydrocarbons (PAHs), selenium, and mercury, among others, have concentrated in aquatic life, and have been documented at high levels in the Delta; but long-term effects and the effects of intermittent exposure are not known (Stewart et al. 2004, Leatherbarrow et al. 2005, Brooks et al. 2012). There are now concerns about the aquatic toxicity of pyrethroid-based pesticides (bifenthrin, cyfluthrin, cypermethrin, and permethrin), which have replaced organophosphorus pesticides such as diazinon and chlorpyrifos. Little is known about the potential for interactive toxicity from complex pesticide mixtures and/or pesticides interacting with other chemical, physical, or biological stressors (EPA 2011b). Pesticide use for

the treatment and elimination of invasive aquatic vegetation may have important consequences for water quality parameters including amount of light that reaches the water column, temperature, salinity, turbidity, and food availability, which may also influence the migratory paths that sDPS green sturgeon salmonids utilize in the Delta (NMFS 2018).

Adult salmonid exposure to contaminants within the Delta is limited and not likely to affect reproduction. However, survival and growth of juvenile salmonids will potentially be affected. In contrast, sDPS green sturgeon may remain in or return to the Delta at all life stages such that survival, growth, and reproduction are all important characteristics to consider for sDPS green sturgeon.

#### **2.4.11. Diversions and Entrainment**

There are over 3,700 water diversions on the Sacramento and San Joaquin Rivers, their tributaries, and in the Delta; most of these are unscreened (Mussen et al. 2013), posing a widespread threat to early life stages of fish. A study of 12 unscreened, small to moderate sized diversions (less than 150 cfs) in the Sacramento River, found diversion entrainment was low for listed salmonids and sturgeon, though the study points out that the diversions used were all situated relatively deep in the river channel (Vogel 2013). The study also suggested that the factors affecting fish entrainment at unscreened diversions are complex and poorly understood because of the many site-specific variables that influence the exposure and vulnerability of fish to entrainment (Vogel 2013). In a previous mark-recapture study addressing mortality caused by unscreened diversions, low mortality was observed in hatchery-produced juvenile Chinook salmon released upstream of four different diversions throughout the Sacramento River (less than or equal to 0.1 percent of individuals released, Hanson 2001).

The Central Valley Project Improvement Act's (CVPIA) Anadromous Fish Screen Program was established in 1994 to minimize the impacts of diversions on anadromous fish and provide technical guidance and cost-share funding for fish screen projects. The Anadromous Fish Screen Program also supports activities and studies to assess the potential benefits of fish screening, determine the highest priority diversions for screening, improve the effectiveness and efficiency of fish screens, encourage the dissemination of information related to fish screening, and reduce the overall costs of fish screens (State Water Resources Control Board 2017). Through the Anadromous Fish Screen Program, as of 2019, there were a total of 30 fish screens constructed at diversions on the Sacramento River, four fish screens in the San Joaquin and tributaries, and three fish screens at Delta diversions, which has resulted in reduced entrainment at those diversions. Currently, screen criteria for sDPS green sturgeon has not been developed (but see Verhille [2014]), and the benefits of projects intended to reduce salmonid impingement and entrainment at diversions to sDPS green sturgeon are not fully understood (NMFS 2018).

#### **2.5. Effects of the Action**

Under the ESA, "effects of the action" refers to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7

consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration” (50 CFR 402.02 (2018)).

## **2.5.1. Construction and Pre-operation Maintenance: Effects to the Species**

### **2.5.1.1 Acoustics**

The proposed action has terrestrial and aquatic habitat construction elements that will result in acoustic related impacts (noise) in the areas associated with those activities. Acoustic related impacts will occur contemporaneously with construction activities, and will be associated primarily with the use of heavy construction equipment on the levees, such as excavators or drilling equipment to modify the levees and construction areas for improved soil stability, pile drivers to install sheet pile walls and steel pilings, and noise from increased vessel traffic due to the movement of commercial barges throughout the work areas transporting large construction equipment and materials. In addition, tunneling by tunnel boring machines (TBMs) has the potential to create low frequency sound and vibrations (infrasound) that will be transmitted to the overlying surface horizons, including the waterways of the Delta where the bore alignment crosses underneath them. When construction activities are halted, noise generation ceases. This is considered an effect of the construction process related to the Project.

#### **2.5.1.1.1 Terrestrial Adjacent Noise**

All the terrestrial construction elements and associated construction equipment required to complete the construction component of the proposed action will create noise in the terrestrial environment, and potentially in the surrounding waterways as well, particularly when heavy earth moving equipment is used. The scraping and moving of earth will create noise, as energy is being transferred from the hard blades or buckets of the equipment to the soil horizons. The energy imparted by the earth moving actions to the soil is partially transferred through the soil to surrounding areas as acoustic energy, including the adjacent aquatic environment, with a portion of the total energy being lost through heat or other mechanisms of transmission loss. This transfer of sound energy is referred to as coupled transmission. It is expected that noise transferred through the soil to adjacent waterways in this manner will attenuate in strength relatively quickly and is therefore unlikely to be of sufficient energy to cause mortality or injury to exposed fish, but more likely to result in harassment causing behavioral avoidance responses instead. It is anticipated that the resulting noise levels will initially “drive” fish away from any affected area, however they may return or stay in the area as they acclimate to the new acoustic environment (habituation). Noise coupled with increased human activity (*i.e.*, motion, noise, shadows, etc.) on the adjacent levees, however, may be sufficient to “drive” fish away from the work area for longer periods of time. Therefore, it is expected that any fish within the areas adjacent to levees where construction activities are underway will avoid the shoreline and the shallow water adjacent to the levee toe and move into deeper, open water to avoid the noise during construction activities. Furthermore, additional “background noise” within the aquatic environment may mask important ecological reception of sounds critical for survival, such as predator detection. Elevated noise within the aquatic environment has the potential to expose fish

to elevated predation pressures from a combined lack of access to hiding areas along the shoreline, and the masking of approaching predators within their immediate surroundings.

The listed salmon, steelhead, and sturgeon species may be present in the action area during construction activities that result in terrestrial adjacent noise. Many of the listed species that are present are expected to pass through the Sacramento River channel migration corridor within the action area relatively quickly, minimizing exposure to terrestrial noise. However, some may exhibit behavioral responses that result in delayed migration or increased predation risk. Therefore, terrestrial adjacent noise is expected to impact a small number of fish during each of the years of in-water construction.

#### **2.5.1.1.2 Pile Driving**

Within the aquatic environment, the BA has described the driving of thousands of individual sheet pile sections into multiple locations in the Action Area to construct cofferdams, as well as driving hundreds of support pilings to create foundations for infrastructure associated with the proposed Project. Two types of pile driving hammers are proposed for the Project: vibratory and impact. A vibratory hammer will be used to initially drive sheet piles to the approximate final depth required and an impact hammer will be used to achieve final depth as required in the design specifications. Certain segments of the sheet pile walls will tie into adjacent levees and will likely also require the use of an impact hammer to achieve the necessary final depth and load bearing requirements for these sections, to prevent water seepage. Installation of steel piles will also require an impact hammer to drive the piles to necessary depths to support concrete floor foundations for the Project's various structural features. Installation of sheet pile cofferdams for multiple construction sites will require several weeks to complete. Once installed, the cofferdams will isolate construction areas, for dewatering to facilitate construction in the dry.

Pile driving consists of driving steel piles into the riverbed with a mechanical hammer. The force of the hammer hitting a pile forms a sound wave that travels down the pile and causes the pile to resonate radially and longitudinally. Acoustic energy is formed as the walls of the steel pile expand and contract, forming a compression wave that moves through the pile. The outward movement of the pile wall sends a pressure wave propagating outward from the pile and through the riverbed and water column in all directions. Inconsistent mediums such as soil and water cause acoustic energy to respond differently. Acoustic energy in water will result in a higher rate of transmission loss. In water, factors such as water depth, water turbulence, air bubbles, and substrate consistency are important considerations when estimating the distance a compression wave will travel. A compression wave traveling through shallow water and substrates with variable consistencies (*i.e.*, variable particle size class distribution) will attenuate more rapidly than compression waves traveling through a constant medium such as deep water or bedrock. As a compression wave moves away from the source, the wave length increases and intersects with the air/water interface. Once the compression wave contacts the air, it attenuates rapidly and does not return to the water column.

The degree an individual fish exposed to underwater sound will be affected (from a startle response to immediate mortality) depends on a number of variables such as the species of fish, size of the fish, presence of a swim bladder, sound pressure intensity and frequency, shape of the sound wave (rise time), depth of the water around the pile and the bottom substrate composition and texture. An important characteristic of the underwater sound that causes injury is frequency.

During pile installation, most energy is contained within the frequency range of 100–1,000 Hertz which results in reverberation of the swim bladder. The most susceptible tissues that are injured during exposure to underwater sound produced from pile driving are the soft-tissue organs surrounding the swim bladder, such as the liver and kidney (Hastings and Popper 2005). Both salmonids and sturgeon possess physostomous swim bladders and are therefore more susceptible to injury from acoustic impacts than fish without swim bladders. In addition, sturgeon, which are primarily benthically oriented fish, have large swim bladders which make them more susceptible to acoustic impacts than fish with smaller swim bladders. When fish are exposed to multiple strikes of a pile driver, the repetitive oscillations and the resultant pressure waves will cause the swim bladder to act like a drum. Although any single pulse (depending on its magnitude) may not result in acute injury to the internal organs, the repetitive nature of the sound produced during pile driving is likely to result in injury due to the repetitive flexure of the organ membrane, particularly if the membrane experiences resonance.

Noise created by pile driving can physically injure animals or change animal behavior in the affected environment. Injurious effects can occur in two ways (Popper *et al.* 2014). First, immediate adverse effects can occur if a single noise event exceeds the threshold for direct physical injury. Second, effects can result from prolonged exposure to repetitive or sustained noise levels for extended periods of time. Behavioral effects can be adverse if such effects interfere with an animal's behavior such as migrating, feeding, resting, or reproducing.

NMFS (2021) uses the sound exposure level (SEL) metric, expressed as the square of the time integrated sound-pressure-level measured in decibels over the duration of the sound exposure (decibels are referenced to one micropascal ( $\mu\text{Pa}$ ) of pressure; one pascal is equivalent to one Newton of force per square meter), to correlate physical injury to fish from underwater sound pressure produced during the installation of piles (Hastings and Popper 2005). This metric allows summation of energy over multiple strikes. Using SEL, the exposure of fish to a total amount of energy (*i.e.*, dose) can be used to determine a physical injury response.

For fishes, generally, the accumulation period can be reset to zero after a 12-hour period of no pile driving, especially in a river or tidally influenced waterway where many fish species are moving. The SEL metric additionally incorporates ‘effective quiet’, which means if the received SEL from an individual pile strike is below a certain level (*e.g.*, 150 dB SEL), then the accumulated energy from multiple strikes would not contribute to injury, regardless of how many pile strikes occur. ‘Effective quiet’ establishes a limit on the maximum distance from the pile where injury is expected. Beyond this distance no physical injury is expected, regardless of the number of pile strikes.

Installation of sheet piles and steel piles with either a vibratory pile driving hammer or impact hammer is expected to result in adverse effects to listed salmonids and sDPS green sturgeon due to levels of underwater sound that will be produced. Elevated noise levels from pile driving activities may cause temporary behavioral changes and/or loss or reduction of hearing in affected fish. Rearing juvenile and migrating post-spawn adult sDPS green sturgeon are expected to avoid the elevated noise of pile driving operations by swimming around the areas with the highest noise levels or holding outside of the high noise areas until pile driving ceases. There is a potential for these fish to suffer a temporary loss of hearing sensitivity at the expected noise levels generated by pile drivers. Loss of hearing sensitivities in juvenile sturgeon could expose



them to higher risks of predation. Fish with impacted hearing capacities will have a lower ability to detect predators and may be unable to maintain position in the water column due to inner ear equilibrium factors. Noise from pile driving may also cause startling and/or avoidance of habitat by fish in the immediate vicinity of in-water and near-shore construction activities. Startling of fish can cause harm by temporarily disrupting normal behaviors essential to growth and survival such as feeding, sheltering, and migrating. Disruption of these behaviors may occur for specific periods during daylight pile driving operations. Cessation of pile driving activities each night is expected to provide a respite, allowing fish to migrate through the affected area and partially offsetting the extent of impacts to listed species in the area. NMFS assumes that normal behavior patterns will cause individual migrating salmonids and sDPS green sturgeon to leave the affected areas within one day, and therefore underwater sound energy will not be summed across multiple days.

NMFS characterizes sound sources as either impulsive or non-impulsive as described below:

- Impulsive sound sources: produce sounds that are typically transient, brief (less than one second), broadband, and consist of high peak sound pressure with rapid rise time and rapid decay. Impulsive sounds can occur in repetition (*e.g.*, seismic air guns, impact pile driving) or as a single event (*e.g.*, explosives).
- Non-impulsive sound sources: can be continuous or intermittent, and produce sounds that can be broadband, narrowband or tonal, and brief or prolonged. Non-impulsive sources do not have the high peak sound pressure with rapid rise time typical of impulsive sounds. Examples of non-impulsive sources include drilling, vibratory pile driving, and certain active sonars.

In 2008, NMFS' West Coast Region established the following interim dual thresholds for the onset of physical injury from impact pile driving activities (*i.e.*, impulsive sound sources) through the Fisheries Hydroacoustic Working Group (FHWG 2008).

|                   | Onset of Physical Injury (Received Level)                          |
|-------------------|--------------------------------------------------------------------|
| Fish Size         | Impulsive Sound Sources                                            |
| Fishes $\geq$ 2 g | Single strike instantaneous peak: 206 dB<br>Cumulative SEL: 187 dB |
| Fishes $<$ 2 g    | Single strike instantaneous peak: 206 dB<br>Cumulative SEL: 183 dB |

Installation of piles using a vibratory hammer is unlikely to result in physical injury to listed fish species but could nevertheless result in behavioral effects to individual fish exposed to active pile driving operations. NMFS considers impacts from this level of exposure will be insignificant due to the mobility of these species and the similarity, accessibility, and availability of nearby habitat in this open-water environment. If an individual fish chooses to remain within the behavioral response zone, it could be exposed to increasing levels of sound energy during pile driving operations for a sustained period. Since pile installations will occur intermittently during daylight



hours only, these species will be able to resume normal activities during quiet periods between pile installations and at night.

Based on the findings presented in section 5.4.1 in the BA (ICF 2025), incorporated here by reference and supported by our own independent analysis, construction of the cofferdams and training walls associated with construction of the new intakes indicated that impact hammer pile driving will result in a single strike peak SEL of 206 dB at a radius of up to 8.5 meters (28 feet) away from the pile being driven, and a cumulative SEL of 187 dB at a radius of up to 179 meters (588 feet) at Intake B and 117 meters (383 feet) at Intake C, representing the distance from the pile driving activity where physical injury could occur following exposure to multiple pile strikes over the course of a day. NMFS expects injurious noise effects are unlikely to occur due to the mobility of these species and the typical behavioral response of moving away from injurious sounds. The duration of impact pile driving to complete construction of the cofferdams would be 21 days at each intake. Up to four additional days of pile driving will also be required during the final year of construction at each intake to install steel pipe piles to support the floating log boom. For detailed descriptions of the assumptions on which this analysis was based, and graphical representations of the extent of acoustic impacts associated with impact hammer pile driving at each of the intakes, NMFS incorporates by reference Tables 5.4-2 and 5.4-3, as well as Figures 5.4-4, 5.4-5, 5.4-6, and 5.4-7 from the BA.

Impact pile driving would also be required at two bridge crossings associated with the proposed action (*i.e.*, Burns Cutoff and Snodgrass Slough). The area of effect associated with single strike peak SEL of 206 dB from impact pile driving at these locations, accounting for attenuation of sound by river bends, extends to a distance from the pile driving activity of 24 meters (82 feet) at Burns Cutoff and 7 meters (24 feet) at Snodgrass Slough. The cumulative SEL of 187 dB from impact hammer pile driving at each bridge crossing extends to 371 meters (1,217 feet) and 273 meters (896 feet) from the source of the pile being driven at Burns Cutoff and Snodgrass Slough, respectively. As with the construction of the intakes, NMFS expects injurious noise effects from impact pile driving at the bridge crossings is unlikely to occur due to the mobility of NMFS listed species and the typical behavioral response of moving away from injurious sounds. The duration of impact pile driving at the bridge crossings would range from five to nine days at each location. For detailed descriptions of the assumptions on which this analysis was based, and graphical representations of the extent of acoustic impacts associated with impact hammer pile driving at each of the bridge crossings, NMFS incorporates by reference Table 5.4-4 and Figures 5.4-8, and 5.4-9 from the BA.

The listed salmon, steelhead, and sturgeon species may be present in the action area during construction activities that result with in-water noise. Underwater noise intensity levels of that cause direct injury or mortality of fish could occur over a period of approximately 25 days during the proposed in-water work period (June 1–October 31) over a 6-year period at each intake location. In addition to the work window, avoidance and minimization measures (AMMs) and best management practices (BMPs) would be implemented to monitor and decrease noise levels from impact pile driving. Underwater noise levels would return to baseline levels following cessation of pile driving and other construction activities and would not be expected to result in long-term impacts on species and critical habitat. Many of the listed species present in the action area during the work window are expected to avoid, either spatially or temporally (*e.g.*, migrate at night), sound-related impacts, or alternatively pass through the Sacramento River channel

migration corridor relatively quickly, minimizing exposure time. However, these behavioral changes in response to underwater noise may disrupt migration and increase predation risk. Therefore, in-water noise is expected to affect low numbers of each species present in the action area during the years of construction.

#### **2.5.1.1.3 Boat/ Barge Operations**

Boat operations during construction will result in temporary acoustic effects to listed fish species. Barge/tugboat operations will be conducted to transport construction equipment and materials to each intake, for a total of 94 and 68 trips to intakes B and C, respectively. There would be no more than two trips upstream and two trips downstream per day, with work staggered by at least one year for each intake. In addition, each barge round trip would be associated with one day of dredging to excavate and prepare the subgrade at the intake for riprap placement for a total of 19 to 28 days of dredging at each intake. It is unlikely that concurrent barge operations and conventional dredging practices on this scale will create sufficient acoustic effects to cause physical injury to fish or elicit anything other than a behavioral avoidance response. Temporary hearing loss could occur if fish remained in the vicinity of an operating dredge for an extended period, but it is unlikely that this would occur in an open water environment. The listed salmon, steelhead, and sturgeon species may be present in the action area during boat/barge operations and exposed to underwater noise. However, the listed species are expected to pass through the Sacramento River channel migration corridor within the action area relatively quickly, actively avoiding any noise-related impacts. Some listed species may exhibit behavioral changes, resulting in delayed migration or increased predation risk. Therefore, boat/barge operations are expected to impact low numbers of each fish species during each of the years of construction.

#### **2.5.1.1.4 Tunnel Boring Related Noise**

Finally, the use of several TBMs to cut tunnels under the Delta sediment horizons will create vibrations and low frequency noise (*i.e.*, infrasound) due to the noise of the machines themselves and the action of the rotating cutterheads grinding through the native soils. Tunnel boring along the DCP alignment would pass beneath 14 different waterbodies a total of 17 times. Tunnel boring is expected to progress at approximately 40 feet per day, with work continuing up to 20 hours per day, 5 days per week, and up to 10 hours on Saturdays, thereby passing under each waterbody for several days, depending on the width of the waterbody along the tunnel alignments. Acoustic modeling of potential effects was undertaken for the tunnel boring intersection with the San Joaquin River, which is the shallowest tunnel boring location passing beneath a waterbody (approximately 21 meters (68 feet) of cover between the crown of the tunnel and the bottom of the river channel). The overall SEL at the bottom of the channel was estimated at 104 dB, which is well below the 150-dB threshold for ‘effective quiet’ described above. Given this, tunnel boring is not expected to result in sound-related injury to listed species present within action area. However, behavioral changes in response to underwater noise/disturbance from tunnel boring may occur, delaying migration and increasing predation risk. Therefore, tunnel boring noise is expected to impact low numbers of each fish species during each of the years of construction.

#### **2.5.1.1.5 Summary of Risk**

As described, increase in aquatic and terrestrial- adjacent noise levels during construction activities for the north Delta diversion intakes and other activities have the potential to temporarily affect individual fish. Sound-related injury resulting from pile driving activities is expected to impact a small number of listed species that may be present in the action area during the in-water work window. However, it is expected that most fish will actively avoid areas with increased noise levels, which in turn is likely to result in behavioral changes that delay migration and increase predation risk. These potential impacts are anticipated to have a localized and temporary effect on individual fish within the action area. The proposed conservation measures, AMMs and construction BMPs included as part of the proposed action are expected to reduce the severity and potential for acoustic-related impacts on the listed fish species.

#### **2.5.1.2 Water Quality**

##### **2.5.1.2.1 Sediment Disturbance**

The proposed project involves construction and pre-operation maintenance activities in or adjacent to the Sacramento River that 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 listed anadromous fish. The re-suspension and deposition of instream sediments is a potential impact of various construction activities. Turbidity-producing activities include bed and bank disturbance during cofferdam and log-boom installation, dredging for riprap placement adjacent to the new intake locations and the placement of bed and rock riprap armoring, and pre-operation maintenance dredging, vegetation removal, and screen cleaning. Propeller wash associated with boat traffic at construction sites may also produce localized turbidity pulses, depending on location.

Temporary increases in turbidity, when compared to the ambient background turbidity levels, are anticipated to occur during various phases of construction in the action area. Elevated turbidity and suspended sediment levels have the potential to negatively affect freshwater life stages of salmonids by clogging or abrading gill surfaces, reducing primary productivity and photosynthesis activity (Cordone and Kelley 1961), and adversely affecting dissolved oxygen levels within the gravel (Zimmerman and Lapointe 2005; Lisle and Eads 1991). Fish behavioral and physiological stress responses include gill flaring, coughing, avoidance, and increased blood sugar levels (Berg and Northcote 1985; Servizi and Martens 1992). Temporary increases in turbidity and suspended sediment levels from construction may also negatively impact individual salmonids through reduced availability of food, reduced feeding efficiency. Green sturgeon are less likely to be negatively impacted by temporary increases in turbidity and suspended sediment due to differences in feeding ecology compared to salmonids. Green sturgeon are benthic feeders and primarily rely on non-visual methods to hunt for prey within the benthic sediment (NMFS 2018). Salmonids, on the other hand primarily use vision to hunt for small prey items in the water column.

Increases in turbidity and suspended sediment resulting from the proposed project are expected to be localized and temporary. Turbidity plumes from construction activities are not expected to span the entire river channel, allowing most fish to actively avoid impacted areas. In addition, AMMs and BMPs will be implemented to monitor and minimize sediment disturbance during construction activities. The temporary increases in turbidity and suspended sediment are not

expected to be severe enough to cause injury or death of listed salmonids or sturgeon. Instead, we expect temporary behavioral effects that include migration delays and movement of fish to adjacent areas, leading to reduced survival (through higher likelihood of predation) and growth (through reduced feeding) for the small number of juvenile fish that are expected to be present in the action area during construction activities.

Re-suspended sediment due to construction and pre-operation maintenance activities could include contaminants (i.e., metals, hydrocarbons such as oil and grease, organochlorine pesticides, polychlorinated biphenyls), that may be released and dispersed when sediments are disturbed. Fish could be exposed to elevated levels of contaminants if present near construction activities that disturb contaminated sediments. The greatest potential for such exposure would be during dredging and excavation for riprap placement. Other potential exposure routes include pile driving for cofferdam and log-boom installation, or from propeller wash by construction boat traffic. Disturbance of contaminated sediments could also affect the food web for listed anadromous fish because toxins in re-suspended sediment can enter the food web via bioaccumulation in macroinvertebrate organisms.

The listed salmon, steelhead, and sturgeon species may be present in the action area during construction activities that result in sediment disturbance. However, their presence is expected to be in low numbers, given adherence to the proposed in-water work window. Exposure to increased sediment is not expected to result in injury or death to listed species, but may cause in behavioral changes, such as avoidance of the action area when work is occurring. These behavioral changes could affect the survival of juvenile fishes due to reduced feeding and increased predation risk. Those listed species that are present during in-water work are expected to pass through the Sacramento River channel migration corridor within the action area relatively quickly, minimizing overall exposure time. Therefore, sediment disturbance is expected to result in low numbers of fish impacted during each of the years of construction.

#### *Summary of Risk*

As described, increased turbidity and suspended sediment levels during construction and pre-operation maintenance activities for the north Delta diversion intakes have the potential to affect water quality in the action area. These impacts would be temporary and localized, affecting migration behavior and increasing predation risk for individual fish that are present during the in-water work window. The conservation measures and construction best management practices described in the BA are expected to result in the minimization of the severity and potential water quality impacts on the listed fish species.

#### **2.5.1.2.2 Construction Contaminants**

Construction of the proposed action could result in accidental spills of contaminants, including oil, fuel, hydraulic fluids, concrete, paint, and other construction-related materials, resulting in localized water quality degradation. If this occurs, it could result in effects to fish through direct injury or mortality (e.g., damage to gill tissue causing asphyxiation), or delayed effect on growth and survival (e.g., increased stress or reduced feeding), depending on the nature and extent of the spill and the contaminants involved.

The greatest potential for adverse impacts to water quality is associated with an accidental spill from construction activities occurring in or near the river channel. Construction for the north

Delta diversion intakes involve extensive in-water work, albeit with much of the work occurring inside a cofferdam. There is some potential for spills during drilled shaft work, cofferdam support installation, excavation of cofferdam, and tremie pours of concrete (although additional concrete would be poured into the concrete base, thereby minimizing the potential for concrete mixing with water within the cofferdam prior to dewatering), but once cofferdams are installed and dewatered, any spills within the cofferdam would prevent or minimize movement of spill materials entering the main river water. Discharge of water from construction sites could also affect water quality for fish. The proposed AMMs and BMPs are expected to minimize the potential for contaminants entering waterbodies, and if they are accidentally released, cleanup plans will be in place to minimize effects on listed species.

The listed salmon, steelhead, and sturgeon species may be present in the action area during construction activities that result in the potential for exposure to construction contaminants. Spills would be accidental and therefore would be infrequent and not expected to occur, especially with proposed AMMs in place.

#### *Summary of Risk*

The potential for accidental release of contaminants through spills or sediment disturbance could degrade water quality and impact fish. However, these potential impacts are anticipated to have a localized and temporary effect on individual fish within the action area. Deployment of conservation measures and construction BMPs described in the BA are expected to minimize the potential for water quality impacts from construction contaminants on the listed fish species.

#### **2.5.1.3 Physical Injury or Mortality**

In-water construction for the proposed action has the potential to result in physical injury or mortality to listed fish species. Construction activities that could result in physical injury or mortality include: pile driving, barge/tugboat operations, enclosing construction areas and associated fish rescues, riprap placement, and construction-related water diversion from surface waters. Any surface water diversion necessary for construction activities would be screened to avoid fish entrainment. Work will be conducted during the proposed in-water work window (June 1-October 31) reducing the potential for listed species presence in the action area. Prior to dewatering and in-channel work behind a cofferdam, fish rescue will be implemented as described in Appendix 3A of the BA (ICF 2025). Fish that are handled are expected to experience low levels of stress or physical injury or mortality. However, fish rescue and handling is anticipated to be conducted by a qualified biologist which is expected to result in reduced injury and reduced likelihood of mortality for fish in the dewatered areas. Additionally, fish handling and rescue is anticipated to occur one time for each intake location, upon completion of the cofferdam at each intake location.

Barge and tugboat operations associated with construction activities have the potential to result in direct physical injury or mortality of anadromous fish from propeller entrainment or strikes. However, given that fish typically exhibit an avoidance behavioral response with boats, there is low potential for physical injury or mortality from barge and tugboat operations.

The listed salmon, steelhead, and sturgeon species may be present in the action area in low numbers during construction activities resulting in physical injury or mortality. However,



adherence to the in-water work window and implementation of AMMs and BMPs reduces the potential for fish to be exposed to project activities. Listed species that are present in the action area are expected to exhibit avoidance behavior or pass through the Sacramento River channel migration relatively quickly. Therefore, the potential for physical injury or mortality is expected to result in low numbers of fish impacted during construction. The herding, capture, and relocation of small numbers of each species is expected to result in low numbers of injury or mortality.

### *Summary of Risk*

The construction activities that have the potential to cause physical injury or mortality are anticipated to be localized within the action area. The conservation measures and construction BMPs included as part of the proposed action are expected to result in the avoidance and/or minimization of potential physical injury or mortality of listed anadromous fish. The herding, capture, and relocation of small numbers of each species is expected to result in low numbers of injury or mortality.

## **2.5.2. Construction and Pre-operation Maintenance: Effects to Critical Habitat**

The proposed project would result in both temporary and permanent impacts to designated critical habitat for the listed salmonids and sDPS green sturgeon PBFs in the Sacramento River channel portion of the Action Area (refer to Section 2.3 of this Biological Opinion). The overall footprint of the construction activities is approximately 1.5 acres of temporary effects<sup>5</sup> in terrestrial areas, and approximately 5.6 acres of permanent effects on tidal perennial habitat. The proposed project footprint of the water intakes in channel-margin habitat in the Sacramento River is approximately 494 linear feet of temporary impact, and approximately 3,124 linear feet of permanent impact. For Intake B (upstream of Hood; refer to Figure 2), rock riprap will replace approximately 1.8 acres of riparian habitat. For Intake C, (downstream of Hood), rock riprap will replace approximately 1.6 acres of riparian habitat.

The nonfederal project applicant, DWR proposes to offset permanent impacts on critical habitat through restoration within designated critical habitat of tidal perennial habitat and channel; margin habitat at an approved restoration site and/ or the purchase of conservation credits at an approved conservation bank (refer to Appendix 3B within the BA; ICF 2025). The critical habitat PBFs for the listed species is described in Section 2.4, Environmental Baseline of this Biological Opinion. In summary, the proposed project will permanently remove 3,124 linear feet of riverine/tidal riparian habitat and replace it with in-water structures and riprap, such as the diversion intakes and associated fish screen. These activities affect the PBFs of freshwater rearing habitat, freshwater migratory corridor, and estuarine areas.

### **2.5.2.1 Riparian Vegetation Permanent Removal**

While scientific literature regarding salmonids and riparian habitat is plentiful, there is a paucity of literature specifically evaluating the interaction of green sturgeon and riparian vegetation, outside of spawning grounds. However, the ecological functions of riparian vegetation for

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<sup>5</sup> Temporary effects are the habitat extent acreage that can be returned to original basic use following completion of construction; permanent effects are the habitat acreage that cannot be returned to original basic use following completion of construction.



riverine and estuarine ecosystems remain the same for a variety of fish species. Therefore, the effects to critical habitat, and the mechanisms of potential impacts, to the listed salmon, steelhead, and green sturgeon are similar and are described as follows.

Riparian and in-channel vegetation provide important habitat to listed salmonids and sDPS green sturgeon, such as large woody materials, temperature and velocity micro-refugia, and macroinvertebrate prey items for juvenile fish. The following analyses describe the mechanisms of how vegetation is an essential aspect of habitat for fish, and how the removal of riparian vegetation can impact anadromous fish.

#### **2.5.2.1.1 Food web for juvenile fish**

Riparian and in-channel vegetation are components of the food web that juvenile salmonids rely on during freshwater rearing. Riparian vegetation is an especially important contributor of organic materials to the stream, including large woody materials, and provides a significant input of external energy (termed allochthonous sources) to the food web of a stream.

Macroinvertebrates, such as aquatic and terrestrial insects, crustaceans, mollusks, and worms, depend and feed on the allochthonous sources, such as leaves or other organic materials provided by riparian vegetation (Cummins 1973; Allan et al. 2021). Macroinvertebrates are the primary food source for juvenile salmonids (Moyle 2002), which means that riparian vegetation significantly influences the food web upon which salmonids depend on (Allan et al. 2003; Rundio and Lindley 2008; Grunblatt et al. 2019). For example, terrestrial invertebrates that fall into the water supplement the macroinvertebrate community already in the area and those that drift down with flows (Rundio and Lindley 2008). Additionally, juvenile salmonids must compete for food sources with several nonnative fish, such as juvenile bass (*Moronidae spp.*), that eat macroinvertebrates as well (Olson 1996; Sullivan et al. 2012). Therefore, riparian vegetation also contributes to a prey base that would allow juvenile salmonids to better compete with juvenile nonnative fish species.

The quality and quantity of macroinvertebrates is highly influenced by river flows and hydrology over time, in addition to water quality. Because of this connection to water quality and flows, macroinvertebrates, and particularly benthic ones (or bottom-dwelling), are commonly used as a biological indicator for water quality, and the general “health” of a stream or waterbody (refer to section 2.4 Environmental Baseline; Karr 1999; Norris and Thoms 1999; Rehn 2009). Aquatic macroinvertebrates spend all or more of their lives in water, are easy to collect, and differ in their tolerances of water velocities and water quality variables, such as salinity, water temperatures, and contaminants. Since macroinvertebrates are the first biological linkage between water and fish, monitoring for them can provide information on the relationship between river flows and water quality, and the health of fish populations.

#### **2.5.2.1.2 Habitat heterogeneity and refugia**

Riparian vegetation and organic materials within a waterway are essential to providing a diversity of micro-habitats for both adult and juvenile salmonids, and sDPS green sturgeon. These micro-habitats can range in utility from providing pockets of macroinvertebrate prey (for juvenile fish), shelter from predators, overhead cover or shade, and thermal or velocity refugia (Crook and Robertson 1999; Windell et al. 2017). Instream organic materials and overhanging vegetation provide shelter for juvenile salmonids from predators, such as nonnative piscivorous fish, aquatic mammals, and aquatic piscivorous birds. Larger instream organic materials, such as

woody materials, are particularly well understood for its benefits in providing cover and shelter for juvenile salmonids (Kauffman et al. 1997; Roni and Quinn 2001; Whiteway et al. 2010; Windell et al. 2017). For example, a study by Sabal et al. (2021) suggests areas with shade, and no instream shelters, such as organic vegetative or woody materials, create potential predator ambush habitat. The potential predator ambush habitat is created when juvenile salmonids cannot visually determine if a predator is waiting in a shaded open area. On the other hand, areas with instream vegetative materials that provide hiding locations for juvenile salmonids, allow them to safely visually assess an area for predators.

Riparian vegetation that provides overhead cover and shade are also important thermal refugia for salmonids (Torgensen et al. 1999). Shade and micro-thermal refugia are especially essential during the spring and summer months when air and water temperatures increase. Riparian vegetation that provides overhead cover and shade allows both adult and juvenile salmonids and sturgeon some temporary respite from summer ambient air temperatures, and likely creates micro-thermal refugia of slightly decreased water temperatures that fish could hold in for short periods of time to decrease their body temperatures.

Riparian vegetation and instream organic material can also dissipate energy of flowing water and create micro-pockets of velocity shelters that could be utilized by both adult and juvenile salmonids and sturgeon. These micro-velocity refuges would be most essential during the warmer spring months when adult and juvenile salmonids and sturgeon have increased metabolic demand, especially if water temperatures consistently exceed 69.8° F (21° C) (Poletto et al. 2017). Micro-velocity refuges allow anadromous fish to rest, temporarily decreasing their metabolic demand. For juveniles, these refuges are especially important in warmer waters when piscivorous predators become more active and voracious (McInturf et al. 2022). Temporary decreases in metabolic demand could allow for energy conservation applied in response to other stressors, and greater investments in growth, both with potentially positive effects on juvenile fish survival. For example, if a juvenile salmonid needs to expend a lot of energy to escape a predator, then the presence of micro-velocity refuges would allow a juvenile salmonid to recover. This may make the juvenile less susceptible to predators, particularly if energy saved is used to grow larger than the prey size targeted by other predators. Juvenile growth is important for outmigration and estuarine survival, and may be a key influence on a salmonid cohort's success (Kareiva et al. 2000).

#### **2.5.2.2 In-Water Structures and Predation**

In-water structures may temporarily and/or permanently result in increased predation risk for juvenile salmonids. Temporary 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 (i.e., vertical grooves), which may make them suitable as predatory fish habitat. In-water structures, particularly cofferdams at the north Delta intakes, may result in negative effects on small fish, such as downstream-migrating juvenile salmonids. Juvenile salmonids in the construction action area near the intakes could be subject to greater risk of predation if predatory fish move in and use the temporary structures for cover.

The permanent in-water structures of the diversion intakes and associated fish screens may increase predation risk of juvenile salmonids and have the potential to create another predation hotspot. Increased predation of juvenile salmonids at the north Delta intakes could occur if

predatory fish aggregate along the intakes' cylindrical tee screens or associated in-water structures (i.e., the floating log boom and its support pilings, including accumulated debris) at greater density than existing conditions.

Predator-prey interactions can be broken down into several fundamental steps between the prey and the predator. These steps include the rates of encounters between the predator and the prey, the rate the predator decides to pursue and attack the prey when detected, the rate the predator successfully captures the prey, and, ultimately, the rate the prey is consumed by the predator. Each one of these steps is influenced by biological and physical factors in the surrounding environment such as prey abundance, spatial and temporal overlap of prey with the predator, habitat complexity, turbidity, and behavioral, physiological, and morphological adaptations that facilitate (predator success) or inhibit (prey avoidance) the predation process (Grossman et al. 2013, Grossman 2016). Although predation is frequently the proximate cause of mortality, the ultimate cause of mortality is often related to alterations in the physical or biological parameters of the habitat the prey occupy that enhance rates of predation. Because fish are adaptable, the response to habitat changes and quality are not always straightforward and linear and thus may not always be completely predictable, particularly on a shorter time scale.

In general, though, habitat that is complex and offers a multitude of different niches provides for a more diverse biological community (Grossman et al. 2013, Grossman 2016). In a stable, undisturbed, properly functioning habitat, multiple species can occupy the same general area with each species occupying a particular ecological niche, thereby minimizing direct competition between species and having a balanced predator-prey interaction. This is particularly true in habitats where predators and prey have co-evolved with each other. This relationship does not exist or is compromised when habitat is altered or nonnative species invade a new habitat, causing a loss of equilibrium among the species inhabiting it.

Man-made structures that do not offer any natural habitat attributes, such as riparian vegetation or large woody materials, have the potential to become predator “hot spots” (Sabal et al. 2016, Michel et al. 2020). While predators of juvenile salmonids currently occupy the action area, the proposed action facilities have the potential to become a predator hotspot. The addition of these structures will increase the amount of predators in the area while reducing the amount of natural riparian habitat juvenile salmonids use to hide from predators. However, special studies and location-specific data are needed to quantify the rate of predation that would occur in the action area from the proposed action. The impact the proposed action has on predation of juvenile salmonids around the new intake screens is uncertain at this time.

Overall, the weight of available information suggests that predation effects of the north Delta intakes on juvenile salmonids could be limited, but there is some uncertainty and would depend more on the operations and long-term maintenance of the facilities (refer to section 2.5.3 in this opinion). Fisheries studies will be undertaken to provide information on predatory fish and predation rate at the north Delta intakes once they are operational, to inform the refinement of future operations and adaptive management (refer to section 2.5.3 in this opinion, and Appendix 5B in ICF 2025).

### 2.5.2.3 Summary of Risk

The proposed project includes offsetting permanent impacts on critical habitat through restoration of tidal perennial habitat and channel; margin habitat at an approved restoration site and/ or the purchase of conservation credits at an approved conservation bank (refer to Appendix 3B within the BA; ICF 2025). Implementation of the Compensatory Mitigation Plan for Special-Status Species and Aquatic Resources as described in the BA would offset the permanent loss of critical habitat overall. However, there is still a temporal and spatial impact that would occur to the listed species in the Action Area, which is within the primary upstream and downstream migratory route for all listed anadromous fish in the Sacramento River watershed.

Through the mechanisms described above, riparian and in-channel vegetation habitat influence the growth and survival of juvenile anadromous fish. The riparian vegetation community provides large woody materials and other organic materials to the river. Riparian vegetation and instream organic materials affect the quality and quantity of juvenile rearing and migration habitat, including the macroinvertebrate community that are the primary food source for juvenile salmonids and foraging sDPS green sturgeon. Adult salmonids and sDPS green sturgeon are expected to be minimally affected by reduced shade and cover, however, we do not expect them to linger in the action areas as long juveniles might. The specific location of habitat loss in the juvenile salmonid and sDPS green sturgeon migration corridor is expected to adversely impact juvenile fish survival in particular.

There is some uncertainty on how listed salmonids and sDPS green sturgeon would interact with the in-channel structures and facilities under the proposed project. Monitoring of juvenile and adult Chinook salmon, CCV steelhead, and sDPS green sturgeon near the completed structures is expected to be useful to inform how the proposed action affects juvenile anadromous fish downstream migration, and adult upstream migration. The negative exchange of riparian vegetation for concrete, riprap, fish screens, and diversion intake structure is expected to result in reduced fitness and growth, and reduced survival of a small portion of the population of juvenile and adult salmon, steelhead, and green sturgeon as they migrate past the action area.

### 2.5.3. Compounding Effects

The construction schedule for in-water and in-channel work within the Sacramento River migratory and rearing corridor is estimated to occur for six years (refer to section 1.3 of this opinion). If there are unforeseen delays in construction, then it is possible that in-channel construction could take up to a total of seven years for the intakes. This timeframe encompasses at least two generations of SR winter-run Chinook salmon, CV spring-run Chinook salmon, and CV steelhead. Individual sDPS green sturgeon could also rear or migrate near or past the construction action area more than once in their lifetime.

Effects from the proposed action activities of construction could have compounding effects on individuals of the listed species each year, multiple times throughout their life cycle. These compounding effects include widespread ongoing noise and degraded water quality, resulting in behavioral changes that increase predation risk. Reduced and temporarily disturbed riparian habitat due to construction activities within the Sacramento River channel results in an overall reduction in prey availability, shelter from predators, and thermal and velocity refugia. This in turn may impact a small portion of the species at the population level by increasing stress and

reducing the overall fitness of individuals migrating through or rearing in the Delta. Furthermore, nutritional deficiencies and reduced fitness of individuals may result in an abbreviated residence time in the waters of the Delta, stunted growth rates, and diminished resiliency for survival in the ocean. Additional results may include the potential for increased susceptibility to disease, contaminants, predation, entrainment (upstream and/or downstream of action area), and other project-related effects that are likely to be compounded by exposure to multiple stressors during their residence in and migration through the action area.

#### **2.5.4. Framework-Level Component Analysis**

As described in the Analytical Approach section, this opinion is considered a “mixed programmatic” action and includes certain action components analyzed as programmatic actions. Programmatic actions include framework programmatic actions that establish a framework for the development of future actions that are authorized, funded, or carried out at a later time, and any take of a listed species would not occur unless and until those future actions are authorized, funded, or carried out and subject to further ESA section 7 consultation.

The level of detail available at the framework programmatic level is often insufficient to identify with particularity where, when, and how the program will affect listed species. Without such detail, NMFS cannot reliably identify the amount or extent of take associated with the specific program and write sufficiently specific and meaningful terms and conditions intended to minimize the impact of the taking for the benefit of the listed species. Under a framework programmatic approach, as specific projects are developed in the future, they are subject to project-specific stepped-down, or tiered, consultations where incidental take is addressed. Once framework-level action components are further developed with sufficient detail to determine the amount or extent of incidental take, they will require additional ESA section 7 consultation before implementation; this subsequent consultation will include an incidental take statement for those components. The implementation of specific actions would occur after the future ESA consultations are complete.

Framework programmatic actions are often described in broader terms and receive a qualitative analysis of their potential effects on listed species and critical habitat. In some cases, programmatic actions are designed to a level of detail where the action and its effects are reasonably certain to occur and can be analyzed more quantitatively. Regardless of whether an action is analyzed qualitatively or quantitatively, NMFS applies the same approach regarding the potential species exposure, response, and risk to individuals and populations described in this opinion’s Analytical Approach section.

The following framework programmatic actions are considered in this opinion:

- Operations and maintenance (post-construction)
- Fisheries tidal habitat mitigation
- Long-term aquatic studies (including fisheries monitoring)

##### **2.5.4.1 Operations and Maintenance**

The effects of the proposed action components of the future operations and maintenance of the DCP are described in the BA, Appendix 5C.7, 5C.8, 5C.10, 5C.11, and 5C.12, and are incorporated here by reference. A qualitative summary of the DCP related stressors in



association with the 2024 LTO opinion and the State's ITP conditions of approval is described in the BA, Appendix 7A.1, and is incorporated here by reference.

Additionally, in Reclamation's BA for the 2024 LTO opinion (Reclamation 2023-2024), relevant guiding principles for the proposed operations of DCP included the following. NMFS expects these principles to apply to the proposed action in this opinion:

- Operate the projects consistent with existing and/or future regulatory requirements in the Delta;
- Implement pulse flow criteria to provide migrating anadromous fish an opportunity to migrate past the diversion locations with minimum exposure to diversions and further minimize effects to through-Delta survival;
- Use best available science to establish flow levels necessary to provide migratory and rearing habitat to minimize effects on juvenile anadromous fish survival and facilitate their movement down the river toward the Delta and San Francisco Bay;
- Monitor and mitigate the effects of diversions on migrating anadromous species and their habitat through identification of opportunities to develop additional habitat (i.e., tidal and channel margin restoration) to improve the productivity of those fish populations;
- Protect habitat conditions supporting listed pelagic and anadromous species, and mitigate potential flow-related effects of DCP with habitat restoration developed in coordination with NMFS, USFWS, and CDFW to improve the productivity of those fish populations;
- Implement project operations and maintenance consistent with the proposed project description as an integrated component of the SWP;
- Update and align elements of project description with conditions (e.g., regulatory, climate, and status of species) in the future consultation on DCP operations and maintenance in advance of operations of the north Delta diversions;
- Use an adaptive management program (AMP) that would integrate with the AMP to test operational modifications to remedy or lessen unanticipated effects.

### *Exposure and Risk*

Adult and juvenile SR winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, and sDPS green sturgeon will be exposed to the operational effects of the DCP. Fish would generally be present during winter and spring months as they migrate upstream and downstream through the operational footprint, although there are some general exceptions described in greater detail in the Status of the Species section of this opinion. Affected attributes of designated critical habitat are freshwater rearing sites and migration corridors, riparian habitat, access for juvenile migration, and estuarine rearing and migration.

Juvenile and adult listed fish species will be exposed to operational effects primarily during the winter and spring months and, to a lesser extent, during the summer and fall. Sub-adult sDPS green sturgeon could be exposed during all months. Exposure to operational effects using diversion criteria such as minimum bypass flows, pulse flow criteria and protections, and other guiding principles will be used to develop more details in a future operations plan. In general, exposure to operational effects would range between medium and high due to the large number of individuals of each species that migrate through the operational footprint.



The suite of potential effects of the DCP to listed species is from operational effects. Sublethal and lethal effects on juvenile rearing and out-migration are associated with exposure to new or existing diversion facilities and fish screen structures and reduced out-migration flows for juveniles in the Sacramento River and the Delta. Other adverse effects to individuals include impacts to juvenile rearing and out-migration conditions associated with reduced flows and out-migration cues and conditions that reduce survival. It is anticipated the DCP will be operated with operational criteria, including factors such as pulse protection criteria and bypass flows, wherein diversions are restricted based on large-scale downstream movement of juvenile salmonids to minimize the potential for negative effects. Compensatory mitigation, as described in Section 1.3 of this opinion, would be undertaken for hydrodynamic effects, including the potential for reduced riverine flow leading to the potential for lowering the river and possible impacts to critical habitat features.

A suite of potential effects to individuals and PBFs of designated critical habitat are proposed to be minimized or avoided through established guiding principles, BMPs, adaptive management strategies, and monitoring and compensatory mitigation strategies. At this time, without specific operations plans and detailed modeling of integrated operations with the CVP and SWP, we determine there would be a low to medium level of impact to individuals listed fish and their designated critical habitat. However, it is not possible to discern the full scope of those impacts, which will be closely evaluated in subsequent phases of development, authorization, and ESA section 7 consultation.

#### *Summary of Risk*

The proposed action includes the future operations and maintenance of the facilities that will be constructed, as described in Section 1.3 of this opinion. There is still uncertainty regarding the details of future operations and maintenance of the DCP. However, the DCP is expected to operate in compliance with various regulatory permits and boundaries. Therefore, NMFS expects that the impacts from the operations and maintenance of the DCP facilities on the listed species will be limited by temporal and spatial components of operating criteria informed by key biological considerations for each listed anadromous species. Biological considerations will be further informed by future site-specific studies on potential effects of the facilities and their operations and maintenance. We anticipate information gained from these studies, combined with latest information on the status of the listed species, will be appropriately used to guide management and operational considerations to further minimize impacts to SR winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead and sDPS green sturgeon.

#### **2.5.4.2 Fisheries Tidal Habitat Mitigation**

The proposed action includes habitat mitigation to offset impacts from the permanent removal of habitat within the Sacramento River, as described in section 1.3 of this opinion, and the section 3.6 and Appendix 3B of the BA. This element of the proposed action is considered at the programmatic framework level, because project-specific consultation will determine the amount and extent of take associated with these restoration projects.

All ESA-listed salmonids and sDPS green sturgeon must pass through the Delta during their migration to the Pacific Ocean. Although rearing and migration through the Delta represents a short period of these fish's overall life cycle, a large proportion of juvenile SR winter-run

Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, and sDPS green sturgeon are expected to be exposed to the tidal habitat restoration in the Delta.

Habitat restoration is expected to benefit juvenile SR winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, and sDPS green sturgeon through increased food availability and quality and refuge habitat from predators. These benefits can be manifested by higher growth rates in fish using these habitats and increased survival through the Delta.

The following life stages of the listed salmonids and sDPS green sturgeon are expected to be present in the Delta during this period and have the potential to be exposed to impacts from in-water construction: immigrating adult CCV steelhead, juvenile sDPS green sturgeon, and some emigrating adult sDPS green sturgeon. Few, if any, juvenile SR winter-run Chinook salmon, CV spring-run Chinook salmon, or CCV steelhead are expected to be present during the in-water construction work window.

Anticipated effects during construction include temporary loss of aquatic and riparian habitat leading to increased predation, increased water temperature, and reduced food availability; degraded water quality from contaminant discharge by heavy equipment, soils, and increased discharges of suspended solids and turbidity leading to direct toxicological impacts on fish health/performance, indirect impairment of aquatic ecosystem productivity, loss of aquatic vegetation providing physical shelter, and reduced foraging ability caused by decreased visibility; impediments and delay in migration caused by elevated noise levels from machinery; and direct injury or mortality from in-water equipment strikes or isolation/stranding within dewatered cofferdams. The risk from these potential effects would be minimized through the application of AMMs. In general, the objectives of tidal habitat restoration are consistent with objectives of the proposed action.

#### **2.5.4.3 Long-term Aquatic Studies (including Fisheries Monitoring)**

The proposed action includes fisheries monitoring and studies, as described in Appendix 5B of the BA. Many ongoing monitoring programs that inform operational actions and effects are currently under existing and separate ESA section 7 consultations and section 10(a)(1)(A) permits and in the Environmental Baseline section of this opinion. Potential future changes to monitoring programs associated with the operation of the proposed action will be addressed in separate ESA section 7 consultations that are tiered to the consultation.

The framework programmatic consultation approach for monitoring includes the following principles, which would be incorporated into any future changes to monitoring programs addressed in a subsequent consultation:

- Ensure monitoring will be beneficial to the proposed action for:
  - Minimizing effects to listed species and habitat.
  - Understanding if various operational objectives are met (e.g., effectiveness and validation monitoring).
- Confirm data collected meet data quality objectives and open data practices.
- Establish a multi-agency collaborative approach, including a management structure for decision-making.
- Ensure scientific rigor of new or modified monitoring and achieving objectives of new or modified monitoring.

- Develop and test mechanisms for learning and adopting new technologies, while maintaining comparability and continuity to historical information on fish and the environment.
- Establish mechanisms for close coordination with any existing or future AMP.
- Provide for robust synthesis of monitoring data to incorporate results and lessons learned.

Given the framework-level programmatic nature of this action component, where further commitment and collaborative planning are necessary to identify effects and quantify a level of benefits and incidental take, it is still possible to estimate a general level of impact qualitatively.

Monitoring effects to listed species commonly include sublethal and lethal effects associated with the capture, collecting, and handling of individuals, although some monitoring activities involve passive techniques that do not result in any adverse effects. Information about when, where, and how the monitoring will occur is important to determining the extent, frequency, and duration of adverse effects, if any, to listed species and critical habitat. If there are changes to the monitoring programs, subsequent approvals would likely be required through separate tiered or stepped-down consultations if it is determined that those activities may affect listed species or designated critical habitat. In general, the objectives of the monitoring program are consistent with objectives of the proposed action.

## **2.6. Cumulative Effects**

“Cumulative effects” are those effects of future state or private activities, not involving federal activities, that are reasonably certain to occur within the action area of the federal action subject to consultation [50 CFR 402.02]. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Some continuing non-federal activities are reasonably certain to contribute to broad scale effects within the action area. However, it is difficult if not impossible to distinguish between the action area’s future environmental conditions caused by global phenomena that are properly part of the environmental baseline *vs.* cumulative effects. Therefore, all relevant future broad scale environmental conditions in the action area are described earlier in the discussion of environmental baseline (Section 2.4).

### **2.6.1. Unscreened Water Diversions**

Water diversions for irrigated agriculture, municipal and industrial use, and managed wetlands are found throughout the California Central Valley. Thousands of small and medium-size water diversions exist along the Sacramento River, San Joaquin River, their tributaries, and the Delta, and many of them remain unscreened. Depending on the size, location, and season of operation, these unscreened diversions entrain and kill many life stages of aquatic species, including juvenile listed anadromous species (Mussen et al. 2013, Mussen et al. 2014). In 1997, 98.5 percent of the 3,356 diversions included in a Central Valley database were either unscreened or screened insufficiently to prevent fish entrainment (Herren and Kawasaki 2001). More recent data show over 95 percent of more than over 3,700 water diversions on the Sacramento and San Joaquin rivers, their tributaries, and the Delta, remain unscreened (CalFish 2019). The impacts from unscreened water diversions have somewhat improved due to the anadromous fish screen program, part of CVPIA, as well as DWR’s fish screening program (Meier 2013). While private

irrigation diversions in the Delta are mostly unscreened, the total amount of water diverted onto Delta farms has remained stable for decades (Culberson et al. 2008). A study of a dozen unscreened diversions in the Sacramento River, all relatively deep in the channel, reported low entrainment for listed salmonids and steelhead (Vogel 2013).

### **2.6.2. Agricultural Practices**

Agricultural practices may negatively affect riparian and wetland habitats through upland modifications that lead to increased siltation or reductions in water flow in stream channels flowing into the action area, including the Sacramento River, Stanislaus River, San Joaquin River, and Delta. Grazing activities from dairy and cattle operations can degrade or reduce suitable critical habitat for listed fish species by increasing erosion and sedimentation. These practices introduce nitrogen, ammonia, and other nutrients into the watershed, which then flow into receiving waters (Lehman et al. 2014). Ammonia introduction from agricultural activities can be additive with much larger sources, such as wastewater treatment discharges.

Salmonids and sturgeon exposure to contaminants are inherent in the Delta, ranging in the degree of effects. Stormwater and irrigation discharges related to agricultural activities contain numerous pesticides, herbicides, and other contaminants that may disrupt various physiological mechanisms and negatively affect reproductive success and survival rates of listed anadromous fish (Dubrovsky et al. 1998, Scott and Sloman 2004, Whitehead et al. 2004, Scholz et al. 2012). Agricultural operations outside the action area can result in discharges that flow into the action area and contribute to cumulative effects of contaminant exposure. The State of California issues waste discharge requirements to dischargers, including irrigators, dairy operations, and cattle operations, that require the implementation of BMPs designed to protect surface water quality, with benefits for listed fish species. Agricultural operations have monitoring and reporting requirements associated with those waste discharge requirements that ensure compliance with BMPs.

### **2.6.3. Wastewater Treatment Plants**

Two wastewater treatment plants (one located on the Sacramento River near Freeport and the other on the San Joaquin River near the City of Stockton) have received special attention because of their discharge of ammonia. The EPA published revised national recommended ambient water quality criteria for the protection of aquatic life from the toxic effects of ammonia in 2013.

However, few studies have been conducted to assess the effects of ammonia on Chinook salmon, steelhead, or sturgeon. Studies of ammonia effects on various fish species have shown numerous effects, including membrane transport deficiencies, increases in energy consumption, immune system impairments, gill lamellae fusions deformities, liver hydropic degenerations, glomerular nephritis, and nervous and muscular system effects leading to mortality (Eddy 2005, Cannon et al. 2011).

Werner et al. (2008), Werner et al. (2009), and Werner et al. (2010) analyzed the acute effects of Sacramento Regional Wastewater Treatment Plant effluent on Delta smelt, rainbow trout, and fathead minnow. The studies found that at ammonia/um concentrations reported downstream of the discharge, on average below 1 milligram per liter ammonia/um, lethal toxicity effects are not expected. In general, this lack of toxicity was attributed to the fact that the lethal concentration at which 50 percent of individuals exposed die (i.e., LC50 values) was much higher than ammonia concentrations reported in environmental sampling. However, the studies did not assess sublethal

toxicity. Sublethal ammonia toxicity at concentrations similar to what had been reported downstream of Sacramento Regional Wastewater Treatment Plant (less than 1 milligrams per liter) has been demonstrated in fish. In a study of coho salmon and rainbow trout exposed to ammonia, (Wicks et al. 2002) showed a decrease in swimming performance due to metabolic challenges and depolarization of white muscle and found that ammonia was significantly more toxic for active fish. Furthermore, fish exposed to sublethal concentrations of ammonia/um have exhibited increased respiratory activity and heart rate, loss of equilibrium, and hyper-excitability (Eddy 2005). None of these studies assessed the chronic effects of ammonia/um exposure that may occur at lower concentrations on the behavior, reproduction, or long-term survival of ESA-listed or surrogate species. However, Werner et al. (2009) concluded that “ammonia/um concentrations detected in the Sacramento River below the Sacramento Regional Wastewater Treatment Plant are of concern with respect to chronic toxicity to Delta smelt and other sensitive species.”

The Sacramento Regional Wastewater Treatment Plant (SRWTP), in order to comply with Order no. R5-2013-0124, began implementing compliance measures to reduce ammonia discharges. Construction of treatment facilities for three major projects required for ammonia and nitrate reduction was initiated in March 2015 (Sacramento Regional County Sanitation District 2015). The order was modified in October 2013 by the Central Valley Regional Water Quality Control Board to impose new effluent limitations, requiring effluent limits for ammonia of 2.0 milligrams per liter per day from April to October, and 3.3 milligrams per liter per day from November to March (Central Valley Regional Water Quality Control Board 2016). However, the board concluded that compliance with these effluent limitations was not feasible and put the plant in non-compliance with the ammonia final effluent limitations. In September 2020, the SRWTP requested a Time Schedule Order to extend the compliance schedule to allow additional time to complete upgrades to the Facility. Time Schedule Order R5-2020-0904 was issued on December 4, 2020, which provided a schedule to achieve compliance with final effluent limitations for ammonia by June 1, 2022 (Central Valley Regional Water Quality Control Board 2019, State of California Department of Finance 2023). As of spring 2023, the SRWTP completed extensive upgrades, and the treatment process now removes 99 percent of ammonia.

#### **2.6.4. Increased Urbanization**

California’s current population is approximately 39.1 million people. The California Department of Finance projects that California’s population will increase to 40.2 million in 2044, and then decrease to 39.6 million by 2060 (State of California Department of Finance 2023). The increase between now and 2044 will likely be accompanied by increases in urbanization and housing developments. The Delta, East Bay, and Sacramento regions include portions of Alameda, Sacramento, San Joaquin, Solano, Stanislaus, Yolo, and Yuba counties. Population growth rate was highest in Yuba County (0.76 percent, State of California Department of Finance 2023). Increases in urbanization and housing developments can impact habitat by altering watershed characteristics and changing both water use and stormwater runoff patterns. Increased growth will place additional burdens on resource allocations, including natural gas, electricity, and water, as well as on infrastructure such as wastewater sanitation plants, roads, highways, and public utilities. Some of these actions, particularly those situated away from waterbodies, will not require federal permits and thus will not undergo review through ESA section 7 consultations.



Negative effects on listed fish species and their critical habitats may result from urbanization-induced point and non-point source chemical contaminant discharges within the action area. These contaminants, which include, but are not limited to, ammonia and free ammonium ion, numerous pesticides and herbicides, and oil and gasoline product discharges, may disrupt various physiological mechanisms and may negatively affect reproductive success and survival rates of listed anadromous fish (Dubrovsky et al. 1998, Scott and Sloman 2004, Whitehead et al. 2004, Scholz et al. 2012).

## **2.7. Integration and Synthesis**

The Integration and Synthesis section is the final step in assessing the risk that the proposed action poses to species and critical habitat. In this section, we add the effects of the action (Section 2.5) to the environmental baseline (Section 2.4) and the cumulative effects (Section 2.6), taking into account the status of the species and critical habitat (Section 2.2), to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) appreciably diminish the value of designated critical habitat for the conservation of the species.

The aggregate of the jeopardy and adverse modification analyses also includes an evaluation of proposed framework level programmatic activities to assess how they would function within the context of the proposed action, including how they would influence the nature of effects to listed species and their critical habitat. The evaluation of framework programmatic actions considers if the framework action descriptions include conservation measures, guiding principles, best management activities and/or adaptive management provisions that would avoid, minimize or mitigate for the consequences of future project activities on listed species and their designated critical habitat. Under a framework programmatic approach, as specific projects are developed in the future, they are subject to project-specific, or tiered, consultations. Once framework-level action components are further developed and provide sufficient detail to analyze effects on species and critical habitat, they will require additional ESA section 7 consultation before implementation. Those subsequent consultations will include a jeopardy and adverse modification analysis to determine if these future actions would appreciably reduce the likelihood of both the survival and recovery of a listed species or appreciably diminish the value of critical habitat for the conservation of the species. These consultations would also include an incidental take statement for those action components.

### **2.7.1. SR Winter-run Chinook Salmon**

#### **2.7.1.1 Summary of the Environmental Baseline, Cumulative Effects, and Status of the Species**

The SR winter-run Chinook salmon in the ESU is currently at a high risk of extinction due to the presence of only one population with a high level of hatchery influence (NMFS 2023). The ESU also continues to face threats from disease; predation; habitat loss, alteration, and degradation; and is particularly susceptible to environmental variation and drought (NMFS 2024c). The existing population spawns in the Sacramento River immediately downstream from Shasta and Keswick reservoirs, and recent droughts in 2014 to 2016 and again in 2020 and 2021 affected



early life stage survival that affected adult abundance. The status of SR winter-run Chinook salmon is described in detail in the Status of the Species section of the opinion; in the Environmental Baseline section, where the status is discussed in terms of the past and present impacts of all federal, state, or private actions and other human activities in the action area, and the impact of state or private actions which are contemporaneous with the consultation in process; and in the Cumulative Effects section, that discusses the effects of future state or private activities, not involving federal activities, that are reasonably certain to occur within the action area of the federal action subject to consultation.

In this opinion, the effects of past and current CVP and SWP operations and existing structures are also part of the environmental baseline. Effects of those actions have been analyzed through past and current consultations and contributed to the current condition of the species and critical habitat in the action area. SR winter-run Chinook salmon are exposed to numerous cumulative effects such as unscreened water diversions, agricultural practices that impact water quality and riparian habitat, water contamination from municipal and agricultural sources, effects of urbanization, and other activities.

Abundance and productivity have shown modest improvement in the most recent years, adult escapement in 2024 was low and the full effects of the 2020–2022 drought have yet to be realized due to the 3-year life cycle of most SR winter-run Chinook salmon. Meanwhile, the spatial structure of the ESU remains limited to the single population found in the mainstem Sacramento River, and the genetic and life history diversity of the ESU may have been negatively affected by elevated water temperatures, reduced early life stage survival, and the increased hatchery production implemented to address drought conditions. The ESU also continues to face threats from disease, predation, and habitat loss, alteration, and degradation, and is particularly susceptible to climate change and drought (NMFS 2024c).

The 2023 Viability Assessment for Pacific Salmon and Steelhead Listed Under the Endangered Species Act: Southwest (NMFS 2023) concluded that the LSNFH improved the ESU demographically and genetically through increasing abundance, especially during periods of extremely poor in-river survival, but that the long-term impacts on relying on hatchery fish pose a concern to the long-term viability of the population and the ESU. The lack of population redundancy in the SR winter-run Chinook salmon ESU is the primary factor contributing to its high extinction rate, and viability will ultimately be improved by re-establishing SR winter-run Chinook salmon to properly functioning historical habitats. Efforts to reintroduce fish to Battle Creek have been ongoing since 2014, when the Battle Creek SR winter-run Chinook salmon jump-start project began; evidence of successful spawning has been observed since 2020. Reintroduction efforts on the McCloud River, upstream from Shasta Reservoir, have also been ongoing since 2022 and recently concluded a third year of egg transfers, juvenile survival studies, and equipment testing. Unfortunately, funding for this effort in the McCloud River is tenuous.

#### **2.7.1.2 Summary of the Proposed Action Effect to the Species (Construction and Pre-Operation Maintenance)**

SR winter-run Chinook salmon are primarily exposed to project-related effects in the mainstem Sacramento River where construction of the north Delta intakes would occur. Most of the effects

to species, as described in section 2.5.1, are localized around the immediate in-channel construction activities. Anticipated effects to species include impacts from construction related noise and reductions in water quality from increased turbidity and sediment disturbance. These activities are expected to cause avoidance of the action area and other behavioral responses, affecting migration and increasing predation risk. With adherence to the in-water work window and implementation of AMMs and BMPs, we expect a small number of juveniles to be affected by these activities during each of the construction years. Additionally, we expect that a small number of juvenile and adult fish to be injured/killed from interactions with construction equipment (e.g., boat/barge propellers, diversions during dewatering, pile driving, etc.) and from capture and handling during rescue efforts. Rescues will be conducted by qualified biologists in order to minimize the numbers of injury and mortality, though low numbers of fish are expected to be injured or killed.

The timeframe for construction within the Sacramento River channel will result in compounding effects. The construction timeframe encompasses at least two generations of SR winter-run Chinook salmon. This in turn may impact the viability of a small portion of the population by increasing stress and reducing the overall fitness of individuals migrating through or rearing in the Delta.

#### **2.7.1.3 Environmental Variation Considerations**

As previously described in this opinion, SR winter-run Chinook salmon egg and fry stages are vulnerable to warmer water temperatures during the summer, and therefore particularly at risk from warming conditions due to environmental variations. The only remaining population of SR winter-run Chinook salmon relies on the cold-water pool in Shasta Reservoir, which is used to buffer the effects of warm temperatures in most years. The exception occurs during drought years, particularly back-to-back drought years, which are predicted to occur more often due to ongoing effects of environmental variation.

#### **2.7.1.4 Risk to the Species**

The SR winter-run Chinook salmon ESU currently comprises one population that resides in one diversity group in California: the Basalt and Porous Lava Diversity Group. The population currently faces a high risk of extinction that is driven by habitat loss, alteration, and degradation, water operations at Shasta Dam, high levels of hatchery influence, threats from disease, predation, environmental variation and drought (NMFS 2024c). There are ongoing efforts to reintroduce SR winter-run Chinook salmon to Battle Creek and to the McCloud River, but to date, there are no established populations in these areas and funding for the McCloud River effort is currently insufficient to effectively re-establish a viable population.

The proposed action does not impede the implementation of other key elements of the recovery plan, such as improving water conservation across California, incorporating ecosystem restoration in flood control planning, and improving salmon harvest monitoring and management. Implementation of the proposed action is likely not creating conditions that would preclude recovery of SR winter-run Chinook salmon in the future. Ultimately, the most effective way to improve the viability of SR winter-run Chinook salmon is by reestablishing them in their historical habitats upstream of Shasta Reservoir and Battle Creek.

After considering its current rangewide status, the environmental baseline within the action area, the effects of the proposed action, the effects of other activities, and cumulative effects, NMFS concludes that the proposed action is not likely to appreciably reduce the likelihood of both the survival and recovery of the SR winter-run Chinook salmon ESU.

## **2.7.2. Critical Habitat of SR Winter-run Chinook Salmon**

### **2.7.2.1 Summary of the Status of Designated Critical Habitat for SR Winter-run Chinook Salmon**

The PBFs essential for the conservation of listed SR winter-run Chinook salmon within the action area include: (1) migration access from the Pacific Ocean to appropriate spawning areas in the Upper Sacramento River, (2) adequate river flows, (3) habitat areas and adequate prey that are not contaminated, (4) riparian habitat that provides for successful juvenile development and survival, and (5) migration access downstream so that juveniles can migrate to the Pacific Ocean.

Many of the essential PBFs of SR winter-run Chinook salmon are degraded and provide limited high-quality habitat. Water diversions, shoreline armoring, and land development impair the PBFs that support juvenile rearing and out-migration by degrading and limiting access to the floodplain. The lasting impacts of habitat destruction from historical gold mining activities, as well as ongoing activities downstream of the action area within the San Francisco Bay and the southern Delta (including dredging, water exports, vessel traffic, and food web disruption from invasive species), continue to further limit habitat quality.

### **2.7.2.2 Summary of the Proposed Action Effects on Designated Critical Habitat**

Proposed action components that affect the functioning of essential PBFs include:

- The permanent removal of riparian habitat (approximately 5.6 acres) within the primary migration corridor for adult and juvenile salmon.
- The permanent replacement of riparian habitat with riprap and in-water structures such water diversion intakes with a fish screen.

The PBFs of designated critical habitat affected by these proposed activities are habitat areas and adequate prey that are not contaminated, and riparian habitat that provides successful juvenile development and survival.

### **2.7.2.3 Risk to Critical Habitat at the Designation Level**

The essential PBFs of this critical habitat have been highly degraded by past and ongoing actions. Ongoing private, state, and federal actions and future non-federal actions are likely to continue to impair the function of PBFs and slow or limit the development of beneficial aspects of these features. The proposed action will generally mitigate or offset project effects. Therefore, the proposed action is not likely to appreciably diminish the value of the critical habitat for the conservation of SR winter-run Chinook salmon.

### **2.7.3. Framework-Level Component Summary: SR Winter-run Chinook Salmon and Critical Habitat**

#### *Operations and Maintenance*

Adverse effects to individuals and PBFs of designated critical habitat are proposed to be minimized or avoided through established Guiding Principles (U.S. Bureau of Reclamation 2023-2024), BMPs, adaptive management strategies, and monitoring and compensatory mitigation strategies. Project components include bypass and pulse flow criteria, monitoring and mitigation actions to address the adverse effects of diversions, including habitat restoration, and use of the best available science to develop and implement operations plans. In addition, the project is expected to operate in compliance with the Biological Criteria and Conditions of Approval of CDFW's 2025 ITP for DCP, which would further limit anticipated adverse effects associated with operations and maintenance of the project.

#### *Fisheries Tidal Habitat Mitigation*

Construction for tidal habitat restoration will result in near-term, temporary impacts to aquatic and riparian habitat leading to minimal impacts to listed species. However the risks to individuals will be largely avoided, minimized and mitigated through long-established BMPs described in the BA. Furthermore, the long-term impacts of fisheries tidal habitat mitigation are expected to be beneficial for the listed species and their critical habitat.

#### *Long-term Aquatic Studies (including Fisheries Monitoring)*

Many ongoing monitoring programs to inform operational actions and effects are currently under existing and separate ESA section 7 consultations and section 10(a)(1)(A) permits. These consultations and permits were considered in the Environmental Baseline section of this opinion. Proposed monitoring programs associated with the operation of the DCP (framework level component) will be addressed in a subsequent ESA section 7 consultations that will be tiered to this consultation. Subsequent changes to existing monitoring programs are expected to be coordinated and included in future consultations of the LTO of the CVP and SWP to allow for a more uniform analysis and improved accounting of incidental take exemptions associated with the operation of the DCP.

### **2.7.4. CV Spring-run Chinook Salmon**

#### **2.7.4.1 Summary of the Environmental Baseline, Cumulative Effects, and Status of the Species**

The status of CV spring-run Chinook salmon is described in detail in the Status of the Species section of the opinion; in the Environmental Baseline section, where the status is discussed in terms of the past and present impacts of all federal, state, or private actions and other human activities in the action area, and the impact of state or private actions which are contemporaneous with the consultation in process; and in the Cumulative Effects section, that discusses the effects of future state or private activities, not involving federal activities, that are reasonably certain to occur within the action area of the federal action subject to consultation. The ESU is currently represented by numerous small populations across all four diversity groups in the Central Valley.

In this opinion, the effects of past and current CVP and SWP operations and existing structures are also part of the environmental baseline. Effects of those actions have been analyzed through

past and current consultations and contributed to the current condition of the species and critical habitat in the action area. CV spring-run Chinook salmon are exposed to numerous cumulative effects such as unscreened water diversions, agricultural practices that impact water quality and riparian habitat, water contamination from municipal and agricultural sources, effects of urbanization, and other activities.

The SWFSC's midcycle viability assessment (SWFSC 2023) concluded that the viability of CV spring-run Chinook salmon (through 2021) has declined since the prior viability assessment in 2016, and that the ESU's extinction risk may have increased. This ESU continues to face significant, unyielding threats that are likely to be exacerbated by the impacts of future climate change. Given that the viability of the ESU has decreased, and the threats to the species' persistence remain high and are not improving, significant habitat and flow improvement actions are urgently needed to prevent the species from experiencing a change in status from threatened to endangered or possibly extinct.

#### **2.7.4.2 Summary of the Proposed Action Effect to the Species**

CV spring-run Chinook salmon are primarily exposed to project-related effects in the mainstem Sacramento River where construction of the north Delta intakes would occur. Most of the effects to species, as described in section 2.5.1, are localized around the immediate in-channel construction activities. Anticipated effects to species include impacts from construction related noise and reductions in water quality from increased turbidity and sediment disturbance. These activities are expected to cause avoidance of the action area and other behavioral responses, affecting migration and increasing predation risk. With adherence to the in-water work window and implementation of AMMs and BMPs, we expect a small number of juveniles to be affected by these activities during each of the construction years. Additionally, we expect that a small number of juvenile and adult fish to be injured/killed from interactions with construction equipment (e.g., boat/barge propellers, diversions during dewatering, pile driving, etc.) and from capture and handling during rescue efforts. Rescues will be conducted by qualified biologists in order to minimize the numbers of injury and mortality, though low numbers of fish are expected to be injured or killed.

The timeframe for construction within the Sacramento River channel will result in compounding effects. The construction timeframe encompasses at least two generations of CV spring-run Chinook salmon. This in turn may impact the viability of a small portion of the population by increasing stress and reducing the overall fitness of individuals migrating through or rearing in the Delta.

#### **2.7.4.3 Environmental Variation Considerations**

Environmental variation is expected to further degrade the suitability of habitats in the Central Valley through increased temperatures, increased frequency of drought, increased frequency of flood flows, and overall drier conditions. Adult CV spring-run Chinook salmon key on snowmelt runoff to access their higher elevation holding and spawning habitat. Thus, the shift from later runoff from snowmelt to earlier runoff from rain could disrupt cues for upstream migration. Adults would arrive in spawning areas earlier and be more likely to hold in unsuitable



conditions. Also, juveniles emigrate during spring periods that often coincide with similar runoff events.

#### **2.7.4.4 Risk to the Species**

The CV spring-run Chinook salmon listed ESU boundary is currently delineated as all naturally spawned CV spring-run Chinook salmon originating from the Sacramento River and its tributaries downstream of large rim dams. The listed ESU boundary does not include the San Joaquin River or its tributaries, as CV spring-run Chinook salmon were considered extirpated from the basin at the time of listing. However, the San Joaquin River now includes a reintroduced non-essential experimental population (NEP) in the San Joaquin River Restoration (SJRRP) Area (NMFS 2024b); and CV spring-run Chinook salmon have recently been observed in the Mokelumne, Stanislaus, Tuolumne, and Merced rivers in increasing number of returning fish (Gutierrez et al. 2024). The majority of spring-run Chinook salmon populations are in the Sacramento River basin.

The proposed action also does not impede the implementation of other key elements of the recovery plan, such as incorporating ecosystem restoration in flood control planning, and improving salmon harvest monitoring and management. Implementation of the proposed action is therefore not expected to create conditions that would preclude recovery of CV spring-run Chinook salmon in the future. The viability of the CV spring-run Chinook salmon can be improved by reestablishing them in their historical habitats upstream of major dams.

After considering its current rangewide status, the environmental baseline within the action area, the effects of the proposed action, the effects of other activities, and cumulative effects, NMFS concludes that the proposed action is not likely to appreciably reduce the likelihood of both the survival and recovery of the CV spring-run Chinook salmon ESU.

### **2.7.5. Critical Habitat of CV Spring-run Chinook Salmon**

#### **2.7.5.1 Summary of the Status of Designated Critical Habitat for CV Spring-run Chinook Salmon**

As described in the Status of the Species and Critical Habitat sections, the geographical range of designated critical habitat for CV spring-run Chinook salmon within the action area includes the Sacramento River in the northern Delta. Within the range of the CV spring-run Chinook salmon ESU, the PBFs of the designated critical habitat that are considered vital for CV spring-run Chinook salmon within the action area include: freshwater rearing sites, water quantity and floodplain connectivity, water quality and forage, natural cover, freshwater migration corridors, and estuarine areas.

As generally described in the Status of the Species and Critical Habitat sections, the status of critical habitat in each of these PBFs is highly degraded. In general, stressors to CV spring-run Chinook salmon critical habitat PBFs include water diversions and water management, dams and other structures that block passage, loss of floodplain connectivity, loss of natural riverine function, bank protection, dredging, sediment disposal, gravel mining, invasive aquatic organisms, and agricultural, urban, and industrial land use (McEwan 2001). Freshwater rearing and migration habitats have been degraded, which delays upstream migration, reduces the



availability of quality rearing habitat, and creates improved feeding opportunities for predators such as pikeminnow and striped bass. Additional negative effects to rearing and migration habitats within the Sacramento River include loss of natural river function and floodplain connectivity through flow regulation, levee construction, direct loss of floodplain and riparian habitat, and effects to water quality associated with agricultural, urban, and industrial land use.

Based on the host of stressors to spawning, rearing, migratory, and estuarine habitats in the Central Valley, the current condition of CV spring-run Chinook salmon critical habitat is degraded.

### **2.7.5.2 Summary of the Proposed Action Effects on Designated Critical Habitat**

Proposed action components that affect the functioning of essential PBFs include:

- Permanent removal of riparian habitat (approximately 5.6 acres) within the primary migration corridor for adult and juvenile salmon.
- Permanent replacement of riparian habitat with riprap and in-water structures such water diversion intakes with a fish screen.

The PBFs of designated critical habitat affected by these proposed activities are: freshwater rearing sites, water quantity and floodplain connectivity, water quality and forage, natural cover, freshwater migration corridors, and estuarine areas.

### **2.7.5.3 Risk to Critical Habitat at the Designation Level**

The essential PBFs of this critical habitat have been highly degraded by past and ongoing actions. Ongoing private, state, and federal actions and future non-federal actions are likely to continue to impair the function of PBFs and slow or limit the development of these features. The proposed action is expected to generally mitigate or offset project effects. Therefore, the proposed action is not likely to appreciably diminish the value of the critical habitat for the conservation of CV spring-run Chinook salmon.

### **2.7.6. Framework-Level Component Summary: CV Spring-run Chinook Salmon and Critical Habitat**

#### *Operations and Maintenance*

Adverse effects to individuals and PBFs of designated critical habitat are proposed to be minimized or avoided through established Guiding Principles (U.S. Bureau of Reclamation 2023-2024), BMPs, adaptive management strategies, and monitoring and compensatory mitigation strategies. Project components include bypass and pulse flow criteria, monitoring and mitigation actions to address the adverse effects of diversions, including habitat restoration, and use of the best available science to develop and implement operations plans. In addition, the project is expected to operate in compliance with the Biological Criteria and Conditions of Approval of CDFW's 2025 ITP for DCP, which would further limit anticipated adverse effects associated with operations and maintenance of the project.

#### *Fisheries Tidal Habitat Mitigation*

Construction for tidal habitat restoration will result in near-term, temporary impacts to aquatic and riparian habitat leading to minimal impacts to listed species. However the risks to

individuals will be largely avoided, minimized and mitigated through long-established BMPs described in the BA. Furthermore, the long-term impacts of fisheries tidal habitat mitigation are expected to be beneficial for the listed species and their critical habitat.

#### *Long-term Aquatic Studies (including Fisheries Monitoring)*

Many ongoing monitoring programs to inform operational actions and effects are currently under existing and separate ESA section 7 consultations and section 10(a)(1)(A) permits. These consultations and permits were considered in the Environmental Baseline section of this opinion. Proposed monitoring programs associated with the operation of the DCP (framework level component) will be addressed in a subsequent ESA section 7 consultations that will be tiered to this consultation. Subsequent changes to existing monitoring programs are expected to be coordinated and included in future consultations of the LTO of the CVP and SWP to allow for a more uniform analysis and improved accounting of incidental take exemptions associated with the operation of the DCP.

### **2.7.7. CCV Steelhead**

#### **2.7.7.1 Summary of the Environmental Baseline, Cumulative Effects, and Status of the Species**

The status of CCV steelhead is described in detail in the Status of the Species section of this opinion; in the Environmental Baseline section, where the status is discussed in terms of the past and present impacts of all federal, state, or private actions and other human activities in the action area, and the impact of state or private actions which are contemporaneous with the consultation in process; and in the Cumulative Effects section, that discusses the effects of future state or private activities, not involving federal activities, that are reasonably certain to occur within the action area of the federal action subject to consultation.

In this opinion, the effects of past and current CVP and SWP operations and existing structures are also part of the environmental baseline. Effects of those actions have been analyzed through past and current consultations and contributed to the current condition of the species and critical habitat in the action area. CCV steelhead are exposed to numerous cumulative effects such as water management and water diversion practices, unscreened water diversions, agricultural practices that impact water quality and riparian habitat, water contamination from municipal and agricultural sources, effects of urbanization, and other activities.

The DPS is currently represented by numerous small populations across all four diversity groups in the Central Valley. The construction and presence of dams block access to most of their historical habitat. There are approximately six Core 1, sixteen Core 2, and four Core 3 populations and several candidate watersheds for reintroduction. Based upon the limited information available, the overall viability of the CCV steelhead DPS appears to be unchanged since the NMFS (2016c) 5-year review. However, the majority (11 of 16) of populations for which there are data are at a high risk of extinction based on abundance and/or hatchery influence, with no population considered to be at a low risk of extinction. The lack of improved natural production estimates, and low abundances coupled with a large hatchery influence are causes for continued concern (NMFS 2023). No reintroduction efforts for CCV steelhead are in the current planning stage in the Central Valley.

### **2.7.7.2 Summary of the Proposed Action Effect to the Species**

CCV steelhead are primarily exposed to project-related effects in the mainstem Sacramento River where construction of the north Delta intakes would occur. Most of the effects to species, as described in section 2.5.1, are localized around the immediate in-channel construction activities. Anticipated effects to species include impacts from construction related noise and reductions in water quality from increased turbidity and sediment disturbance. These activities are expected to cause avoidance of the action area and other behavioral responses, affecting migration and increasing predation risk. With adherence to the in-water work window and implementation of AMMs and BMPs, we expect a small number of juveniles to be affected by these activities during each of the construction years. Additionally, we expect that a small number of juvenile and adult fish to be injured/killed, from interactions with construction equipment (e.g., boat/barge propellers, diversions during dewatering, pile driving, etc.) and from capture and handling during rescue efforts. Rescues will be conducted by qualified biologists in order to minimize the numbers of injury and mortality, though low numbers of fish are expected to be injured or killed.

The timeframe for construction within the Sacramento River channel will result in compounding effects. The construction timeframe encompasses at least two generations of CV steelhead. This in turn may impact the viability of a small portion of the population by increasing stress and reducing the overall fitness of individuals migrating through or rearing in the Delta.

### **2.7.7.3 Environmental Variation Considerations**

Environmental variation is expected to further degrade the suitability of habitats in the Central Valley through increased temperatures, increased frequency of drought, increased frequency of flood flows, and overall drier conditions. Adult CCV steelhead key on snowmelt runoff to access their higher elevation holding and spawning habitat. Thus, the shift from later runoff from snowmelt to earlier runoff from rain will likely disrupt cues for upstream migration. Adults would arrive in spawning areas earlier and be more likely to hold in unsuitable conditions. Also, juveniles emigrate during spring periods that often coincide with similar runoff events.

### **2.7.7.4 Risk to the Species**

CCV steelhead are composed of multiple populations across four diversity groups. Based upon the limited information available, the overall viability of the CCV steelhead DPS appears to be unchanged since the NMFS (2016c) 5-year review. However, the majority (11 of 16) of populations for which there are data are at a high risk of extinction based on abundance and/or hatchery influence, with no population considered to be at a low risk of extinction. The lack of improved natural production estimates, and low abundances coupled with large hatchery influence are causes for continued concern.

The proposed action does not impede the implementation of other key elements of the recovery plan, incorporating ecosystem restoration in flood control planning, and improving salmon harvest monitoring and management. Implementation of the proposed action is therefore not likely to create conditions that would preclude recovery of CCV steelhead in the future. Ultimately, the most effective way to improve the viability of the CCV steelhead is reestablishing them in their historical habitats upstream of major dams.

Considering its current rangewide status, the environmental baseline within the action area, the effects of the proposed action, the effects of other activities, and cumulative effects, NMFS concludes that the proposed action is not likely to appreciably reduce the likelihood of both the survival and recovery of the CCV steelhead.

## **2.7.8. Critical Habitat of CCV Steelhead**

### **2.7.8.1 Summary of the Status of Designated Critical Habitat for CVV Steelhead**

As described in the Status of the Species and Critical Habitat section, the geographic extent of designated critical habitat for CCV steelhead within the action area includes the Sacramento River in the northern Delta, and the waterways of the Delta. CCV steelhead critical habitat within the action area has PBFs that include: freshwater rearing sites, freshwater migration corridors, and estuarine habitat. The PBFs for CCV steelhead designated critical habitat were described in 70 FR 52488.

In general, stressors to CCV steelhead critical habitat PBFs of rearing sites, and migration corridors include; water diversions and water management, dams and other structures, loss of floodplain connectivity, loss of natural riverine function and bank protection, dredging, sediment disposal, gravel mining, invasive aquatic organisms, and agricultural, urban, and industrial land use (McEwan 2001). Passage impediments in the Sacramento and San Joaquin river basins have contributed to substantial reductions in suitable habitat available to CCV steelhead by isolating them from much of their historical spawning habitat. The function of PBFs of available critical habitat is currently highly degraded. Rearing and migration PBFs have also been degraded within the Sacramento and San Joaquin river basins by loss of natural river function and floodplain connectivity through flow regulation, water withdrawals, levee construction, direct loss of floodplain and riparian habitat, and effects to water quality associated with agricultural, urban, and industrial land use. Lasting impacts of habitat destruction from gravel mining and historical gold mining activities as well as ongoing activities in the Central Valley bays and Delta (including dredging, agricultural barriers, water exports, vessel traffic, and food web disruption from invasive species) continue to further limit habitat quality.

Based on the host of stressors to spawning, rearing, migratory, and estuarine habitats in the Central Valley, it is apparent that the current condition of CCV steelhead critical habitat is degraded.

### **2.7.8.2 Summary of the Proposed Action Effects on Designated Critical Habitat**

Proposed action components that affect the functioning of essential PBFs include:

- The permanent removal of riparian habitat (approximately 5.6 acres) within the primary migration corridor for adult and juvenile salmon.
- The permanent replacement of riparian habitat with riprap and in-water structures such water diversion intakes with a fish screen.

The PBFs of designated critical habitat affected by these proposed activities are: freshwater rearing sites, freshwater migration corridors, and estuarine habitat.

### **2.7.8.3 Risk to Critical Habitat at the Designation Level**

The essential PBFs of this critical habitat have been highly degraded by past and ongoing actions. Ongoing private, state, and federal actions and future non-federal actions are likely to continue to impair the function of PBFs and slow or limit the development of these features. The proposed action will generally mitigate or offset project effects. Therefore, the proposed action is not likely to appreciably diminish the value of the critical habitat for the conservation of CCV steelhead.

### **2.7.9. Framework-Level Component Summary: CCV Steelhead and Critical Habitat**

#### *Operations and Maintenance*

Adverse effects to individuals and PBFs of designated critical habitat are proposed to be minimized or avoided through established Guiding Principles (U.S. Bureau of Reclamation 2023-2024), BMPs, adaptive management strategies, and monitoring and compensatory mitigation strategies. Project components include bypass and pulse flow criteria, monitoring and mitigation actions to address the adverse effects of diversions, including habitat restoration, and use of the best available science to develop and implement operations plans. In addition, the project is expected to operate in compliance with the Biological Criteria and Conditions of Approval of CDFW's 2025 ITP for DCP, which would further limit anticipated adverse effects associated with operations and maintenance of the project.

#### *Fisheries Tidal Habitat Mitigation*

Construction for tidal habitat restoration will result in near-term, temporary impacts to aquatic and riparian habitat leading to minimal impacts to listed species. However the risks to individuals will be largely avoided, minimized and mitigated through long-established BMPs described in the BA. Furthermore, the long-term impacts of fisheries tidal habitat mitigation are expected to be beneficial for the listed species and their critical habitat.

#### *Long-term Aquatic Studies (including Fisheries Monitoring)*

Many ongoing monitoring programs to inform operational actions and effects are currently under existing and separate ESA section 7 consultations and section 10(a)(1)(A) permits. These consultations and permits were considered in the Environmental Baseline section of this opinion. Proposed monitoring programs associated with the operation of the DCP (framework level component) will be addressed in a subsequent ESA section 7 consultations that will be tiered to this consultation. Subsequent changes to existing monitoring programs are expected to be coordinated and included in future consultations of the LTO of the CVP and SWP to allow for a more uniform analysis and improved accounting of incidental take exemptions associated with the operation of the DCP.

### **2.7.10. sDPS of North American Green Sturgeon**

#### **2.7.10.1 Summary of the Environmental Baseline, Cumulative Effects, and Status of the Species**

The status of sDPS of North American green sturgeon is described in detail in the Status of the Species section of this opinion; in the Environmental Baseline section, where the status is discussed in terms of the past and present impacts of all federal, state, or private actions and



other human activities in the action area, and the impact of state or private actions which are contemporaneous with the consultation in process; and in the Cumulative Effects section, that discusses the effects of future state or private activities, not involving federal activities, that are reasonably certain to occur within the action area of the federal action subject to consultation.

In this opinion, the effects of past and current CVP and SWP operations and existing structures are also part of the environmental baseline. Effects of those actions have been analyzed through past and current consultations and contributed to the current condition of the species and critical habitat in the action area. sDPS green sturgeon are exposed to numerous cumulative effects such as water management and water diversion practices, unscreened water diversions, agricultural practices that impact water quality and riparian habitat, water contamination from municipal and agricultural sources, effects of urbanization, and other activities.

The sDPS of green sturgeon is at substantial risk of future population declines (NMFS 2021). The principal threat to green sturgeon in the sDPS is the reduction in available spawning habitat due to dams and barriers on Central Valley rivers, which alter and reduce the replenishment of spawning substrates for the species. The potential threats faced by sDPS green sturgeon include enhanced vulnerability due to the reduction of spawning habitat into one concentrated area on the Sacramento River, lack of empirical population data, vulnerability of long-term cold water supply for egg incubation and larval survival, loss of juvenile sDPS green sturgeon due to entrainment at the CVP and SWP fish collection facilities in the south Delta and agricultural diversions within the Sacramento River and the Delta, alterations of food resources due to changes in the Sacramento River and Delta habitats, and exposure to various sources of contaminants throughout the basin to juvenile, sub-adult, and adult life stages.

#### **2.7.10.2 Summary of the Proposed Action Effect to the Species**

sDPS green sturgeon are primarily exposed to project-related effects in the mainstem Sacramento River where construction of the north Delta intakes would occur. Most of the effects to species, as described in section 2.5.1, are localized around the immediate in-channel construction activities. Anticipated effects to species include impacts from construction related noise and reductions in water quality from increased turbidity and sediment disturbance. These activities are expected to cause avoidance of the action area and other behavioral responses, affecting migration and increasing predation risk. With adherence to the in-water work window and implementation of AMMs and BMPs, we expect a small number of juveniles to be affected by these activities during each of the construction years. Additionally, we expect that a small number of juvenile and adult fish to be injured/killed from interactions with construction equipment (e.g., boat/barge propellers, diversions during dewatering, pile driving, etc.) and from capture and handling during rescue efforts. Rescues will be conducted by qualified biologists in order to minimize the numbers of injury and mortality, though low numbers of fish are expected to be injured or killed.

The timeframe for construction within the Sacramento River channel will result in compounding effects. Individual sDPS green sturgeon could rear or migrate near or past the construction action area more than once in their lifetime. This in turn may impact the viability of a small portion of the population by increasing stress and reducing the overall fitness of individuals migrating through or rearing in the Delta.



### **2.7.10.3 Environmental Variation Considerations**

In the Sacramento River, the upstream extent of the spawning range for sDPS green sturgeon lies somewhere downstream of ACID Dam (river mile 298), as that dam and associated fish ladder presumably impede passage for sDPS green sturgeon further up the Sacramento River. It is uncertain if sDPS green sturgeon spawning occurs in cooler water reaches of the Upper Sacramento River near ACID Dam, but this habitat (~4 river miles to Keswick Dam) could allow spawning to shift upstream in response to environmental variation change effects.

### **2.7.10.4 Risk to the Species**

sDPS green sturgeon are known to range through the San Francisco Bay estuary, the Delta, and the Sacramento, Feather, and Yuba Rivers. In summary, available information indicates the spatial structure of sDPS green sturgeon is composed of a single, independent population, which principally spawns in the mainstem Sacramento River and also breeds opportunistically in the Feather River and Yuba River. Concentration of adults in a very few select spawning locations makes the species highly vulnerable to poaching and catastrophic events. The apparent extirpation from potential upstream spawning reaches of the San Joaquin River narrows the habitat usage by the species, leaving little buffer to impacts to the species.

NMFS expects the effects of the proposed action on abundance are likely insignificant. Overall, the proposed action is not expected to exert any additional selective pressures on sDPS green sturgeon that would affect the diversity parameter. Given the higher tolerances of water temperatures and turbidity of sDPS green sturgeon when compared to salmonids, the effects of the proposed action on individual fish are anticipated to be insignificant.

The proposed action also does not impede implementation of other key elements of the recovery plan, such as improving passage and water quality conditions in the Yuba and Feather Rivers and reducing non-point source contaminants in the Delta. Implementation of the proposed action is, therefore, not creating conditions that would preclude recovery of sDPS green sturgeon.

After considering its current rangewide status, the environmental baseline within the action area, the effects of the proposed action, the effects of other activities, and cumulative effects, NMFS concludes that the proposed action is not likely to appreciably reduce the likelihood of both the survival and recovery of the sDPS green sturgeon.

## **2.7.11. Critical Habitat of sDPS of North American Green Sturgeon**

### **2.7.11.1 Summary of the Status of Designated Critical Habitat for sDPS Green Sturgeon**

The PBFs essential for the conservation of listed sDPS green sturgeon within the action area include (1) food resources, (2) substrate type or size, (3) water flow, (4) water quality, (5) migratory corridor, (5) water depth, and (6) sediment quality.

Many of the PBFs of sDPS green sturgeon designated critical habitat are currently degraded or impaired and provide limited high-quality habitat. Features that lessen the quality of migratory corridors and rearing habitat for juveniles include unscreened or inadequately screened diversions, altered flows in the Delta, and the presence of contaminants in sediment. Although the current conditions of sDPS green sturgeon critical habitat are significantly degraded, the

spawning habitat, migratory corridors, and rearing habitat that remain in both the Sacramento/San Joaquin River watersheds and the Delta are considered to have high intrinsic value for the conservation of the species.

### **2.7.11.2 Summary of the Proposed Action Effects on Designated Critical Habitat**

Proposed action components that affect the functioning of essential PBFs include:

- The permanent removal of riparian habitat (approximately 5.6 acres) within the primary migration corridor for adult and juvenile sDPS green sturgeon.
- The permanent replacement of riparian habitat with riprap and in-water structures such as water diversion intakes with a fish screen.

The PBFs of designated critical habitat affected by these proposed activities are: food resources, substrate type or size, water quality, migratory corridor, water depth, and sediment quality.

### **2.7.11.3 Risk to Critical Habitat at the Designation Level**

The essential PBFs of this critical habitat have been highly degraded by past and ongoing actions. Ongoing private, state, and federal actions and future non-federal actions are likely to continue to impair the function of PBFs and slow or limit the development of these features. The proposed action will generally mitigate or offset project effects. Therefore, the proposed action is not likely to appreciably diminish the value of the critical habitat for the conservation of sDPS of green sturgeon.

### **2.7.12. Framework-Level Component Summary: sDPS Green Sturgeon and Critical Habitat**

#### *Operations and Maintenance*

Adverse effects to individuals and PBFs of designated critical habitat are proposed to be minimized or avoided through established Guiding Principles (U.S. Bureau of Reclamation 2023-2024), BMPs, adaptive management strategies, and monitoring and compensatory mitigation strategies. Project components include bypass and pulse flow criteria, monitoring and mitigation actions to address the adverse effects of diversions, including habitat restoration, and use of the best available science to develop and implement operations plans. In addition, the project is expected to operate in compliance with the Biological Criteria and Conditions of Approval of CDFW's 2025 ITP for DCP, which would further limit anticipated adverse effects associated with operations and maintenance of the project.

#### *Fisheries Tidal Habitat Mitigation*

Construction for tidal habitat restoration will result in near-term, temporary impacts to aquatic and riparian habitat leading to minimal impacts to listed species. However the risks to individuals will be largely avoided, minimized and mitigated through long-established BMPs described in the BA. Furthermore, the long-term impacts of fisheries tidal habitat mitigation are expected to be beneficial for the listed species and their critical habitat.

#### *Long-term Aquatic Studies (including Fisheries Monitoring)*

Many ongoing monitoring programs to inform operational actions and effects are currently under existing and separate ESA section 7 consultations and section 10(a)(1)(A) permits. These

consultations and permits were considered in the Environmental Baseline section of this opinion. Proposed monitoring programs associated with the operation of the DCP (framework level component) will be addressed in a subsequent ESA section 7 consultations that will be tiered to this consultation. Subsequent changes to existing monitoring programs are expected to be coordinated and included in future consultations of the LTO of the CVP and SWP to allow for a more uniform analysis and improved accounting of incidental take exemptions associated with the operation of the DCP.

## **2.8. Conclusion**

After reviewing, analyzing, and adding together the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, the effects of other activities caused by the proposed action, and the cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of SR winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, and sDPS of North American green sturgeon, or destroy or adversely modify their designated critical habitat.

## **2.9. Incidental Take Statement**

Section 9 of the ESA and federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined by regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102). "Harass" is further defined by guidance as to "create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering." "Incidental take" is defined by regulation as takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the federal agency or applicant (50 CFR 402.02). Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this ITS.

An incidental take statement is not required for a framework-level programmatic action component, i.e., an action "that approves a framework for the development of future action(s) that are authorized, funded, or carried out at a later time, and any take of a listed species would not occur unless and until those future action(s) are authorized, funded, or carried out and subject to further ESA section 7 consultation" (50 CFR 402.02; 50 CFR 402.14).

For a mixed programmatic action, an incidental take statement is required only for those programmatic actions that are reasonably certain to cause take and are not subject to further ESA section 7 consultation (50 CFR 402.14). A mixed programmatic action is defined as, "for the purposes of an incidental take statement, a federal action that approves action(s) that will not be subject to further ESA section 7 consultation, and also approves a framework for the development of future action(s) that are authorized, funded, or carried out at a later time and any

take of a listed species would not occur unless and until those future action(s) are authorized, funded, or carried out and subject to further ESA section 7 consultation” (50 CFR 402).

If an action agency designs a mixed programmatic action that approves a framework for the development of future action(s) that are authorized, funded, or carried out at a later time and provides adequate information to inform the development of a biological opinion related to future actions implemented under the program that are not subject to further ESA section 7 consultation, NMFS will include an incidental take statement related to such programmatic action if it determines that the action is reasonably certain to cause incidental take of listed species.

The proposed action is a mixed programmatic action that includes: (1) a framework for the development of future actions (i.e., operations and maintenance of the future DCP, habitat mitigation, fisheries studies), and (2) actions that are not subject to further approvals (i.e., construction of the DCP facilities). This incidental take statement is applicable to all construction and pre-operation maintenance activities for the DCP, as described in the BA (ICF 2025). This incidental take statement does not include framework programmatic action components of the proposed action where information was not sufficient to determine specific levels of incidental take of listed species. An incidental take statement for those actions is expected to be included in a subsequent tiered project-level ESA section 7 consultation.

### **2.9.1. Amount or Extent of Take**

NMFS often cannot, using the best available information, quantify and track the amount or number of individuals that are expected to be incidentally taken per species because of the variability and uncertainty associated with the population sizes of the species, annual variation in the timing of migration, and variability regarding individual habitat use of the action area. However, it is possible to express the extent of incidental take in terms of ecological surrogates for those elements of the proposed action that are expected to result in incidental take.

These ecological surrogates are measurable, and the Corps and DWR can monitor the ecological surrogates to determine whether the level of anticipated incidental take described in this incidental take statement is exceeded.

In the biological opinion, NMFS determined that incidental take is reasonably certain to occur as follows: increases in turbidity, pile driving, barge and boat traffic noise, and permanent loss of habitat.

#### **2.9.1.1 Incidental take associated various construction noise sources**

NMFS anticipates incidental take will be limited to take in the form of harm, injury and death to individual listed fish, due to elevated underwater noise from construction, including pile driving.

The anticipated low numbers of adult and/or juvenile SR winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, and sDPS green sturgeon that are passing through or otherwise present in the action area during construction activities will be exposed to elevated levels of noise generated by pile driving, dredging, and boat or barge traffic, resulting in reduced fitness and reduced survival. The level of underwater noise generated during construction can be

accurately and consistently measured and provides a quantifiable metric for the extent of acoustic effects. The measurement of underwater noise generated during construction, and the vibratory and impact pile driving described in the proposed action, will therefore serve as a quantifiably measurable surrogate for incidental take of listed fish species. The most appropriate thresholds for incidental take in the form of harm (resulting in fish displacement or behavior modification), injury, and death associated with elevated underwater noise from construction and pile driving is an ecological surrogate expressed as the amount of habitat temporarily disturbed by elevated underwater noise within a certain distance from the construction site or the source of the acoustic signal, in this case the pile being driven. Elevated underwater noise disturbances are also expected to elevate fish stress levels, contributing to decreased overall fitness and survival of exposed individuals through compounding sub-lethal effects.

NMFS uses an ecological surrogate for acoustic noise characterized as an estimated distance to a specific threshold of sound that is expected to result in adverse effects to fish, either through behavioral responses to the disturbance (150 dB), the onset of physical injury (183/187 dB), or mortality (206 dB). The corresponding area of effect at each construction site is then calculated based on the distance to a given threshold as determined by the equipment being used, the nature, frequency, and duration of the construction activities being performed, and any unique site-specific environmental conditions that might affect the way sound disperses at that location, such as channel geometry, water depth, or soil composition (Table 6). Underwater acoustic noise below the 150 dB threshold is considered ‘effective quiet’ for assessing effects to listed fish. The estimated distances and corresponding areas of effect for each of the construction sites in or adjacent to the aquatic environment in the action area are represented in the table below.

**Table 6.** Summary table of the estimated distances to threshold and areas of acoustic impacts from pile driving based on noise level (where dB = decibels).

Estimated distances to thresholds and areas of acoustic effects from pile driving

| Noise Level (below) | Intake B Cofferdams (21 days) | Intake C Cofferdams (21 days) | Intake B Logbooms (4 days) | Intake C Logbooms (4 days) | Snodgrass Slough Bridge Crossing (5 days) | Burns Cutoff Bridge Crossing (9 days) |
|---------------------|-------------------------------|-------------------------------|----------------------------|----------------------------|-------------------------------------------|---------------------------------------|
| 206-dB              | 9 m<br>0.1 acres              | 9 m<br>0.1 acres              | 25 m<br>0.5 acres          | 25 m<br>0.5 acres          | 7 m<br>0.1 acres                          | 24 m<br>0.47 acres                    |
| 187-dB              | 179 m<br>12.3 acres           | 117 m<br>6.7 acres            | 1,166 m<br>66.4 acres      | 302 m<br>27.2 acres        | 273 m<br>4.1 acres                        | 371 m<br>12.4 acres                   |
| 183-dB              | 331 m<br>25.1 acres           | 216 m<br>18.5 acres           | 1,166 m<br>66.4 acres      | 558 m<br>51.7 acres        | 504 m<br>7.3 acres                        | 685 m<br>12.4 acres                   |
| 150-dB              | 4,641 m<br>67.7 acres         | 4,641 m<br>134.1 acres        | 3,981 m<br>69.3 acres      | 3,981 m<br>117.9 acres     | 3,981 m<br>25.5 acres                     | 3,981 m<br>12.4 acres                 |

Based on the timing of the proposed in-water work in these areas, and as detailed in sections 3.2.2, 5.4.1, and Appendix 3A.1.15 of the BA and incorporated here by reference, NMFS anticipates that underwater noise levels from pile driving and other construction activities would adversely affect the listed species due to their temporal and spatial overlap with pile driving over



a period of up to 25 to 35 days during the proposed in-water work windows (June 1–October 31) over a 2-year interval at each intake location.

If monitoring indicates that underwater sound levels greater than 206 dB peak, 187 dB or 183 dB cumulative SEL, or 150 dB RMS extend beyond the distances expected for the activities and locations presented in the table above, the amount of incidental take for those surrogates will have been exceeded, triggering the need to stop work and contact NMFS within 24 hours.

#### **2.9.1.2 Incidental take associated with water quality (elevated in-river turbidity plumes and disturbance)**

In-water construction and pre-operation maintenance activities are expected to mobilize sediment and increase water turbidity beyond natural levels. Increased turbidity is expected to cause harm to listed species present through elevated stress levels and disruption of normal habitat use. These temporary responses are expected to result in decreased growth, survival, and a reduction of overall fitness as described in the effects section of this opinion.

NMFS anticipates incidental take will be limited to take in the form of harm to a low number of SR winter-run Chinook salmon, CV spring-run Chinook salmon, CVC steelhead, and sDPS green sturgeon over a 2-year interval at each intake location, as a result of exposure to elevated concentrations of suspended sediment in the water column generating turbidity plumes in the action area. The most appropriate ecological surrogate providing a quantifiable metric to determine the extent of incidental take of listed fish caused by turbidity increases related to in-water construction and maintenance activity is a measurement of nephelometric turbidity units (NTUs) in the water column relative to pre-construction background conditions measured upstream of the construction area.

Incidental take would consist of fish disturbance and sub-lethal effects associated with elevated in-river turbidity plumes is an ecological surrogate of the extent and duration of turbidity increases in the aquatic environment relative to environmental background conditions during in-water construction and maintenance. In tidally influenced waters, such as the action area, the affected area may occur either upstream or downstream from the disturbance in accordance with the prevailing direction of flow at that time. Based on specific site conditions, and in accordance with the turbidity objectives and basin plan standards for construction as identified by the Central Valley Regional Water Quality Control Board in the *Basin Plan for the Sacramento River and San Joaquin River Basins* (CVRWQCB 2019), where natural turbidity is between 5 and 50 NTUs, turbidity levels may not be elevated by 20 percent above ambient conditions; where ambient conditions are between 50 and 100 NTUs, conditions may not be increased by more than 10 NTUs; and where natural turbidity is greater than 100 NTUs, increases will not exceed 10 percent. If turbidity is higher than these levels, take would be considered exceed.

#### **2.9.1.3 Incidental take associated with the permanent loss of habitat**

The proposed project would result in permanent impacts to approximately 5.6 acres of tidal perennial habitat, which includes 3.4 acres of riparian habitat. Habitat features would be permanently replaced by riprap or in-channel water diversion structures. This area of 5.6 acres will serve as the ecological surrogate.



NMFS expects the following species and life stages to be impacted by the permanent loss of habitat:

- adult and/or juvenile SR winter-run Chinook salmon
- adult and/or juvenile CV spring-run Chinook salmon
- adult and/or juvenile CCV steelhead
- adult and/or juvenile sDPS green sturgeon

Incidental take will occur in the form of harm to the listed species and life stages through permanent adverse habitat changes resulting from the removal of riparian vegetation and habitat. The most appropriate surrogate measurement of harm to the listed species is the total area (in terms of acreage) and amount of riparian habitat permanently removed from the action area. This is an appropriate surrogate because the amount of riparian habitat removal and degradation is expected to be coextensive with effect to fish and resulting in impacts.

The removed riparian vegetation would have otherwise supported the macroinvertebrate prey of juvenile salmon, steelhead, and benthic prey items for adult and juvenile sDPS green sturgeon. The removed riparian vegetation would have also provided limited amounts of shade and habitat cover relative to their occupation in the overall available habitat. The loss of shade, habitat cover, and allochthonous input (i.e., macroinvertebrates and organic materials), will result in a reduction in growth, fitness, and survival.

NMFS considers any increases to the area of permanent habitat loss would exceed the anticipated incidental take of ESA-listed anadromous fish as assessed in this opinion.

#### **2.9.1.4 Incidental take associated with the compounding effects of construction**

The proposed project includes a variety of ongoing construction activities within the Sacramento River channel for approximately six years. During each of those years, NMFS expects the following species and life stages to be impacted by compounding effects, as described in the effects section of this opinion:

- adult and/or juvenile SR winter-run Chinook salmon
- adult and/or juvenile CV spring-run Chinook salmon
- adult and/or juvenile CCV steelhead
- adult and/or juvenile sDPS green sturgeon

Incidental take will occur in the form of harm to the listed species and life stages through the compounding effects of acoustics, degraded water quality, physical injury and/or mortality, and permanent loss of habitat. The most appropriate surrogate measurement of harm to the listed species is the length of time that construction will occur within the Sacramento River channel within the action area. This is an appropriate surrogate because fish are expected to be exposed to the effects caused by construction and pre-operation maintenance for the entire length of time these activities occur within the river channel, and those effects are expected to result in take.

Due to the length of time of construction within the primary rearing and migratory route for the above listed species, multiple generations of fish for each species are expected to be impacted.

The multi-generational impacts of the proposed project will result in reduced growth, fitness, and survival to a small proportion of the populations.

While the construction activities are expected to occur for up to six years, we can reasonably assume unforeseen construction delays could result in an additional year of work. Therefore, NMFS considers that if construction within the Sacramento River channel extends more than seven years total, then it would exceed anticipated incidental take of ESA-listed anadromous fish as assessed in this opinion.

### **2.9.2. Effect of the Take**

In the biological opinion, NMFS determined that the amount or extent of anticipated take, coupled with other effects of the proposed action, is not likely to result in jeopardy to the species or destruction or adverse modification of designated critical habitat.

### **2.9.3. Reasonable and Prudent Measures**

“Reasonable and prudent measures” refer to those actions the Director considers necessary or appropriate to minimize the impact of the incidental take on the species (50 CFR 402.02).

- 1) Measures shall be taken by the Corps, or its applicant, to reduce underwater sound impacts and other disturbances related to pile driving and barge and boat traffic, as described in this biological opinion.
- 2) Measures shall be taken by the Corps, or its applicant, to minimize sediment events and turbidity plumes in the action area and related effects, as described in this biological opinion.
- 3) Measures shall be taken by the Corps, or its applicant, to reduce the extent of degradation and alteration to the habitats in the action area because of the permanent removal of riparian habitat and replacement with riprap and in-channel structures, related to the effects of this proposed project, as described in this biological opinion.
- 4) Measures shall be taken by the Corps, or its applicant, to prepare and provide NMFS with a plan and report describing how ESA-listed species in the action area would be protected and/or monitored and to document the observed effects of the proposed action on listed species and designated critical habitat. In the report, the Corps, or its applicant, shall demonstrate how the conservation measures were incorporated and implemented.

### **2.9.4. Terms and Conditions**

In order to be exempt from the prohibitions of section 9 of the ESA, the federal action agency must comply (or must ensure that any applicant complies) with the following terms and conditions. The Corps, or any applicant, has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this ITS (50 CFR 402.14). If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

1. The following terms and conditions implement reasonable and prudent measure 1:

- 
- May 29, 2026

- b. Upon completion of in-river channel work for the proposed project, a report shall be submitted to NMFS that describes how ESA-listed species were monitored and protected during construction activities. The report shall be submitted within 90 days of completion of in-river channel work for the proposed project.

## **2.10. Conservation Recommendations**

Section 7(a)(1) of the ESA directs federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Specifically, “conservation recommendations” are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02).

- 1) The Corps should continue supporting and promoting aquatic and riparian habitat restoration within the Sacramento-San Joaquin River Delta and other watersheds, especially those with listed anadromous fish species. Practices that avoid or minimize adverse effects to listed species should be encouraged.
- 2) The Corps should continue to work cooperatively with other State and Federal agencies, private landowners, governments, and local watershed groups to identify opportunities for cooperative analysis and funding to support salmonid and/or green sturgeon habitat restoration projects.
- 3) The Corps should use all their authorities, to the maximum extent feasible to implement high priority actions in the Central Valley Salmon and Steelhead Recovery Plan (NMFS 2014) and/or the Recovery Plan for the sDPS of North American Green Sturgeon (NMFS 2021).

For NMFS to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, NMFS requests notification of the implementation of any conservation recommendations.

## **2.11. Reinitiation of Consultation**

This concludes formal consultation for the Delta Conveyance Project.

Under 50 CFR 402.16(a): “Reinitiation of consultation is required and shall be requested by the federal agency or by the Service, where discretionary federal involvement or control over the action has been retained or is authorized by law and: (1) If the amount or extent of taking specified in the incidental take statement is exceeded; (2) If new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion or written concurrence; or (4) If a new species is listed or critical habitat designated that may be affected by the identified action.”

### **3. MAGNUSON–STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT ESSENTIAL FISH HABITAT RESPONSE**

Section 305(b) of the MSA directs federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. Under the MSA, this consultation is intended to promote the conservation of EFH as necessary to support sustainable fisheries and the managed species' contribution to a healthy ecosystem. For the purposes of the MSA, EFH means “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity”, and includes the associated physical, chemical, and biological properties that are used by fish (50 CFR 600.10). Adverse effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects may result from actions occurring within EFH or outside of it and may include direct, indirect, site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) of the MSA also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH. Such recommendations may include measures to avoid, minimize, mitigate, or otherwise offset the adverse effects of the action on EFH (50 CFR 600.905(b)).

#### **3.1. Essential Fish Habitat Affected by the Proposed Action**

NMFS has evaluated the proposed action for the ESA consultation as a “mixed programmatic” action as defined by 50 CFR 402.02 because it includes some action components for which no additional authorization will be necessary and others that are considered at a framework-level. Once framework-level action components are further developed and sufficient detail is available to determine the amount and extent of incidental take, they will require additional ESA section 7 consultation, and EFH consultation, before implementation. Additionally, in future combined ESA/ EFH consultations, the action area may be re-assessed based on updated information and operational details. Therefore, this EFH consultation only includes the construction and pre-operation maintenance activities under the proposed action, and the associated action area for those activities (section 2.3.1 of this opinion), and does not include the activities assessed under the Framework Programmatic.

The proposed action under this EFH consultation occurs within EFH for various federally managed fish species within the Pacific Coast Groundfish Fishery Management Plan (FMP; PFMC 2025) and the Pacific Coast Salmon FMP (PFMC 2014, 2024). The action area of the proposed action occurs within the legal boundary of the Sacramento- San Joaquin Delta (Delta). The Delta is considered to be a tidally influenced and part of the San Francisco Bay-Delta estuary. This information is relevant in determining which, if any, habitat area of particular concern (HAPC) are within or near the vicinity of the proposed project. Given this information, the project occurs within and near the vicinity of estuary habitat that is designated as a HAPC for various federally managed fish species within the Pacific Coast Groundfish FMP, and for various federally managed fish species within the Pacific Coast Salmon FMP. Under the Pacific Coast Salmon FMP, the populations include SR winter-run Chinook salmon, CV spring-run Chinook salmon, and CV fall-run and late fall-run Chinook salmon.

HAPC are described in the regulations as subsets of EFH which are rare, particularly susceptible to human-induced degradation, especially ecologically important, or located in an environmentally stressed area. Designated HAPC are not afforded any additional regulatory protection under the MSA; however, federal projects with potential adverse impacts on HAPC will be more carefully scrutinized during the consultation process.

### **3.2. Adverse Effects on Essential Fish Habitat**

NMFS determined the proposed action would adversely affect EFH as follows, and the HAPC described above, as follows:

- Temporary adverse effects include: acoustic effects and water quality effects.
- Permanent adverse effects include: loss of approximately 5.6 acres of tidal perennial habitat, which includes the loss of approximately 3,124 linear feet of the Sacramento River.

These temporary and permanent adverse effects to the habitat in the action area are described in more detail in section 2.5 of this Biological Opinion and are incorporated by reference here.

For the temporary effects of the proposed action on EFH, NMFS believes that the proposed action, including the construction best management practices, and by abiding by the RMPs and Terms and Conditions of this Biological Opinion, the action agency will address temporary effects on Pacific Coast Salmon and Pacific Coast Groundfish EFH and HAPC.

For the permanent effects of the proposed action on EFH, NMFS believes that the proposed actions described in the Compensatory Mitigation Plan for Special-Status Species and Aquatic Resources (Appendix 3B of the BA; ICF 2025), will address the permanent loss of Pacific Coast Salmon and Pacific Coast Groundfish EFH and HAPC.

Therefore, NMFS has no additional EFH conservation recommendations to provide at this time. This concludes the EFH consultation.

### **3.3. Supplemental Consultation**

The USACE must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH conservation recommendations (50 CFR 600. 920(l)).



## 4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

The Data Quality Act (DQA) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the opinion addresses these DQA components, documents compliance with the DQA, and certifies that this opinion has undergone pre-dissemination review.

### 4.1. Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this opinion are the Corps, and their applicant DWR. Individual copies of this opinion were provided to them. The document will be available within 2 weeks at the NOAA Library Institutional Repository [<https://repository.library.noaa.gov/welcome>]. The format and naming adhere to conventional standards for style.

### 4.2. Integrity

This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, ‘Security of Automated Information Resources,’ Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

### 4.3. Objectivity

Information Product Category: Natural Resource Plan

**Standards:** This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the NMFS ESA Consultation Handbook, ESA regulations, 50 CFR 402.01 et seq., and the MSA implementing regulations regarding EFH, 50 CFR part 600.

**Best Available Information:** This consultation and supporting documents use the best available information, as referenced in the References section. The analyses in this opinion and EFH consultation contain more background on information sources and quality.

**Referencing:** All supporting materials, information, data and analyses are properly referenced, consistent with standard scientific referencing style.

**Review Process:** This consultation was drafted by NMFS staff with training in ESA and MSA implementation and reviewed in accordance with West Coast Region ESA quality control and assurance processes.

## 5. REFERENCES

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# **Attachment C**

## **Programmatic Agreement (USACE & SHPO)**

**2025**

**PROGRAMMATIC AGREEMENT  
BETWEEN  
THE UNITED STATES ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT,  
AND THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER  
REGARDING  
THE DELTA CONVEYANCE PROJECT, SACRAMENTO–SAN JOAQUIN DELTA,  
CALIFORNIA**

**WHEREAS**, the California Department of Water Resources (DWR), an agency of the State of California, is proposing to construct new water diversion and conveyance facilities as part of the Delta Conveyance Project (Project); and

**WHEREAS**, the Project consists of the construction of new water diversion and conveyance facilities from the Sacramento River south of Sacramento, California, and through the Sacramento–San Joaquin Delta (Delta), along an alignment known commonly as the ‘Bethany Reservoir Alternative,’ with the intent to improve diversion and conveyance facilities in the Delta to ensure the reliability of State Water Project water deliveries south of the Delta consistent with the State’s Water Resilience Portfolio; and

**WHEREAS**, the United States Army Corps of Engineers, Sacramento District (USACE) under the authority of Section 404 of the Clean Water Act (33 United States Code [U.S.C.] § 1344) (Section 404), Sections 10 and 14 of the Rivers and Harbors Act of 1899 (33 U.S.C. § 403 and 33 U.S.C. § 408) (Section 10 and Section 408, respectively) anticipates issuing one or more permits and permissions to DWR; and

**WHEREAS**, the issuance of permits or permissions by USACE constitutes an Undertaking as defined at 36 Code of Federal Regulations [C.F.R] § 800.16(y) subject to review by the USACE under Section 106 (54 U.S.C. § 306108) of the National Historic Preservation Act (NHPA) (54 U.S.C. § 300101 et seq.) and its implementing regulations, “Protection of Historic Properties” (36 C.F.R Part 800); and

**WHEREAS**, pursuant to 36 C.F.R § 800.2(c)(1)(i) the California State Historic Preservation Officer (SHPO) reflects the interests of the State of California and its citizens in the preservation of their cultural heritage, administers the State Historic Preservation Program within California in accordance with 54 U.S.C. § 302303 and in accordance with 54 U.S.C. § 302303(b), advises and assists federal and state agencies in carrying out their historic preservation responsibilities under the NHPA, in cooperation with the Advisory Council on Historic Preservation (ACHP); and

**WHEREAS**, limited property access and the phased design of the Project precludes the determination of effects by the USACE prior to its approval of the undertaking; and

**WHEREAS**, the USACE, in consultation with the SHPO, determined it shall fulfill its Section 106 responsibilities for the Undertaking through the development and implementation of this Programmatic Agreement (Agreement) pursuant to 36 C.F.R § 800.14(b)(1)(ii); and

**WHEREAS**, this Agreement provides for a phased process to conduct identification and evaluation of historic properties (as defined in 36 C.F.R. § 800.16(l)(1)) within each Project segment pursuant to 36 C.F.R § 800.4(b)(2), and a phased process to assess effects for each Project segment pursuant to 36 C.F.R § 800.5(a)(3); and

**WHEREAS**, the USACE determined and documented the Undertaking's area of potential effects (APE) in accordance with 36 C.F.R. § 800.4(a) as the location of surface impacts with an additional 0.25-mile buffer and the location of subsurface impacts with no buffer (see Stipulation V and Appendix 2); and

**WHEREAS**, the Project will be planned and constructed in phases where the term "segment" refers to a portion of the overall Project, and each segment will be initiated with a design package document that describes the Project features being planned for and/or designed, including specific footprint locations; and

**WHEREAS**, Project designs are being developed in segments due to the size and duration of the overall Project and property access is currently limited, and although DWR conducted a built-resources survey from the public right-of-way between 2020 and 2021 that identified 45 built resources within the APE that appear eligible for listing in the National Registry of Historic Places (NRHP) and 1 property that was already listed in the NRHP and further conducted a desk-top study to identify previously recorded archaeological resources that identified 9 archaeological resources within the APE, none of which have been evaluated for NRHP eligibility, and prepared a geoarchaeological overview of the APE to assess the likelihood of landforms in which there is a high potential for buried archaeological materials, there is insufficient detail or certainty about the entire Project to conduct comprehensive identification of historic properties that may be affected by the Project; and

**WHEREAS**, USACE, pursuant to 36 C.F.R § 800.2(c)(2)(ii) contacted Indian Tribes, also known as Native American Tribes (Tribes), listed in Appendix 1 and invited them to participate in the development of this Agreement as consulting Tribes and the United Auburn Indian Community of the Auburn Rancheria chose to participate in the development of this Agreement; and

**WHEREAS**, USACE, pursuant to 36 C.F.R § 800.2(c)(3) and (5), contacted the interested parties listed in Appendix 1 and invited them to participate in the development of this Agreement as consulting parties, and the Delta Protection Commission, Contra Costa County Water Agency, Sacramento County Community Services, San Joaquin County and Yolo County chose to participate in the development of this Agreement; and

**WHEREAS**, USACE proposed the development of this Agreement to the ACHP by letter on October 8, 2020, to request their participation in the development of this Agreement in accordance with 36 C.F.R § 800.6(a)(1), and the ACHP declined by letter of December 8, 2020; and

**WHEREAS**, DWR participated in the development of this Agreement and acknowledges and recognizes that execution of this Agreement is a necessary component of the USACE review process for determining whether and under what conditions to issue permits and permissions under its authority in compliance with Section 106 of the NHPA and, because this Agreement assigns substantial responsibilities to DWR, the USACE invited DWR to sign this Agreement as an Invited Signatory pursuant to 36 C.F.R § 800.6(c)(2); and

**WHEREAS**, pursuant to 36 C.F.R § 800.6(c)(3), USACE has consulted with the consulting Tribes concerning properties of traditional, religious, and cultural significance and has invited these consulting Tribes to sign this Agreement as Concurring Parties; and

**WHEREAS**, pursuant to 36 C.F.R § 800.6(c)(3), the other consulting parties have participated in consultation and been invited to sign this Agreement as Concurring Parties; and

**WHEREAS**, the definitions set forth in 36 C.F.R § 800.16, are incorporated herein by reference and apply throughout this Agreement;

**NOW, THEREFORE**, the USACE and the SHPO agree that the proposed Undertaking shall be implemented in accordance with the following Stipulations to consider the effects of the Undertaking on historic properties and to satisfy the USACE's Section 106 responsibilities for the Undertaking.

## **STIPULATIONS**

The USACE shall ensure that the following measures are implemented.

### **I. ROLES AND RESPONSIBILITIES OF THE SIGNATORIES AND INVITED SIGNATORY**

#### **A. USACE**

1. USACE shall be responsible for ensuring this Agreement is implemented consistent with requirements 36 C.F.R Part 800 in consultation with the SHPO. The USACE shall be responsible for the following:
  - a. Determining the APE or Project segment APE in consultation with DWR and the SHPO pursuant to Stipulation V. USACE may modify the APE as



necessary to account for Project changes, in accordance with Stipulation V.B.1 of this Agreement, and shall notify all Signatories, Invited Signatories, consulting Tribes and consulting parties of any proposed change to the APE.

- b. Determining the NRHP eligibility of a historic property, issuing findings regarding the effects of the Undertaking on historic properties, resolving any adverse effects, all in consultation with the Signatories, Invited Signatories, consulting Tribes and consulting parties to this Agreement.
- c. Conducting government-to-government consultation with federally recognized Native American Tribes, whether a concurring party to this Agreement or not, throughout any activity of the Undertaking that might affect historic properties, particularly regarding sites that may have traditional, religious, and/or cultural importance to a Federally recognized Tribe. In meeting its Federal trust responsibility, the USACE alone shall conduct government-to-government consultation with Federally recognized tribes.
- d. Circulating draft documents, comments on documents, and final documents among the Signatories, Invited Signatories, consulting Tribes and consulting parties, as limited by confidentiality considerations outlined in Stipulation XII.E.
- e. Maintaining documentation of Section 106 compliance.
- f. Responding to written lead agency designation requests from other federal agencies under 36 C.F.R § 800.2(a)(2). If the USACE receives a written request from another federal agency that intends to carry out, fund, license, permit, or approve an Undertaking covered by this Agreement, the USACE shall notify the SHPO and DWR of such request within fifteen **(15) calendar days**. The USACE may invite such federal agency to become a Signatory party to this Agreement pursuant to 36 C.F.R § 800.6(c)(2). If such federal agency agrees to become a Signatory, the USACE shall comply with Stipulation XII.C to amend this Agreement. If such federal agency does not agree to become a Signatory, that agency remains individually responsible for complying with Section 106 for its Undertaking.
- g. Continue to involve the public in the Section 106 process pursuant to 36 CFR § 800.3(e) and consistent with 36 CFR § 800.2(d).
- h. Determining the scope of identification efforts pursuant to 36 CFR §§ 800.4(a) - (b).

- i. Evaluating historic significance pursuant to 36 CFR § 800.4(c).

## B. SHPO

1. In accordance with SHPO's role as defined in 36 C.F.R 800.2(c)(1)(i), SHPO shall be responsible for the following:
  - a. Advising and assisting USACE in carrying out their section 106 responsibilities, including:
    - (1) Planning to continue to involve the public in the Section 106 process pursuant to 36 CFR § 800.3(e) and consistent with 36 CFR § 800.2(d).
    - (2) Determining the scope of identification efforts pursuant to 36 CFR §§ 800.4(a) - (b).
    - (3) Evaluating historic significance pursuant to 36 CFR § 800.4(c).
    - (4) Consulting with USACE on findings of no historic properties affected pursuant to 36 CFR § 800.4(d).
    - (5) Advising USACE on the resolution of disagreements on findings of no historic properties affected pursuant to 36 CFR § 800.4(d)(1).
    - (6) Consulting on the application of the criteria of adverse effect with USACE pursuant to 36 CFR § 800.5.
    - (7) Advising USACE on the resolution of disagreements on findings of no adverse effects to historic properties affected pursuant to 36 CFR § 800.5(c)(2).

## C. DWR

1. DWR as the Project proponent shall be responsible for the following:
  - a. Coordinating with the USACE to provide information necessary for disseminating information about the Undertaking to Signatories, Invited Signatories, consulting Tribes and consulting parties.
  - b. Preparing and submitting to the USACE documentation of the identification and evaluation of historic properties in the APE in accordance with 36 C.F.R § 800.4, meeting federal documentation standards at 36 C.F.R § 800.11, including the preparation of necessary technical studies to support the evaluations, such as cultural resource

inventory reports and resource eligibility and effect recommendations in accordance with Stipulations V–VI.

- c. Preparing and submitting to the USACE resource-specific Historic Property Treatment Plans (HPTPs) for the protection and treatment of any adversely affected historic properties within the APE, in accordance with Stipulation IX.A of this Agreement.
- d. Coordinating with the USACE to hold informational meetings with federally recognized Native American Tribes, other California Native American Tribes, and as appropriate, other parties with a demonstrated interest in the heritage or cultural resources within the APE to provide Undertaking updates and identify potential consulting parties.
- e. Maintaining documentation of DWR's compliance with this Agreement.

## **II. PROFESSIONAL QUALIFICATIONS STANDARDS**

- A. The USACE shall ensure that all actions prescribed by this Agreement that involve the identification, evaluation, analysis, recording, treatment, monitoring, or disposition for historic properties, or that involve reporting or documentation of such actions in the form of reports, forms, or other records, shall be carried out by or under the direct supervision of a person or persons who meet at a minimum the U.S. Secretary of the Interior's (SOI) Professional qualifications standards (48 *Federal Register* [FR] 44738-44739; Appendix A to 36 C.F.R Part 61) in the appropriate discipline, or anyone with a demonstrated level of special expertise who may not be formally SOI qualified.
- B. The USACE and DWR shall ensure that the work outlined in this Agreement is conducted by individuals meeting these qualifications standards.
- C. The USACE acknowledges that Tribes possess special expertise in identifying properties of religious and cultural significance, pursuant to 36 C.F.R § 800.4(c)(1). In deference to Tribes, Tribes shall be considered the appropriate experts with respect to determining professional qualification standards for reporting or documentation that involves historic properties of religious and cultural significance. This includes the use of Tribal Monitors during construction. This also includes the identification, evaluation, and treatment of historic properties of religious and cultural significance by Tribes during consultation.

## **III. TIMEFRAMES AND REVIEW PROCEDURES**

- A. The timeframes and communication protocols described in this Stipulation apply to all Stipulations in this Agreement unless otherwise specified (such as certain steps in Stipulation VI regarding identification of historic properties or Stipulation VII regarding assessments of effect). All time designations are in calendar days unless

otherwise stipulated as business days. If a review period ends on a Saturday, Sunday, or Federal holiday, the review period will be extended until the end of the next business day. All review periods are concurrent and thirty **(30) days**, unless otherwise specified, starting on the day the documents are provided by the USACE and/or DWR, noting it is submitting on behalf of the USACE, to the reviewing parties electronically, or the day the documents are received by hard copy, if previously requested, which constitutes notification.

- B. The USACE shall review and provide comments on all documents and deliverables produced in accordance with the stipulations of this Agreement, in thirty **(30) days**, beginning on the date received, except as expressly identified in this Agreement. Upon receipt of the USACE comments, DWR will revise documents and deliverables to address those comments and provide revised documents and deliverables to USACE for further review until USACE deems the documents and deliverables acceptable.
- C. The USACE shall provide documentation (in accordance with Stipulation IV) of its determinations and findings to the Signatories, Invited Signatories, consulting Tribes and consulting parties for a review and comment period of thirty **(30) days**, while respecting confidentiality concerns in accordance with Stipulation XII.E.
  - 1. The USACE may extend this review and comment period up to an additional thirty **(30) days**, if requested in writing, unless a shorter extension period is expressly provided for in this Agreement.
  - 2. Any written comments provided within the review and comment period of thirty **(30) days** shall be considered in the revision of the determination or finding.
- D. The USACE shall document written comments received and communicate how comments were addressed.
  - 1. The USACE shall provide the comments, and any response document, with a final determination or finding to the SHPO for review and comment and/or concurrence. Should the SHPO determine that the final document or deliverable is not sufficient as set forth in 36 C.F.R § 800.11(a), the SHPO shall notify the USACE and specify the information needed, and the Signatories shall continue to consult on the document or deliverable in accordance with the timeframes established in the applicable Stipulation or with the dispute resolution procedures in Stipulation XII.B.1.
- E. Failure of the Signatories, Invited Signatories, consulting Tribes and consulting parties to respond within thirty **(30) days** of any submittal shall not preclude the USACE from proceeding with the next steps in compliance with this Agreement.

- F. Pursuant to 36 C.F.R § 800.3(g) and where the USACE and SHPO agree it is appropriate, the USACE may consult and address multiple steps in §§ 800.4 through 800.6 through the submission of documentation to Signatories, Invited Signatories, consulting Tribes and consulting parties. The decision to address multiple steps will be made during consultation on the Project segment APE in accordance with Stipulation V.A.
- G. If the Signatories do not agree or do not concur with the USACE determinations or findings in the final document or deliverable submitted for concurrence, the Signatories shall consult, in writing, for a period not to exceed fifteen **(15) days** following the receipt of the SHPO's written objection. If the Signatories do not reach agreement they shall proceed in accordance with Stipulation XII.B. Note that there may be exceptions specified in certain procedures; for example, resolution of objections to eligibility determinations will follow procedures as shown in Stipulation VI.B.5.

#### **IV. DOCUMENTATION STANDARDS**

- A. The USACE shall ensure that all historic preservation activities carried out pursuant to this Agreement shall meet the *Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation* (48 FR 44716-44740) as well as standards and guidelines for historic preservation activities established by the SHPO and National Park Service.
- B. The USACE shall ensure that all reports prepared pursuant to this PA are consistent with 36 C.F.R § 800.11 and shall be in accordance with the document requirements provided for specific documents in their applicable Stipulations in this agreement.
- C. All documentation prepared under this Agreement shall be kept on file at DWR and the USACE, submitted to the California Historical Resources Information System, and made available to the public or tribes upon request, consistent with applicable confidentiality requirements referenced under Stipulation XII.E of this Agreement.
1. Information released to the public shall comply with Stipulation XII.E of this Agreement, 36 C.F.R §§ 800.2(d) (1–2) and 800.11(c)(1) and (3), Section 6254.10 of the California Government Code and/or the Freedom of Information Act (5 U.S.C. § 552), as appropriate and applicable.

#### **V. AREA OF POTENTIAL EFFECTS (APE)**

- A. The USACE, in consultation with DWR, shall confirm the APE for each Project segment that proceeds through identification, evaluation, and assessment of effects in accordance with this Agreement. The USACE shall submit the APE for each Project segment to the Signatories, Invited Signatories, consulting Tribes and consulting parties for review prior to initiating historic property identification efforts. Reviews and comments shall be addressed in accordance with Stipulation III.

1. Pursuant to Stipulation III. F.; should the USACE make a request to address multiple steps in the consultation process at the same time, it will do so when submitting the Project segment APE.
- B. As Project activities covered by the Undertaking progress, design changes or modifications may be necessary. DWR shall inform the USACE of any such design changes or modifications, and the USACE shall determine if the design changes or modifications affect additional areas that would necessitate modification of the APE.
1. If the USACE determines additional areas shall be affected, the USACE shall submit a modified APE to the Signatories, Invited Signatories, consulting Tribes and consulting parties for a review and comment period of fifteen **(15) days**. Any written comments provided within the review and comment period shall be considered by the USACE in determining the modified APE. The USACE will notify the Signatories, Invited Signatories, consulting Tribes and consulting parties of the final modified APE within three **(3) days** of finalization.

## VI. IDENTIFICATION OF HISTORIC PROPERTIES

USACE, with support from DWR, shall be responsible for identifying historic properties present within the APE prior to any ground disturbance associated with construction or other activities covered by the Undertaking. Identification efforts may be phased with Project activities and components of construction covered by the Undertaking in accordance with 36 C.F.R § 800.4(b)(2). Such efforts will be organized by project segment and as land within the APE is made accessible for surveys, as detailed below. DWR shall identify historic properties in accordance with *The Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation* (48 C.F.R Parts 44716–44742) and 36 C.F.R § 800.4.

### A. Historic Property Surveys

1. Prior to the initiation of construction or ground-disturbing activities for any segment of the Project, DWR shall identify historic properties consistent with 36 C.F.R 800.4(b), including performing studies to identify and record all resources within the APE and evaluate whether they qualify as historic properties, including surveys within all areas of the APE not previously surveyed or areas within the APE where previous surveys are deemed inadequate by the USACE in consultation with the Signatories.
2. DWR shall conduct an updated records and literature search for each Project segment if more than five **(5) years** have passed since the prior records and literature search. The records and literature search shall be comprehensive and involve review of all appropriate documentation. The records and



literature search shall be completed no more than one **(1) year** prior to beginning the historic property survey.

3. DWR and the USACE shall continue to solicit input to identify historic properties within the APE or Project segment APE through continued outreach, coordination, and consultation with local historical societies, local agencies, Tribes and individuals and newly identified parties that may have pertinent information. Historic properties that are identified by consulting Tribes and consulting parties shall be listed in the identification document with information regarding the location and significance of the historic property, subject to confidentiality considerations provided in Stipulation XII.E and in accordance with 36 C.F.R 800.11(c).
  - a. Historic properties that are identified by Tribes shall not be dismissed if archaeological survey fails to identify the properties. However, DWR shall reach out to ask Tribes if: (1) they believe that the historic property has physical components and what the general nature of those components may be (cultural soils, gathering areas, etc.); and (2) if they would like to see any additional identification work done to locate the physical components of the historic property.
  - b. DWR shall offer to conduct additional surveys to gain additional information regarding boundaries of historic properties that are identified by Tribes. Such surveys may include archaeological pedestrian survey, Tribal survey, sub-surface testing, canine forensic survey, etc.
4. DWR shall record all resources identified during surveys on the appropriate *California Department of Parks and Recreation 523 forms*. DWR shall document the results of the extent of historic property investigations in separate archaeological, architectural, and ethnographic technical reports. As surveys may be phased by Project segment, DWR may produce multiple survey reports related to specific Project segments or components. If resources can be evaluated based on survey level identification efforts, the survey report(s) may also include evaluation of those resources.
5. DWR shall offer to record all resources identified by Tribes on the appropriate *California Department of Parks and Recreation 523 forms*. DWR shall document the results of tribal identifications of historic properties in a separate ethnographic technical report. If properties in the report are also deemed to possess archaeological or other significance, they may be listed in multiple reports. Any information that is confidential to a Tribe may be separated into a confidential appendix. If resources can be evaluated based on tribal consultation, the ethnographic report(s) may also include evaluation of those resources.

6. The USACE shall provide copies of draft survey reports prepared by DWR for review and comment in accordance with Stipulation III.
7. Within thirty **(30) days** of approving the final survey reports, the USACE shall provide a copy of the final documents to the Signatories, Invited Signatories, consulting Tribes and consulting parties and submit the final documents to the SHPO for review and comment in accordance with Stipulation III.D.1. The USACE may provide the final reports concurrent with its determination of eligibility and finding of effect (FOE) in accordance with Stipulation III.F.

#### B. Evaluation of Historic Properties

1. DWR shall apply the *National Register Criteria* (36 C.F.R Part 63) and conduct evaluation of resources present within the APE or Project segment APE and prepare recommendations of eligibility for listing in the NRHP in accordance with 36 C.F.R § 800.4(c)(1).
  - a. DWR shall evaluate recorded historic or cultural resources such as archaeological sites, architectural resources (buildings, structures, objects), districts or landscapes, ethnographic resources, places of religious and cultural significance to Tribes or the public, and Traditional Cultural Properties within the APE. If effects to resources can be avoided or unevaluated properties protected, or if properties cannot be evaluated in their entirety, DWR and the USACE, in consultation with Signatories, and consulting parties may treat them as eligible for inclusion in the NRHP for the purposes of the Undertaking.
2. DWR shall produce evaluation report(s) for resources not evaluated in the survey report(s) prepared according to Stipulation VI.A.
3. The USACE shall submit copies of draft evaluation reports for review and comment in accordance with Stipulation III.C. The USACE shall consider comments made by the Signatories, Invited Signatories, consulting Tribes and consulting parties in their determination(s) of eligibility.
4. The USACE, within thirty **(30) days** of acceptance of the final evaluation reports, shall provide a copy of the final documents and the USACE's determination(s) of eligibility for listing in the NRHP to the Signatories, Invited Signatories, consulting Tribes and consulting parties, in accordance with Stipulation III.D. The USACE shall make determinations of eligibility in accordance with the NRHP criteria set forth in 36 C.F.R § 60.4 for all unevaluated resources within the APE, consistent with the *Secretary of the Interior's Standards and Guidelines for Evaluation*.

5. The USACE shall make a final determination of eligibility (DOE). The USACE shall submit the final DOE to the SHPO for review in accordance with Stipulation III.D.1.
6. If the USACE and the SHPO are unable to agree on the NRHP eligibility of a resource, the USACE shall obtain a determination from the *Keeper* of the NRHP pursuant to 36 C.F.R §63.2(d)-(e) and 36 C.F.R § 800.4(c)(2).

## **VII. ASSESSMENTS OF EFFECTS**

- A. The USACE shall make assessments of effects to historic properties from the Undertaking by applying the criteria of adverse effect pursuant to 36 C.F.R § 800.5(a). Such assessments will be grouped by project segment into a single FOE for each segment.
  1. DWR may coordinate preliminary assessments of effect with the identification efforts for each Project segment. DWR may incorporate the FOE into either survey or evaluation reports if enough information is available to make the recommended FOE.
- B. DWR shall submit a draft FOE for each Project segment to the USACE for review and distribution in accordance with Stipulation III.B. The FOE report shall assess potential direct, indirect, and cumulative effects and optionally identify any measures that would avoid or minimize those effects found to be adverse.
  1. The FOE may include tables that list each historic property, including historic properties of religious and cultural significance. In populating the table for historic properties of religious or cultural significance, USACE will ensure that effects are correctly identified and characterized so that avoidance, minimization of effects, or mitigation can be considered based on the significance that the consulting Tribes or consulting parties ascribes to the site.
  2. For each historic property the table shall state the applicable NRHP eligibility criteria and identify whether the Undertaking may alter, directly or indirectly, any of the character-defining features of a historic property that qualify the property for inclusion in the NRHP in a manner that would diminish any of the seven (7) aspects of integrity.
  3. Consideration shall be given to all qualifying characteristics of a historic property, including those that may have been identified after the original evaluation of the property's eligibility for the NRHP.

4. Adverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance or be cumulative.
- C. The USACE shall provide the draft FOE(s) for review and comment in accordance with Stipulation III.C. The USACE shall consider recommendations made by the Signatories, Invited Signatories, consulting Tribes and consulting parties in its development of a revised FOE report. The USACE shall distribute the revised FOE in accordance with Stipulation III.D.
- D. The USACE shall make a final FOE within thirty **(30) days** of approving the revised FOE report. The USACE shall submit the final FOE to the SHPO for review in accordance with Stipulation III.D.1.
- E. If within the thirty **(30)-day** review period, the SHPO notifies the USACE official in writing that it disagrees with the finding and specifies the reasons for the disagreement in the notification, the USACE shall consider those comments and consult with the party to resolve the disagreement in accordance with Stipulation XII.B.
- F. If within the thirty **(30)-day** review period the SHPO fails to respond in writing, in accordance with 36 C.F.R § 800.3(c)(4) the USACE and DWR shall proceed with any applicable next steps in accordance with Stipulation III.E.

## VIII. UNANTICIPATED DISCOVERY PLAN

Within two **(2) years** of execution of this Agreement, pursuant to 36 C.F.R. § 800.13(a)(1), the USACE, in consultation with the other Signatories, consulting Tribes, and consulting parties, will develop a draft and final Monitoring and Discovery Plan (MDP) for the Undertaking. The MDP shall conform to the principles of *The Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation* and be consistent with this Agreement. The USACE shall provide the draft MDP for circulation among the other Signatories, consulting Tribes, and consulting parties for review and comment, in accordance with Stipulation III.

Prior to finalization of the MDP, any post review discoveries during implementation of Project activities shall be governed by the procedures in 36 C.F.R. § 800.13(b). When the consultation described in Stipulation VII results in a requirement for monitoring, Project activities will carry out that monitoring as determined in that consultation.

The MDP for the Undertaking shall include the following:

- A. A description of the Undertaking and a map of the Project APE.

- B. Protocols tailored to the environmental conditions within the Project APE and to the specific historic property or types of historic properties which are likely to be present and could be inadvertently discovered in the Project APE.
- C. A summary of the previous historic property identification efforts and provide information on the probability for encountering buried cultural deposits.
- D. A description of the roles and responsibility of an archaeological monitor (e.g., authority to halt construction for an inadvertent discovery, daily monitoring, daily reporting, etc.) and project archaeologist (e.g., oversee monitors, response to inadvertent discovery, final reporting, etc.).
- E. A statement that archaeological monitoring shall be conducted by personnel that meet the professional qualification standards identified in Stipulation II.A of this Agreement, or under the direct supervision of a person meeting these professional qualification standards.
- F. Provisions for tribal monitors, should tribal consultation indicate the need for tribal monitoring, including description of the roles and responsibilities of the tribal monitor standard.
- G. A post-review discovery section that details the protocols to be followed in the event of an unanticipated discovery of cultural resources or human remains.
- H. Notification procedures and a list of key contacts for the Undertaking.
- I. A draft and final monitoring report submitted in accordance with Stipulation III, and, once complete, inclusion in the Agreement annual report.
- J. Because previously unidentified archaeological resources may be discovered during implementation of Project activities, the USACE shall ensure the requirements outlined below are included in the post-review discoveries section of the Undertaking's MDP.
  - 1. All ground-disturbing activities within hundred (100) feet of the discovery are immediately halted and any exposed archaeological resources will be protected from further harm and protected. An archaeologist meeting the professional qualification standards in Stipulation II.A. of the Agreement will conduct a field inspection of the find to determine the extent of the discovery and provide NRHP eligibility recommendations to the USACE.
  - 2. The USACE will determine if the discovery is eligible for listing in the NRHP. The USACE may assume a property to be eligible pursuant to 36 C.F.R. § 800.13(c).

3. In accordance with 36 C.F.R. § 800.13(b)(3), the USACE shall notify the SHPO, consulting Tribes, and consulting parties, within forty-eight **(48) hours** of the discovery. The USACE will provide its assessment of the NRHP eligibility, and the measures proposed to resolve adverse effects, if applicable.
4. The SHPO, consulting Tribes, and consulting parties shall respond within forty-eight **(48) hours** of the notification. The USACE shall consider their recommendations regarding NRHP eligibility and the proposed actions and then carry out the appropriate actions. The USACE shall provide SHPO, consulting Tribes, and consulting parties, a report of the actions when they are completed.
5. Should the discovered cultural resource be identified by any consulting Tribe or consulting party as a property of traditional cultural or religious significance, the USACE will consult with the appropriate consulting Tribes and consulting parties regarding eligibility and treatment.
6. Post-review discoveries which are not being adversely affected by Project activities, and which can be avoided will be protected, monitored, and to the extent possible, avoided by future Project ground disturbing activities.

## **IX. RESOLUTION OF ADVERSE EFFECTS**

To the extent practicable, the USACE in consultation with Signatories, Invited Signatories, and all consulting parties shall seek ways to avoid and minimize adverse effects to historic properties. If a Project segment results in adverse effects to historic properties that cannot be avoided, the USACE will ensure DWR develops a Historic Properties Treatment Plan (HPTP) for the Project segment that outlines how the adverse effects will be resolved.

### **A. Historic Property Treatment Plans**

1. USACE will ensure that DWR develops HPTPs in consultation with the consulting Tribes and consulting parties and tailor treatment efforts to the types and degree of anticipated effects. Mitigation shall address adverse effects (direct or indirect alterations) caused by the undertaking to the characteristics of the historic property that qualify it for inclusion in the NRHP in a manner that would diminish the integrity of the property's location, setting, design, materials, workmanship, feeling, or association.
2. If an HPTP specifically addresses mitigation for adverse effects to historic properties to which Federally or non-Federally recognized Tribes attach religious or cultural significance, the USACE will consult with the appropriate tribe(s) on the distribution of the draft HPTP to the consulting Tribes and consulting parties. Following that consultation, the USACE shall submit the HPTP to the consulting Tribes and consulting parties for a thirty **(30)-day** review, subject to the



confidentiality provisions of 36 C.F.R § 800.11(c). After the consulting Tribes and consulting parties thirty **(30)-day** review period, the USACE shall consider and address the comments and then shall submit the HPTP to the SHPO.

3. The SHPO shall have thirty **(30) days** to review. If SHPO concurs, the USACE shall notify the Signatories, Invited Signatories, consulting Tribes and consulting parties that the HPTP is complete and shall provide the schedule for its implementation. If the SHPO does not concur with the HPTP, the USACE shall consult with the SHPO to resolve the dispute. If an agreement on the HPTP cannot be reached within thirty **(30) days**, or as extended by the USACE, resolution of the issue may proceed by following the dispute resolution in Stipulation XII.B.
4. The USACE shall ensure that each HPTP is tailored to the specific historic property types within the Project segment and include the following framework, for consistency:
  - a. A description of the Project activities.
  - b. A map of the historic property(ies) locations, situating them in relationship to the Project activities.
  - c. A description of the historic property(ies) to which the HPTP applies, including associated primary number(s) and Trinomial(s) or other identifying names.
  - d. The results of previous research relevant to the historic property(ies). A summary of each historic property's effects assessment and character defining features that convey its eligibility to the NRHP; and SHPO concurrence of the determination of eligibility.
  - e. Information regarding the loss of values of the historic property as a result of the Project activities, including:
    - (1) A statement of the significant values of the historic property that would be lost.
    - (2) For archaeological resources, include information regarding a Phase II research design or Phase III data recovery research design that evidences a knowledge of the resource structure and content.
  - f. The way(s) in which the historic property(ies) will be affected by the Project activities.

- g. A discussion regarding how the proposed resolution of adverse effects for each historic property type within the Project APE will be implemented.
  - h. Protocols for the treatment of human remains pursuant to Stipulation IX.
  - i. A suspension/termination protocol that stipulates the procedures to be followed if the Project activities are halted during fieldwork conducted under the HPTP, pursuant to this Agreement.
  - j. The timeline for the preparation of deliverables, review process and final distribution, as well as timelines agreed to in this Agreement.
  - k. Protocols to address the discovery of previously unknown cultural resources and unanticipated adverse effects or damage to historic properties.
5. If it is determined an HPTP requires amendment, the USACE, in consultation with Signatories, Invited Signatories, consulting Tribes and consulting parties, shall use the following process:
- a. The USACE, in coordination with DWR, shall notify the Signatories, Invited Signatories, consulting Tribes and consulting parties of any proposed change in the HPTP with a description of the proposed change. The Signatories, Invited Signatories, consulting Tribes and consulting parties shall then have fifteen **(15) days** from receipt, or as extended through agreement by the Signatories, to comment on the modified HPTP.
  - b. Once the USACE receives, considers, and addresses all comments regarding the modified HPTP, the USACE shall notify the SHPO and include a summary of the comments received for a ten **(10)-day** review period.
  - c. If the USACE and SHPO agree to the proposal, then the USACE will distribute copies to the Signatories, Invited Signatories, consulting Tribes and consulting parties within thirty **(30) days** of the day upon which agreement to the modification was reached or the close of the review period. The USACE will keep copies of the description on file for its administrative record.
  - d. If the USACE and SHPO cannot agree to a proposal for the modification of the HPTP within thirty **(30) days**, or as extended by the USACE, then they will resolve the dispute in accordance with Stipulation XII.B.
6. All finalized HPTPs will be included in the appropriate USACE files and included in the Agreement annual report, pursuant to Stipulation XII.D.

## **X. HUMAN REMAINS**

- A. If human remains are inadvertently discovered, all construction, archaeological excavation, or other similar activities shall cease within 100 feet of the find and DWR shall immediately notify the appropriate parties in accordance with the unanticipated discovery protocols in the Unanticipated Discovery Plan (Stipulation VIII) or the applicable Project segment HPTP (Stipulation IX). Associated grave items shall be treated in accordance with the Unanticipated Discovery Plan or the applicable Project segment HPTP.
  - 1. For purposes of this Undertaking, this Agreement adopts the definitions found at 43 C.F.R § 10.2.
- B. Any Native American human remains, funerary objects, items of cultural patrimony, and sacred objects encountered during any activity of this Undertaking on federal lands will be the responsibility of the federal land management agency in accordance with the requirements of the Native American Graves Protection and Repatriation Act (NAGPRA), 25 U.S.C. 3001, et seq., and its implementing regulations found at 43 C.F.R Part 10.
- C. DWR shall treat Native American human remains, funerary objects, objects of cultural patrimony, and sacred objects encountered during any activities of this Undertaking on non-federal lands in accordance with the requirements of Section 7050.5 of the California State Health and Human Safety Code, and Section 5097.98 of the Public Resources Code. DWR shall ensure that to the extent permitted by applicable law and regulation, the views of the Most Likely Descendant(s) are taken into consideration when DWR makes decisions about the disposition of the Native American human remains and funerary objects, which may include reburial of such items at the request of the Most Likely Descendant(s), and shall further ensure the respectful treatment of human remains and funerary objects.

## **XI. CURATION**

- A. If materials are to be curated from federal lands, the USACE shall notify the appropriate federal land management agency of any cultural materials unrelated to burials or NAGPRA and associated records resulting from identification, evaluation, and treatment of historic properties on federal lands conducted under this Agreement. Such materials and records shall then be the responsibility of the federal land management agency to properly maintain in accordance with 36 C.F.R Part 79. The federal land management agency will be responsible for documentation of the curation of these materials. (See Stipulation X.B of this Agreement for the treatment of items regulated by NAGPRA, such as human remains and funerary objects.)

- B. The disposition of any material collected off federal lands shall be determined in consultation with the property owner and consistent with 36 C.F.R Part 79.
- C. USACE shall ensure that if any cultural materials unrelated to burials and associated records resulting from identification, evaluation, and treatment of historic properties conducted under this Agreement are to be curated, they shall be properly maintained in accordance with 36 C.F.R Part 79 as detailed in the applicable HPTP. Objects or soils associated with a historic property of religious and cultural significance shall only be curated following consultation with Signatories and consulting Tribes per Stipulation I.A.1(c).

## **XII. ADMINISTRATIVE STIPULATIONS**

### **A. Notices**

- 1. All notices, requests, consents, approvals, or communications shall be personally delivered, delivered via email, or shall be deemed delivered after five **(5) business days** from deposit in the United States mail.

### **B. Dispute Resolution**

- 1. Should any Signatory, Invited Signatory, or Concurring Party to this Agreement object, in writing to the USACE, to the manner in which the terms of this Agreement are carried out, to any action carried out or proposed with respect to implementation of this Agreement, or to any document prepared in accordance with and subject to the terms of this Agreement, the USACE shall immediately notify the other Signatories and Concurring Parties of the objection, request their comments on the objection within fifteen **(15) days** following receipt of the USACE notification, and proceed to consult with the objecting party for no more than thirty **(30) days** to resolve the objection. The USACE shall honor the request of the other parties to participate in the consultation and shall take any comments provided by those parties into account.
  - a. If the objection is resolved through consultation, the USACE may proceed in accordance with the terms of such resolution.
  - b. If, after initiating such consultation, the USACE determines that the objection cannot be resolved through consultation, the USACE shall forward all documentation relevant to the objection, including the USACE's proposed resolution, to the ACHP. The ACHP will provide the USACE with its advice on the resolution of the objection within thirty **(30) days** of receiving adequate documentation. Prior to reaching a final decision on the objection, the USACE shall prepare a written response that considers any timely advice or comments regarding the objection from the ACHP, Signatories, and

Concurring Parties, and provide them with a copy of the written response. The USACE will then proceed according to its final decision.

If the ACHP does not provide its advice regarding the objection within the thirty **(30)-day** comment period, the USACE may make a final decision on the objection and proceed accordingly. Prior to reaching such a final decision, the USACE shall prepare a written response that considers any timely comments regarding the objection from the Signatories and Concurring Parties to the Agreement and provide them and the ACHP a copy of such written response.

- c. The USACE's responsibility to carry out all other actions subject to the terms of this Agreement that are not the subject of the dispute remain unchanged.
2. At any time during implementation of the terms of this Agreement, should any member of the public raise an objection in writing to any Signatory party to this Agreement, pertaining to such implementation, that Signatory party shall immediately notify the USACE. The USACE shall immediately notify the other Signatories in writing within fifteen **(15) days** of receipt of their notification and provide Signatories fifteen **(15) days** to provide comments. The USACE shall consider the objection, and in reaching its decision, the USACE shall take all comments into account. Within fifteen **(15) days** following closure of the comment period, the USACE shall render a decision regarding the objection and respond to the objecting party. The USACE shall promptly notify the Signatories of its decision in writing, including a copy of the response to the objecting party. The USACE's decision regarding resolution of the objection shall be final. Following issuance of its final decision, the USACE may authorize the action subject to dispute hereunder to proceed in accordance with the terms of that decision.

### C. Amendments

1. This Agreement may be amended only upon written agreement of the Signatories. The amendment process shall comply with 36 C.F.R. § 800.6(c)(7).
2. Any Signatory or Invited Signatory to this Agreement may request, in writing, to the other Signatories that it be amended, whereupon the Signatories shall consult for no more than thirty **(30) days** to consider such amendment. The USACE may extend this consultation period upon agreement of the Signatories. This Agreement may be amended only upon written concurrence of all Signatories. If the Signatories cannot reach concurrence on the proposed amendment, the Signatories shall proceed in accordance with Stipulation XII.B.

3. This Agreement will be amended when such an amendment is agreed to in writing by all Signatories, including Invited Signatories. The amendment will be effective on the date a copy signed by all Signatories is filed with the ACHP.

#### D. Reporting and Review Requirements

1. DWR shall submit an annual report to the USACE and SHPO, no later than three **(3) months** following the end of the State fiscal year until the terms of the Agreement document are met or the Agreement is terminated. DWR shall also send the annual report to the consulting Tribes and consulting parties. There shall be a comment period of thirty **(30) days** and DWR shall produce a final report within thirty **(30) days** of receipt of comments. Report content shall include a summary of actions taken under this Agreement including all findings and determinations, public objections, inadvertent effects, post review discoveries, APE modifications, emergency actions, status of implementation of treatments and resolution of effects, list of qualified staff, status of Project schedule, and upcoming activities for the next year.
2. The annual report shall provide the opportunity for this Agreement's Signatories, Invited Signatories, consulting Tribes and consulting parties to review the effectiveness of this Agreement. If any of the Signatories believes amendments to this Agreement are required, they shall consult in accordance with Stipulation XII.C.
3. USACE shall organize biannual meetings for the Signatories, Invited Signatories, and Concurring Parties, with an agenda that summarizes the activities of the last six **(6) months**, to facilitate open communication and to provide regular updates on the progress of activities related to Section 106 compliance. One of the meetings shall occur following submission of the final annual report each year. The meetings can be cancelled upon mutual agreement by the Signatories. If a Signatory, Invited Signatory, or Concurring Party is unable to attend a biannual meeting as scheduled, they will be provided with a meeting summary.
4. Unless otherwise specified, all documents produced for the Undertaking shall be subject to the review process in Stipulation III.

#### E. Confidentiality

1. The parties to this Agreement acknowledge that information regarding historic properties, including data concerning the precise location and nature of the historic properties, is subject to the provisions of Section 304 of the NHPA, as amended (54 U.S.C. § 307103), 36 C.F.R § 800.6(a)(5), and 36 C.F.R § 800.11(c), relating to the public disclosure of such information, as well as Section 9 of the Archaeological Resources Protection Act (10 U.S.C. §§ 470aa–470mm), the Freedom of Information Act (5 U.S.C. § 552, as amended), and/or



the Executive Order on Sacred Sites 13007 FR 61-104, dated May 24, 1996, as applicable.

2. Regarding sensitive information shared by Tribes, USACE, in accordance with the provisions of the federal law will not share non-public information that is so designated by the Tribes without first confirming (in writing with the provider of the information) the appropriateness of sharing.
3. Subject to the confidentiality limitations in Stipulation XII.E.1, DWR and the USACE may share studies and background documentation developed by DWR or the USACE with other federal or state agencies.

#### F. Emergencies

Should an emergency occur during construction that threatens a historic property, and which represents an imminent threat to public health or safety, or creates a hazardous condition, the USACE shall immediately notify the Signatories of the condition that has initiated the situation and the measures taken to respond to the emergency or hazardous condition. Should the Signatories desire to provide technical assistance to the USACE, they shall submit comments within seven **(7) days** from notification if the nature of the emergency or hazardous condition allows for such coordination.

#### G. Termination

1. If any Signatory or Invited Signatory to this Agreement determines that the terms of the agreement document will not or cannot be carried out, that party shall immediately notify the other Signatories in writing and proceed to consult with the other Signatories to attempt to develop an amendment in accordance with Stipulation XII.C. If within thirty **(30) days** (or another period agreed to by all Signatories) an amendment cannot be reached, any Signatory may terminate this Agreement upon written notification to the other Signatories.
2. In the event of termination, if work remains to be completed under this Agreement, then the USACE shall consult in accordance with 36 C.F.R § 800.14(b) to develop a new Agreement. Beginning with the date of termination, the USACE shall ensure that until and unless a new Agreement is executed for the actions covered by this Agreement, any activities related to the Undertaking shall be reviewed individually in accordance with 36 C.F.R §§ 800.4–800.6.
3. Upon a determination by the USACE, in consultation with the Signatories, Invited Signatories, consulting Tribes and consulting parties, that all the terms of this Agreement have been satisfactorily fulfilled, the USACE shall notify in writing the Signatories, Invited Signatories, consulting Tribes and consulting parties of its intention to close out this Agreement. The USACE shall invite the parties to comment within thirty **(30) days** on the effectiveness of this Agreement in

resolving the adverse effects on historic properties and take such comments under advisement in refining its approach to future Section 106 reviews.

#### H. Effective Date

This Agreement and its Appendices shall take effect on the date it has been fully executed by the Signatories. Amendments shall take effect on the dates they are fully executed by the Signatories.

#### I. Duration of this Agreement

Unless amended pursuant to Stipulation XII.C, this Agreement shall remain in force for ten **(10) years** after the effective date. If the terms of this Agreement are not carried out prior to expiration, the USACE will consult with the other signatories to this Agreement to consider amendment of the Agreement, at least sixty **(60) days** prior to expiration.

#### J. Authorizing Signatures

In witness hereof, the following authorized representatives of the Signatories have signed their names on the dates indicated, thereby executing this Agreement. This Agreement may be signed by the Signatories, Concurring Tribes, and Concurring Parties using counterpart signature pages. The USACE will distribute copies of all signed pages to the Signatories once this Agreement is fully executed.

### XIII. EXECUTION AND ADMINISTRATION

Execution of this Agreement by the Signatories, its transmittal to the ACHP, and subsequent implementation of its terms demonstrate that the USACE has afforded the ACHP an opportunity to comment on the Undertaking and its effects on historic properties, that the USACE has taken into account the effects of the Undertaking on historic properties, and that the USACE has satisfied its responsibilities under Section 106 of the NHPA and applicable implementing regulations for all aspects of the Undertaking.

**PROGRAMMATIC AGREEMENT  
BETWEEN  
THE UNITED STATES ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT,  
AND THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER  
REGARDING  
THE DELTA CONVEYANCE PROJECT,  
SACRAMENTO–SAN JOAQUIN DELTA, CALIFORNIA**

**SIGNATORIES:**

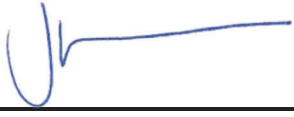
**UNITED STATES ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT**

Name:  \_\_\_\_\_ Date: 20 AUG 2025  
Robert M. McTighe, PMP  
Title: Colonel, U.S. Army  
Commander and District Engineer

**PROGRAMMATIC AGREEMENT  
BETWEEN  
THE UNITED STATES ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT,  
AND THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER  
REGARDING  
THE DELTA CONVEYANCE PROJECT,  
SACRAMENTO–SAN JOAQUIN DELTA, CALIFORNIA**

**SIGNATORIES:**

**CALIFORNIA STATE HISTORIC PRESERVATION OFFICER**

Name:  \_\_\_\_\_ Date: August 22, 2025  
Julianne Polanco  
State Historic Preservation Officer

**PROGRAMMATIC AGREEMENT  
BETWEEN  
THE UNITED STATES ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT,  
AND THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER  
REGARDING  
THE DELTA CONVEYANCE PROJECT,  
SACRAMENTO-SAN JOAQUIN DELTA, CALIFORNIA**

**INVITED SIGNATORIES:**

**CALIFORNIA DEPARTMENT OF WATER RESOURCES**

Name: Karla Nemeth Date: 26 AUG 2025  
Karla Nemeth  
Title: Director

**PROGRAMMATIC AGREEMENT  
BETWEEN  
THE UNITED STATES ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT,  
AND THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER  
REGARDING  
THE DELTA CONVEYANCE PROJECT,  
SACRAMENTO–SAN JOAQUIN DELTA, CALIFORNIA**

**CONCURRING TRIBES:**

**BUENA VISTA RANCHERIA OF ME-WUK INDIANS**

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Title:

**CALIFORNIA VALLEY MIWOK TRIBE**

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Title:

**KLETSEL DEHE BAND OF WINTUN INDIANS**

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Title:

**GUIDIVILLE RANCHERIA OF CALIFORNIA**

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Title:



**IONE BAND OF MIWOK INDIANS OF CALIFORNIA**

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Title:

**JACKSON BAND OF MIWUK INDIANS**

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Title:

**SHINGLE SPRINGS BAND OF MIWUK INDIANS**

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Title:

**UNITED AUBURN INDIAN COMMUNITY OF THE AUBURN RANCHERIA**

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Title:

**WILTON RANCHERIA**

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Title:

**YOCHA DEHE WINTUN NATION**

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Title:

**PROGRAMMATIC AGREEMENT  
BETWEEN  
THE UNITED STATES ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT,  
AND THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER  
REGARDING  
THE DELTA CONVEYANCE PROJECT,  
SACRAMENTO–SAN JOAQUIN DELTA, CALIFORNIA**

**CONCURRING PARTIES:**

**CONTRA COSTA COUNTY WATER AGENCY**

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Title: \_\_\_\_\_

**DELTA PROTECTION COMMISSION**

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Title: \_\_\_\_\_

**LOCKE MANAGEMENT ASSOCIATION**

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Title: \_\_\_\_\_

**NORTH DELTA CARES**

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Title: \_\_\_\_\_

**SACRAMENTO COUNTY DEPARTMENT OF COMMUNITY DEVELOPMENT**

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Title: \_\_\_\_\_

Programmatic Agreement, Delta Conveyance Project  
U.S. Army Corps of Engineers and the California State Historic Preservation Officer

## **SAN JOAQUIN COUNTY**

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Title:

## **YOLO COUNTY**

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Title:

## **APPENDICES**

- 1. Native American Indian Tribes and Other Parties Consulted**
- 2. Delta Conveyance Project APE Map**

## **Appendix 1: Native American Indian Tribes and Other Parties Consulted**

### Native American Indian Tribes

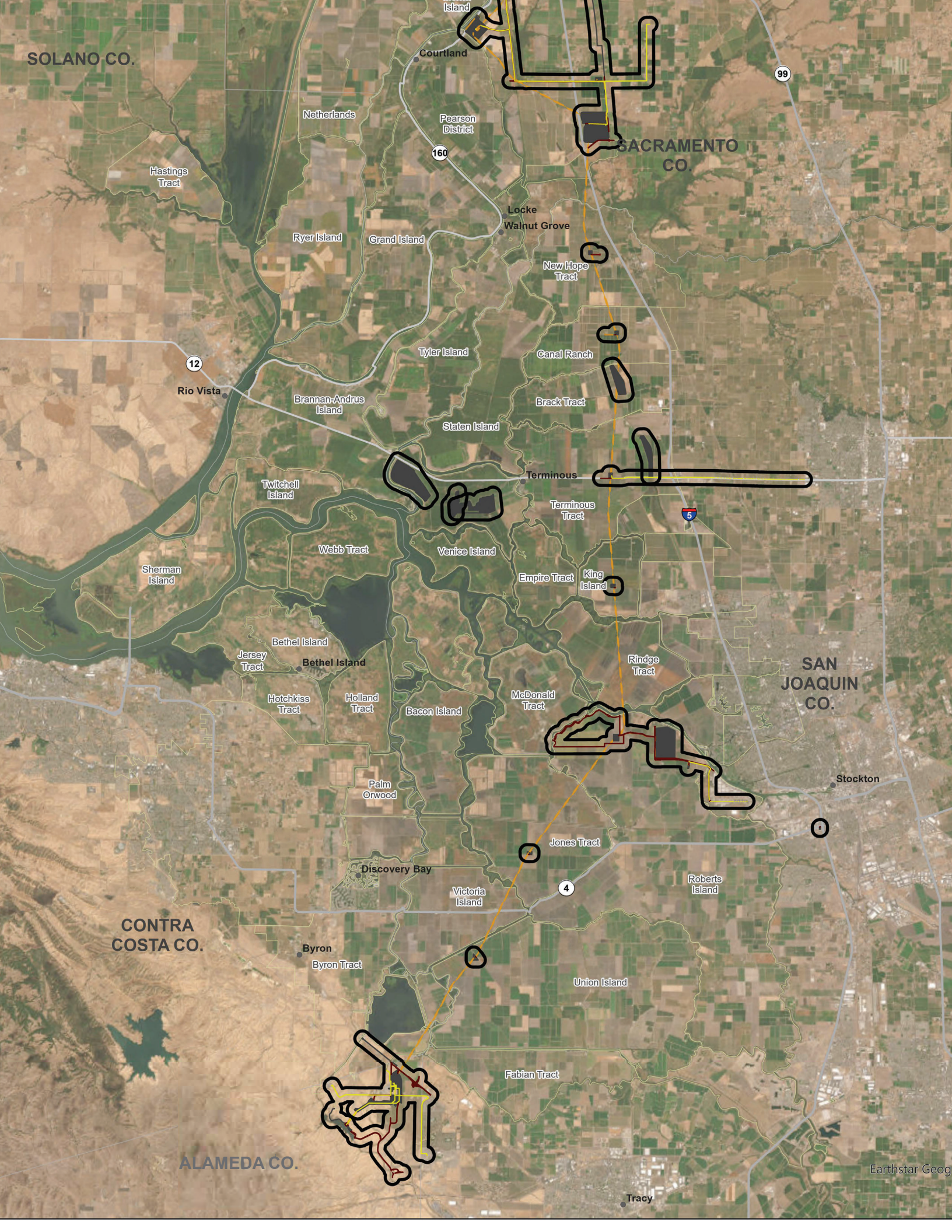
- Buena Vista Rancheria of Me-Wuk Indians
- California Valley Miwok Tribe
- Kletsel Dehe Band of Wintun Indians
- Guidiville Rancheria of California
- Ione Band of Miwok Indians of California
- Jackson Band of MiWuk Indians
- Shingle Springs Band of Miwok Indians
- United Auburn Indian Community of the Auburn Rancheria
- Wilton Rancheria
- Yocha Dehe Wintun Nation

### Other Parties Consulted

- Contra Costa County Water Agency
- Delta Protection Commission
- Locke Management Association
- North Delta CARES
- Sacramento County Department of Community Development
- San Joaquin County
- Yolo County

## **Appendix 2: Delta Conveyance Project Area of Potential Effect**





SOLANO CO.

SACRAMENTO CO.

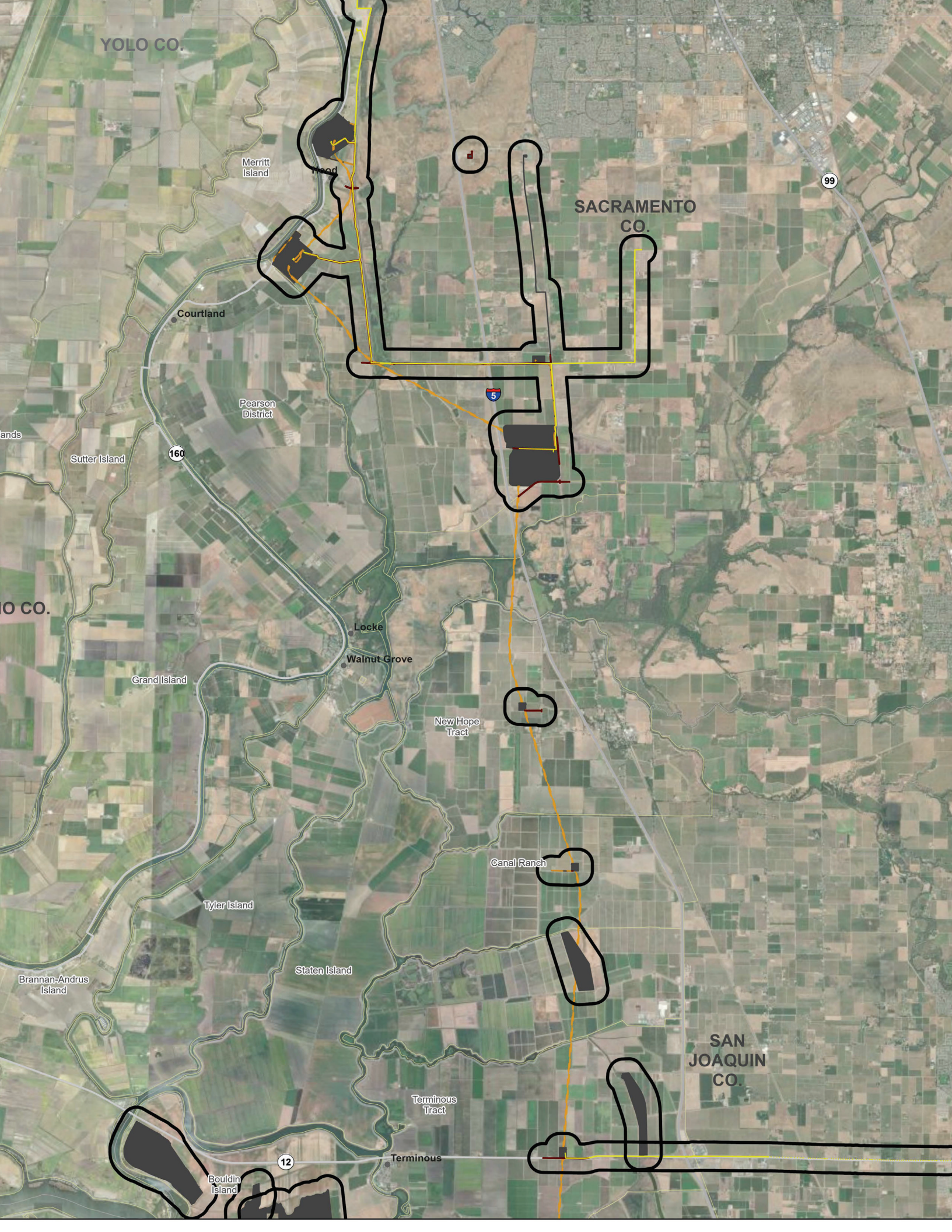
SAN JOAQUIN CO.

CONTRA COSTA CO.

ALAMEDA CO.

Earthstar Geog





YOLO CO.

Merritt Island

Courtland

Pearson District

SACRAMENTO CO.

99

Sutter Island

160

CO.

Grand Island

Locke

Walnut Grove

New Hope Tract

Canal Ranch

Tyler Island

Brannan-Andrus Island

Staten Island

Terminous Tract

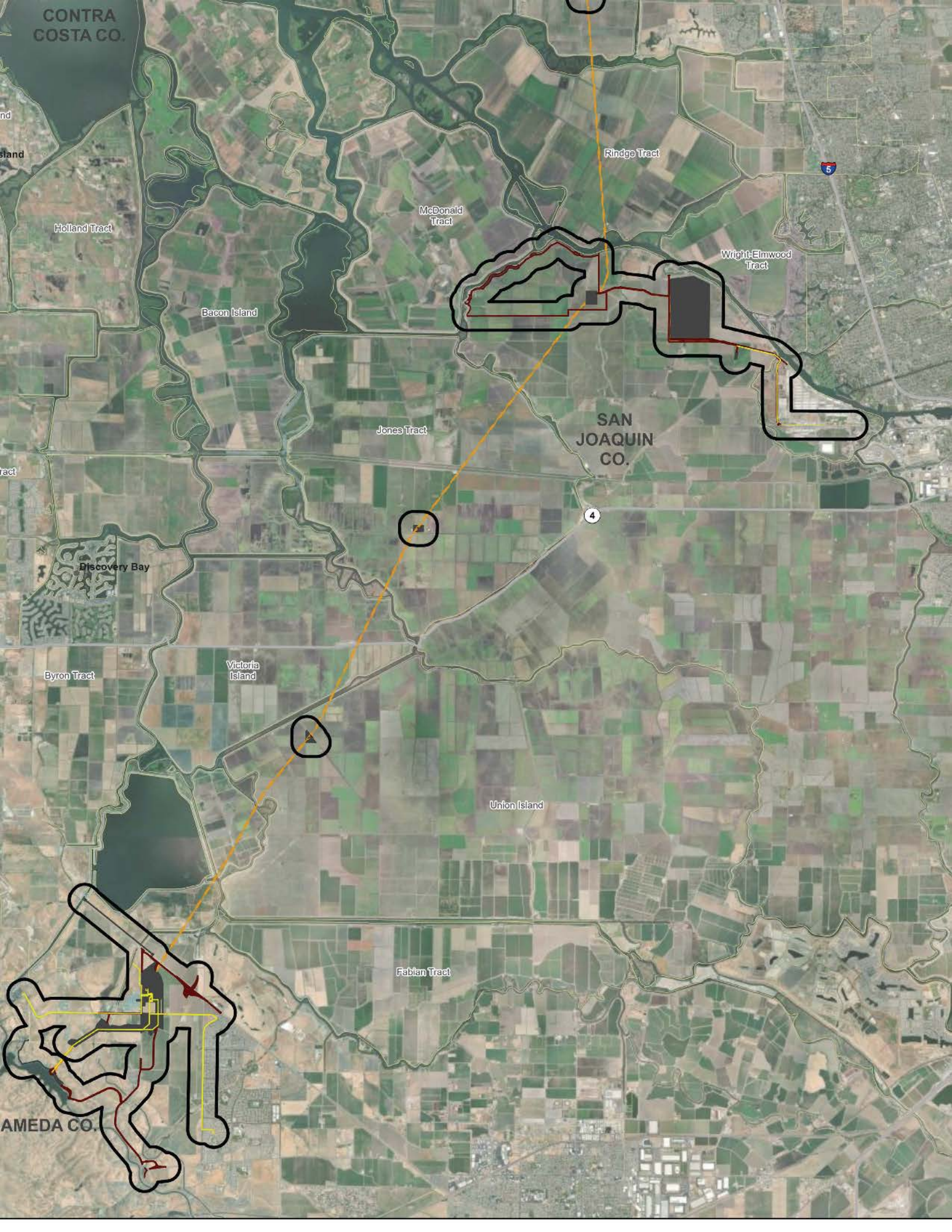
SAN JOAQUIN CO.

12

Bouldin Island

Terminus





CONTRA  
COSTA CO.

nd  
island

Holland Tract

Bacon Island

McDonald  
Tract

Rindge Tract

Wright-Elmwood  
Tract

5

Jones Tract

SAN  
JOAQUIN  
CO.

4

Discovery Bay

Byron Tract

Victoria  
Island

Union Island

Fabian Tract

AMEDA CO.