Yolo Bypass Salmonid Habitat Restoration & Fish Passage

Environmental Impact Statement
Environmental Impact Report

Draft

December 2017

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

DEPARTMENT OF WATER RESOURCES
STATE OF CALIFORNIA

Yolo Bypass Salmonid Habitat Restoration and Fish Passage

Draft Environmental Impact Statement/Environmental Impact Report

December 2017

U.S. Department of the Interior
Bureau of Reclamation

California Department of Water Resources

Mission Statements

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

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

Yolo Bypass Salmonid Habitat Restoration and Fish Passage Project
Draft Environmental Impact Statement/Environmental Impact Report

Lead Agencies: U.S. Department of the Interior, Bureau of Reclamation (Reclamation) and the California Department of Water Resources (DWR)

State Clearinghouse # 2013032004

ABSTRACT

Reclamation and DWR have made available for public review and comment the Yolo Bypass Salmonid Habitat Restoration and Fish Passage Project (Project) Draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR). The Draft EIS/EIR addresses methods to improve fish passage and increase floodplain fisheries rearing habitat in the Yolo Bypass to benefit Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley steelhead, and Southern Distinct Population Segment green sturgeon. The Project actions would implement Reasonable and Prudent Alternative actions I.6.1 and I.7, as described in the 2009 National Oceanic and Atmospheric Administration National Marine Fisheries Service Biological Opinion and Conference Opinion on the Long-Term Operations of the Central Valley Project and State Water Project and the 2012 Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan.

This Draft EIS/EIR has been prepared according to requirements of the National Environmental Policy Act and the California Environmental Quality Act. Direct, indirect, and cumulative impacts resulting from the project alternatives on the environment of the region are addressed.

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Executive Summary

The Yolo Bypass Salmonid Habitat Restoration and Fish Passage Project (Project) has been developed to improve fish passage and increase floodplain fisheries rearing habitat in the Yolo Bypass and the lower Sacramento River basin. The United States Department of the Interior, Bureau of Reclamation (Reclamation), as the Federal lead agency under the National Environmental Policy Act (NEPA), and the California Department of Water Resources (DWR), as the State of California (State) lead agency under the California Environmental Quality Act (CEQA), have prepared this joint Draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR) to assess impacts of the Project. The Project actions would implement Reasonable and Prudent Alternative (RPA) action I.6.1 and, in part, RPA action I.7, as described in the 2009 National Oceanic and Atmospheric Administration National Marine Fisheries Service (NMFS) *Biological Opinion and Conference Opinion on the Long-Term Operations of the Central Valley Project and State Water Project* (NMFS BO) and the 2012 Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan (Reclamation and DWR 2012).

Authority for combined Federal and State documents is provided in Title 40, Code of Federal Regulations (CFR), Sections 1502.25, 1506.2, and 1506.4 (Council on Environmental Quality's Regulations for Implementing NEPA [CEQ Regulations]) and California Code of Regulations Title 14, Division 6, Chapter 3 (State CEQA Guidelines), Section 15222 (Preparation of Joint Documents). This document also was prepared consistent with United States Department of the Interior regulations specified in 43 CFR, Part 46 (United States Department of the Interior Implementation of NEPA, Final Rule).

This Draft EIS/EIR evaluates reasonably foreseeable potential direct, indirect, and cumulative impacts on the environment that could result from implementing the Project alternatives. In addition, this Draft EIS/EIR includes feasible mitigation measures to avoid, minimize, rectify, reduce, or compensate for adverse impacts.

ES.1 Background

Substantial modifications have been made to the historical floodplain of California's Central Valley for water supply and flood control purposes. These activities, and other environmental stressors, have resulted in losses of rearing habitat, migration corridors, and food web production for fish, adversely affecting native fish species that rely on floodplain habitat during part or all of their life history.

DWR is responsible for operating and maintaining the State Water Project (SWP), and Reclamation is responsible for managing the Central Valley Project (CVP). The SWP and CVP are operated in a coordinated manner to deliver water to agricultural, municipal, and industrial contractors throughout California. On June 4, 2009, the NMFS BO concluded that, if left unchanged, CVP and SWP operations are likely to jeopardize the continued existence of four anadromous fish species listed under the Federal Endangered Species Act (ESA): Sacramento

River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley steelhead, and the Southern Distinct Population Segment (DPS) of North American green sturgeon. In addition, the NMFS BO concluded that operations were likely to destroy or adversely modify designated critical habitat for the four anadromous fish species. The NMFS BO sets forth RPA actions that would allow CVP and SWP operations to remain in compliance with the ESA.

The NMFS BO identified activities in RPA actions I.7 and I.6.1 to improve fish passage and habitat restoration actions in the lower Sacramento River basin, including the Yolo Bypass. The Yolo Bypass, which currently experiences at least some flooding in approximately 70 percent of years (Nurmi 2017), retains many characteristics of the historical floodplain habitat that are favorable to various fish species. Implementation of the RPA actions would enhance existing floodplain benefits in the lower Sacramento River basin and improve fish passage in the Yolo Bypass. The primary function of the Yolo Bypass is flood control, with much of it also managed as agricultural land or wetland waterfowl habitat. Major California restoration planning efforts (e.g., CALFED Bay-Delta Program, the Bay Delta Conservation Plan, and California EcoRestore) have identified the Yolo Bypass, as well as other areas, as a prime area of the Sacramento Valley for enhancement of seasonal floodplain fisheries rearing habitat.

The two RPA actions that formed the basis for alternatives considered for analysis in this EIS/EIR are summarized below:

- RPA Action I.6.1: Restore floodplain rearing habitat for juvenile Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley steelhead through increased acreage of seasonal floodplain inundation within the lower Sacramento River basin
- RPA Action I.7: Reduce migratory delays and loss of salmon, steelhead, and sturgeon at Fremont Weir and other structures in the Yolo Bypass (NMFS 2009)

In addition to the species included in the NMFS BO, two other species listed under the California Endangered Species Act (CESA) as fisheries Species of Special Concern may benefit from increased floodplain rearing habitat: Sacramento splittail and Sacramento River fall-run Chinook salmon.

ES.2 Purpose and Uses of this EIS/EIR

The purpose of this Draft EIS/EIR is to disclose the reasonably foreseeable potential direct, indirect, and cumulative impacts of implementing any of the Project alternatives, pursuant to RPA Actions I.6.1 and I.7, consistent with NEPA and CEQA requirements. This Draft EIS/EIR serves as an informational document for decision makers, public agencies, non-governmental organizations, and the public.

Reclamation is the lead NEPA agency, and DWR is the lead CEQA agency for this EIS/EIR. As Lead Agencies, Reclamation and DWR will be responsible for completing the Draft and Final EIS/EIR documents, selecting a preferred alternative, approving an alternative, completing the Record of Decision (Reclamation) and Notice of Determination (DWR), implementing the project as ultimately approved, and ensuring all mitigation measures incorporated into the Environmental Commitment Plan/Mitigation and Monitoring and Reporting Plan for the Project

have been completed. The Lead Agencies will also be responsible for obtaining all required approvals and permits necessary to implement the Project.

As discussed in Chapter 23.6, DWR has identified Alternative 1 as the preferred alternative for CEQA purposes. DWR's identification of a preferred alternative does not foreclose any alternatives or mitigation measures, however, and any alternative could be selected by the lead agencies following the conclusion of environmental review. Reclamation has not identified a preferred alternative in this Draft EIS/EIR for NEPA purposes. Consistent with CEQ Regulations 40 CFR Part 46.425, the Final EIS/EIR will identify a NEPA preferred alternative for implementation (or alternatives if more than one exists).

ES.3 Scoping and Public Involvement Process

The Lead Agencies conducted public and stakeholder outreach activities to engage and inform all interested parties of Project activities. Reclamation initiated the NEPA process by issuing a Notice of Intent on March 4, 2013, to prepare an EIS and hold public scoping meetings. DWR initiated the CEQA process by issuing a Notice of Preparation (State Clearinghouse # 2013032004) on the same date to prepare an EIR and hold public scoping meetings. Reclamation and DWR accepted scoping comments throughout the public scoping period of March 4 through May 6, 2013.

The Lead Agencies held public scoping meetings on March 14, 2013, in the cities of West Sacramento and Woodland, California. During the scoping meetings and throughout the public scoping comment period, Reclamation and DWR accepted comments to help determine the range of alternatives, the environmental effects, and the mitigation measures to be considered in this EIS/EIR. Comments and suggestions regarding alternatives were documented in the Public Scoping Report published in July 2013 (Reclamation and DWR 2013).

Public involvement and outreach activities have continued since 2013 and enabled the Lead Agencies to successfully involve stakeholders and incorporate public and stakeholder input into the development of this Draft EIS/EIR. These activities have sought to create an open and transparent process through which the public, stakeholders, and other interested parties can track and participate in Project activities, including the formulation of alternatives for this Draft EIS/EIR.

ES.4 Purpose and Need and Project Objectives

The planning objectives are described in the purpose and need statements (under NEPA) and objectives (under CEQA), which describe the underlying need for and purpose of a project. The purpose statement is a critical part of the environmental review process because it helps to set the overall direction of an EIS/EIR, identify the range of reasonable alternatives, and focus the scope of analysis.

ES.4.1 Purpose and Need

The need for action is decreased habitat quality in the Sacramento River and an inadequate ability to access higher quality habitat, which has led to a decline in abundance, spatial distribution, and life history diversity associated with native ESA- and CESA-listed fish species. The purpose of the action is to enhance floodplain rearing habitat and fish passage in the Yolo Bypass and/or other suitable areas of the lower Sacramento River by implementing RPA action I.6.1 and, in part, RPA action I.7, as described in the NMFS BO, to benefit Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley steelhead, and the Southern DPS of North American green sturgeon.

ES.4.2 Project Objectives

The objective of RPA action I.6.1 is to increase the availability of floodplain fisheries rearing habitat for juvenile Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley steelhead. This action can also improve conditions for Sacramento splittail and Central Valley fall-run Chinook salmon. Specific biological objectives include:

- Improve access to seasonal habitat through volitional entry
- Increase access to and acreage of seasonal floodplain fisheries rearing habitat
- Reduce stranding and presence of migration barriers
- Increase aquatic primary and secondary biotic production to provide food through an ecosystem approach

The objective of RPA action I.7 is to reduce migratory delays and loss of fish at Fremont Weir and other structures in the Yolo Bypass. Specific biological objectives include:

- Improve connectivity within the Yolo Bypass for passage of salmonids and green sturgeon
- Improve connectivity between the Sacramento River and the Yolo Bypass to provide safe and timely passage for:
  - Adult Sacramento River winter-run Chinook salmon between mid-November and May when water surface elevations in the Sacramento River are amenable to fish passage
  - Adult Central Valley spring-run Chinook salmon between January and May when elevations in the Sacramento River are amenable to fish passage
  - Adult California Central Valley steelhead in the event their presence overlaps with the defined seasonal window for other target species when elevations in the Sacramento River are amenable to fish passage
  - Adult Southern DPS green sturgeon between February and May when elevations in the Sacramento River are amenable to fish passage

ES.5 Project Area

The Project area includes the lower Sacramento River basin, including the Yolo Bypass, in Sacramento, Solano, Sutter, and Yolo counties, California. Figure ES-1 shows the neighboring local jurisdictions, including the cities of Davis, Sacramento, West Sacramento, and Woodland. Major water bodies and infrastructure located within the Project area include the Sacramento River; Fremont, Sacramento, and Lisbon weirs; Knights Landing Ridge Cut and Wallace Weir; Cache and Putah creeks; Willow Slough Bypass; Tule Canal; and the Toe Drain. Project actions are primarily located along Fremont Weir and within the Fremont Weir Wildlife Area south to Agricultural Road Crossing 1. Some alternatives include additional actions farther south within the Yolo Bypass.

The Yolo Bypass is part of the Sacramento River Flood Control Project, which includes levees, weirs, and bypass facilities that help manage the historic flooding in the Sacramento Valley (DWR 2010). The Yolo Bypass is about a 59,000-acre area that can convey a design flow of 343,000 cfs, which is about 80 percent of the floodwaters in this area (DWR 2010). Existing facilities in the Yolo Bypass area include:

- Fremont Weir – Fremont Weir, a State Plan of Flood Control facility, diverts Sacramento River flood flows around the City of Sacramento—within the Yolo Bypass—at times of high flood stage. This type of event is commonly referred to as an overtopping event. Flood waters overtop into the Yolo Bypass once the Sacramento River stage exceeds 32 feet North American Vertical Datum 1988 (NAVD 88), the weir crest elevation of Fremont Weir. All elevations herein will be NAVD 88 unless specified.
- Sacramento Weir – Sacramento Weir, a State Plan of Flood Control facility, is located along the right bank of the Sacramento River, approximately two miles upstream from the mouth of the American River. Its purpose is to divert additional Sacramento River flow into the Yolo Bypass to protect the City of Sacramento from excessive flood stages in the Sacramento River channel downstream of the American River.
- Tule Pond – Tule Pond is an approximately 15-acre perennial pond in the Yolo Bypass located about 13 miles north of Interstate (I) 80. Likely, the pond is sustained by multiple sources, including impounded floodwater, leakage from an agricultural canal at its southern end, and groundwater.
- Agricultural Road Crossing 1 – Agricultural Road Crossing 1, which is the northernmost agricultural road crossing in Tule Canal at the southeastern corner of the Fremont Weir Wildlife Area, serves as a vehicular crossing and a water delivery feature.
- Tule Canal – Tule Canal is a channel along the east side of the Yolo Bypass, which begins at Agricultural Road Crossing 1. Tule Canal receives water from westside tributaries and agricultural diversions almost year-round. Tule Canal also drains the initial flows from the Sacramento River when the river rises above the crest of Fremont Weir.
- Toe Drain – Tule Canal becomes the Toe Drain south of the I-80 Yolo Causeway. The perennially wetted Toe Drain extends south approximately 20 miles and becomes increasingly tidal as it connects with Cache Slough.

- Lisbon Weir – Lisbon Weir is the southernmost water-control structure that crosses the Toe Drain. Lisbon Weir provides higher and more stable water levels to water users north of the weir.
- Wallace Weir Fish Rescue Facility – Wallace Weir Fish Rescue Facility is a structure that is being constructed by the DWR (construction began in August 2016) to prevent fish from straying into the Colusa Basin Drain via the Knights Landing Ridge Cut. The Wallace Weir Fish Rescue Facility will also be used to divert water for agricultural purposes as the original Wallace Weir.
- I-5 and I-80 – I-5 and I-80 both have bridges that span the width of the Yolo Bypass.

ES.5.1 Project Facilities

The Project would primarily consist of an intake channel, headworks structure, a transport channel, and downstream channel improvements. Under different alternatives, each of these facilities may be constructed in a different location as part of one of three different channel alignments (east, center, and west) in the Yolo Bypass. Each alignment would terminate downstream into the existing Tule Pond.

The primary function of each main facility is summarized below:

- Intake Channel: The intake channel would connect the Sacramento River to the proposed headworks structure at the appropriate elevation to facilitate an upstream fish passage facility for adult fish and for passing rearing habitat flows and juvenile salmonids.
- Headworks: The headworks structure would bisect the existing Fremont Weir at one of three locations (east, center, or west) and would control the diversion of Project flow from the Sacramento River into the Yolo Bypass. It would also serve as the primary upstream fish passage facility for adult fish and the primary facility for passing rearing habitat flows and juvenile salmonids into the Yolo Bypass. The components of the headworks would include a concrete control structure, an upstream vehicular bridge crossing, and a concrete channel transition, which transitions the rectangular sides of the control structure to the side channel slopes of the transport channel.
- Transport Channel: The transport channel would serve as the primary facility for upstream adult fish passage between the existing Tule Pond and the headworks structure. It would also serve as the primary channel for conveying juvenile salmonids and rearing habitat flows from the headworks structure to the existing Tule Pond.
- Downstream Channel Improvements: Improvements would be made to the existing channel that extends from the Tule Pond outlet to the beginning of Tule Canal. The improvements would be made to facilitate upstream adult fish passage between the existing Tule Canal and Tule Pond.

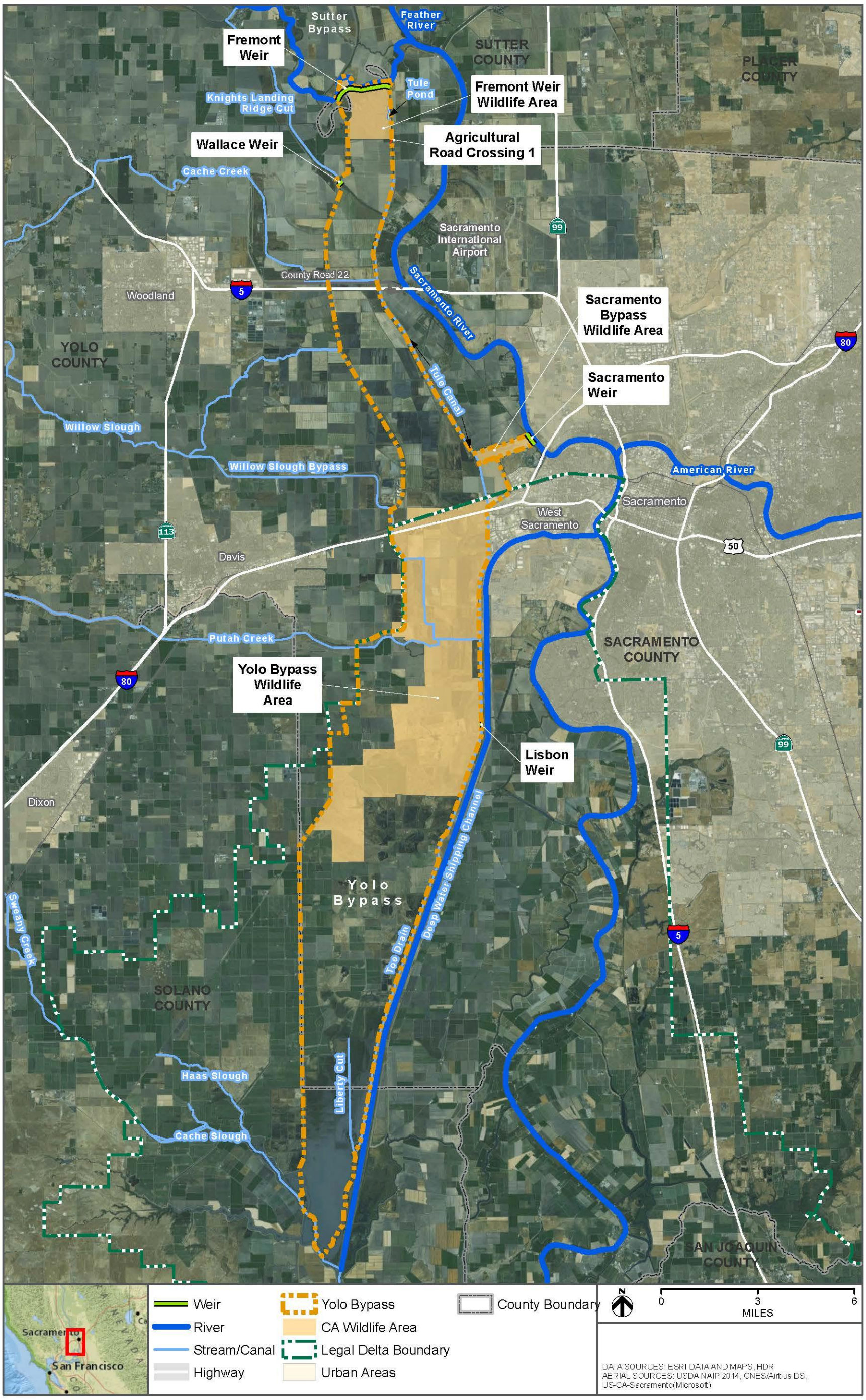

Figure ES-1. Project area

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ES.6 Alternatives Evaluated in this EIS/EIR

This EIS/EIR presents a No Action/No Project Alternative (hereafter called the No Action Alternative) and six action alternatives to implement the Project:

- No Action Alternative
- Alternative 1 – East Side Gated Notch
- Alternative 2 – Central Gated Notch
- Alternative 3 – West Side Gated Notch
- Alternative 4 – West Side Gated Notch – Managed Flow
- Alternative 5 – Central Multiple Gated Notches
- Alternative 6 – West Side Large Gated Notch

Table ES-1 summarizes key elements of each alternative.

Table ES-1. Summary of Alternatives

Components	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
Maximum design flow (cubic feet per second [cfs])	6,000	6,000	6,000	3,000	3,400	12,000
Gated notch and channel location	East	Central	West	West	Central (Multiple)	West
Supplemental fish passage	West	West	East	East	West	East
Downstream channel improvements	X	X	X	X		X
Agricultural road crossing 1	X	X	X	X	X	X
Tule Canal water control structures				X		
Tule Canal floodplain improvements (program-level)					X	
Closure date for inundation flows	March 15	March 15	March 15	March 15 or March 7	March 15	March 15

ES.6.1 No Action Alternative

NEPA and CEQA require the evaluation of an alternative that presents the reasonably foreseeable future conditions in the absence of the project. This alternative is called the No Action Alternative under NEPA and the No Project Alternative under CEQA. The No Action or No Project Alternative allows decision makers to compare the impacts of approving the project to the impacts of not approving the project. This alternative is referred to in the remainder of the

document as the "No Action Alternative." Under NEPA, the No Action Alternative also serves as the baseline to which action alternatives are compared to determine potential impacts. This differs from CEQA wherein existing conditions serve as the baseline to determine potential impacts of the alternatives. The No Action Alternative may differ from the existing conditions if other actions that could occur in the Project area in the future do not rely on approval or implementation of the project. The No Action Alternative and the existing conditions will be used as the environmental baseline for identifying project effects.

Under the No Action Alternative, the Yolo Bypass would continue to be inundated from the westside tributaries and overtopping events at Fremont and Sacramento weirs. Juvenile fish would enter the bypass with overtopping flood flows from Fremont and Sacramento weirs, and the fish would benefit from the rearing opportunities in the Yolo Bypass. Additional flow and fish would not pass through Fremont Weir when the Sacramento River elevation is below Fremont Weir or Sacramento Weir.

Adult fish may move upstream in Tule Canal in response to tidal influence in Cache Slough, flows over Fremont Weir, or when the westside tributaries attract fish. As under existing conditions, fish would either move downstream and migrate back into the Sacramento River, pass over Fremont Weir, pass through the existing fish passage structure at Fremont Weir, become stranded at Fremont Weir, or move to the Wallace Weir Fish Rescue Facility.

ES.6.2 Components Common to Multiple Action Alternatives

This section describes components included in multiple action alternatives.

ES.6.2.1 Agricultural Road Crossing 1

Agricultural Road Crossing 1 improvements would include removal of the existing berms in the Tule Canal that provide a fish passage barrier and construction of an inverted siphon to maintain access and water deliveries to the agricultural pumps on the landside of the east levee. The road crossing would be replaced with a bridge that would be 18 feet wide and 80 feet long. It would include concrete abutments on either side to span Tule Canal. Agricultural Road Crossing 1 improvements are included in all action alternatives.

ES.6.2.2 Downstream Channel Improvements

Under Alternatives 1 through 4 and 6, improvements would be made to the existing channel that extends from the Tule Pond outlet to the beginning of Tule Canal at Agricultural Road Crossing 1. The improvements would facilitate upstream adult fish passage between the existing Tule Canal and Tule Pond. The improvements would also include a cutoff wall in this area, in the east Yolo Bypass Levee, for levee stability.

ES.6.3 Alternative 1: East Side Gated Notch

Alternative 1, East Side Gated Notch, would allow increased flow from the Sacramento River to enter the Yolo Bypass through a gated notch on the east side of Fremont Weir. The gated notch would create an opening in Fremont Weir, that is deeper than Fremont Weir, with gates to control water going through the facility into the Yolo Bypass. The invert of the new notch would be at an elevation of 14 feet, which is approximately 18 feet below the existing Fremont Weir

crest. Water would be able to flow through the notch from November 1 through March 15 when the river elevations are not high enough to go over the crest of Fremont Weir (at an elevation of 32 feet).

Alternative 1 would connect the new gated notch to Tule Pond with a channel that parallels the existing east levee of the Yolo Bypass. Alternative 1 would have the shortest and most direct access to the Tule Canal for migrating fish. Alternative 1 would allow flows up to 6,000 cfs, depending on Sacramento River elevation, through the gated notch to provide open channel flow for adult fish passage, juvenile emigration, and floodplain inundation. This alternative would include a supplemental fish passage facility on the west side of Fremont Weir and improvements to allow fish to pass through Agricultural Road Crossing 1 and the channel north of Agricultural Road Crossing 1. Figure ES-2 shows key components of the alternative.

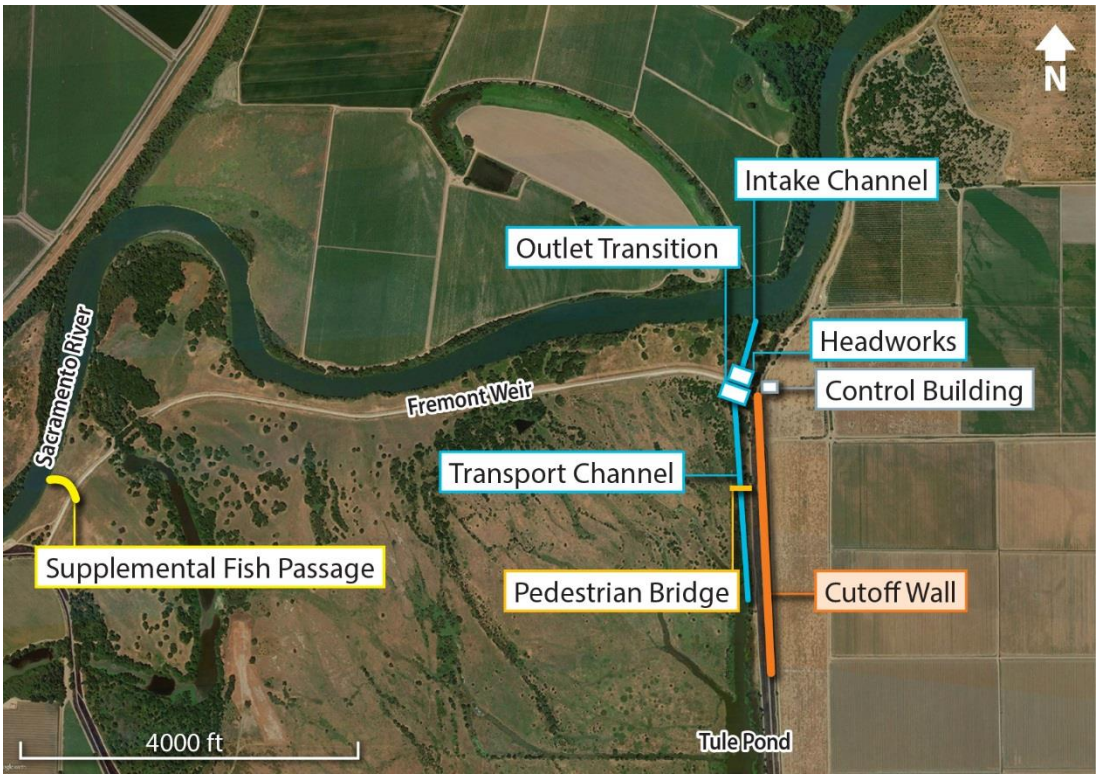

Figure ES-2. Alternative 1 Key Components

ES.6.4 Alternative 2: Central Gated Notch

Alternative 2, Central Gated Notch, would provide a new gated notch through Fremont Weir similar to the notch described for Alternative 1. The primary difference between Alternatives 1 and 2 is the location of the notch; Alternative 2 would site the notch near the center of Fremont Weir. This gated notch would be similar in size to Alternative 1 but would have an invert elevation that is higher (14.8 feet) because the river is higher at this upstream location. This location is on an outside bend of the river. Studies have indicated that juvenile fish may be found in greater numbers on the outside edge of river bends (DWR 2017). Because the bottom of the new gated notch would be at an elevation of 14.8 feet, it would allow flow to pass into the Yolo

Bypass from November 1 through March 15 when the river elevations are not high enough to go over the crest of Fremont Weir (at an elevation of 32 feet).

Alternative 2 would include facilities to connect the gated notch to the existing Tule Pond. Alternative 2 would allow flows up to 6,000 cfs, depending on Sacramento River elevation, through the gated notch to provide open channel flow for adult fish passage, juvenile emigration, and floodplain inundation. This alternative would also include a supplemental fish passage facility on the western end of Fremont Weir and improvements to allow fish to pass through Agricultural Road Crossing 1 and the channel north of Agricultural Road Crossing 1. Figure ES-3 shows the key components of this alternative.

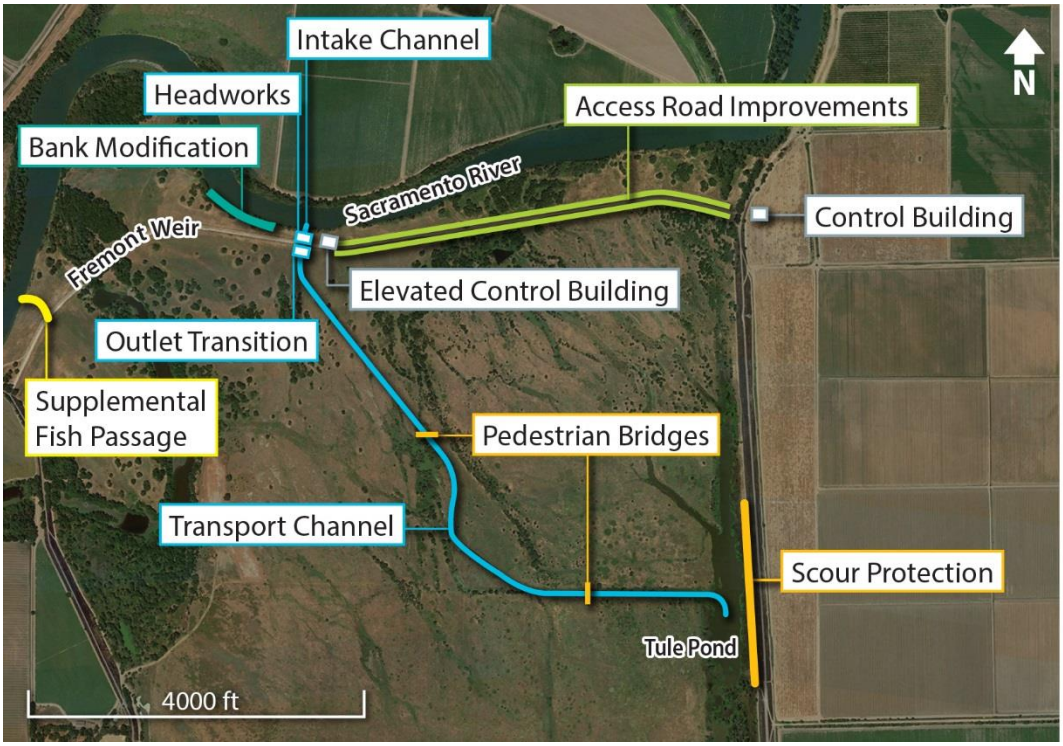

Figure ES-3. Alternative 2 Key Components

ES.6.5 Alternative 3: West Side Gated Notch

Alternative 3, West Side Gated Notch, would provide a new gated notch through Fremont Weir similar to the notch described for Alternative 1. The primary difference between Alternatives 1 and 3 is the location of the notch; Alternative 3 would site the notch on the western side of Fremont Weir. This gated notch would be similar in size to Alternative 1 but would have an invert elevation that is higher (16.1 feet) because the river is higher at this location. The western location is on the outside of a river bend, similar to Alternative 2, but would be easier to access for operations and maintenance than a central location. The new gated notch would allow flow to pass into the Yolo Bypass from November 1 through March 15 when the river elevations are not high enough to go over the crest of Fremont Weir (at an elevation of 32 feet).

Alternative 3 would include facilities to connect the gated notch to the existing Tule Pond. Alternative 3 would allow small flows up to 6,000 cfs, depending on Sacramento River stage, through the gated notch to provide open channel flow for adult fish passage. juvenile emigration, and floodplain inundation. This alternative would also include a supplemental fish passage facility on the eastern side of Fremont Weir and improvements to allow fish to pass through Agricultural Road Crossing 1 and the channel north of Agricultural Road Crossing 1. Figure ES-4 shows the key components of Alternative 3.

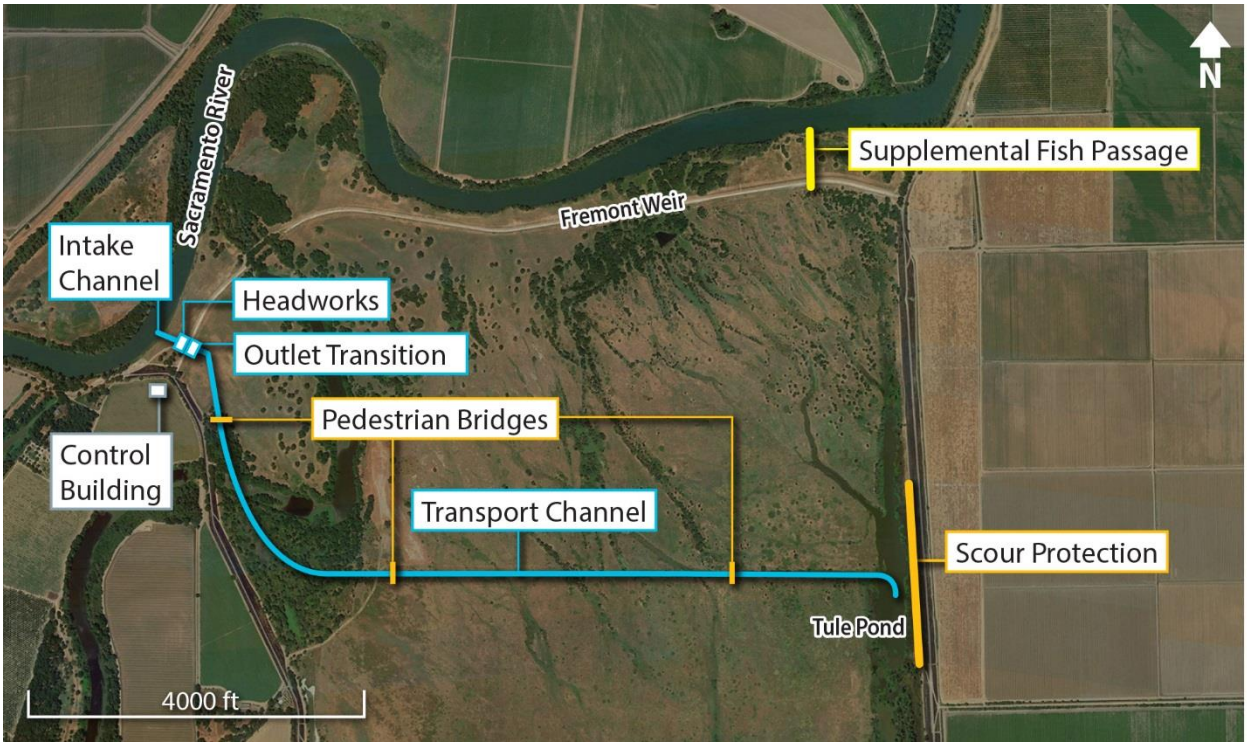

Figure ES-4. Alternative 3 Key Components

ES.6.6 Alternative 4: West Side Gated Notch – Managed Flow

Alternative 4, West Side Gated Notch – Managed Flow, would have a smaller amount of flow entering the Yolo Bypass through the gated notch in Fremont Weir than the other alternatives, but it would incorporate water control structures to maintain inundation in defined areas for longer periods of time within the northern Yolo Bypass. Alternative 4 would include the same gated notch and associated facilities as described for Alternative 3. However, it would be operated to limit the inflow from exceeding 3,000 cfs from November 1 through March 7 or March 15.

Alternative 4 includes two water control structures on Tule Canal to extend periods of inundation locally. A bypass channel would be constructed around each water control structure to provide adult fish passage. The alternative would also provide means for fish passage on the eastern side of Fremont Weir through a supplemental fish passage facility. In addition, improvements to Agricultural Road Crossing 1 and the downstream channel would be implemented under this alternative. Figure ES-5 shows the key components of Alternative 4.

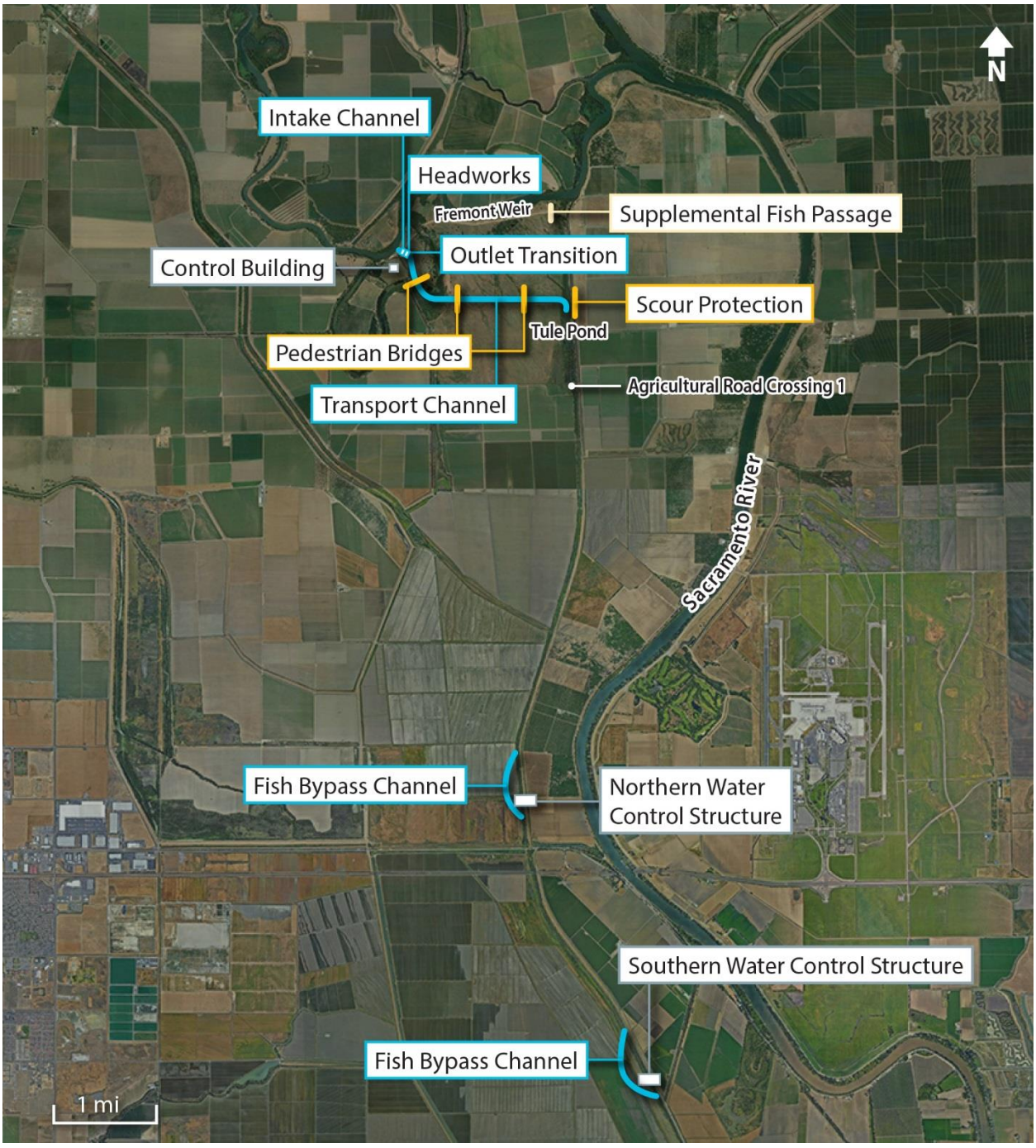

Figure ES-5. Alternative 4 Key Components

ES.6.7 Alternative 5: Central Multiple Gated Notches

Through the strategy of using multiple gates and intake channels at Fremont Weir, Alternative 5, Central Multiple Gated Notches, has the goal of increasing the number of outmigrating juvenile fish that enter the Yolo Bypass. Trapezoidal channels create some limitations for fish passage because they have smaller flows at lower river elevations (because the channel is smaller at this elevation) when winter-run Chinook salmon are outmigrating. Alternative 5 includes multiple gates so that the deeper gate could allow more flow to enter the bypass when the river is at lower elevations. Flows would move to other gates when the river is higher to control inflows while maintaining fish passage conditions.

Alternative 5 incorporates multiple gated notches in the central location on the existing Fremont Weir that would allow combined flows up to 3,400 cfs from November 1 through March 15. The invert elevations at the different sets of gates would be 14, 17, 20, and 23 feet. As the river rises, the deeper gate would close and the next gate would open. This alternative would include a supplemental fish passage facility and improvements to allow fish to pass through Agricultural Road Crossing 1. Alternative 5 also includes floodplain improvements in Tule Canal (analyzed at a program level) that would develop secondary channels and increase inundation area just north of I-80. Figure ES-6 shows the key components of this alternative.

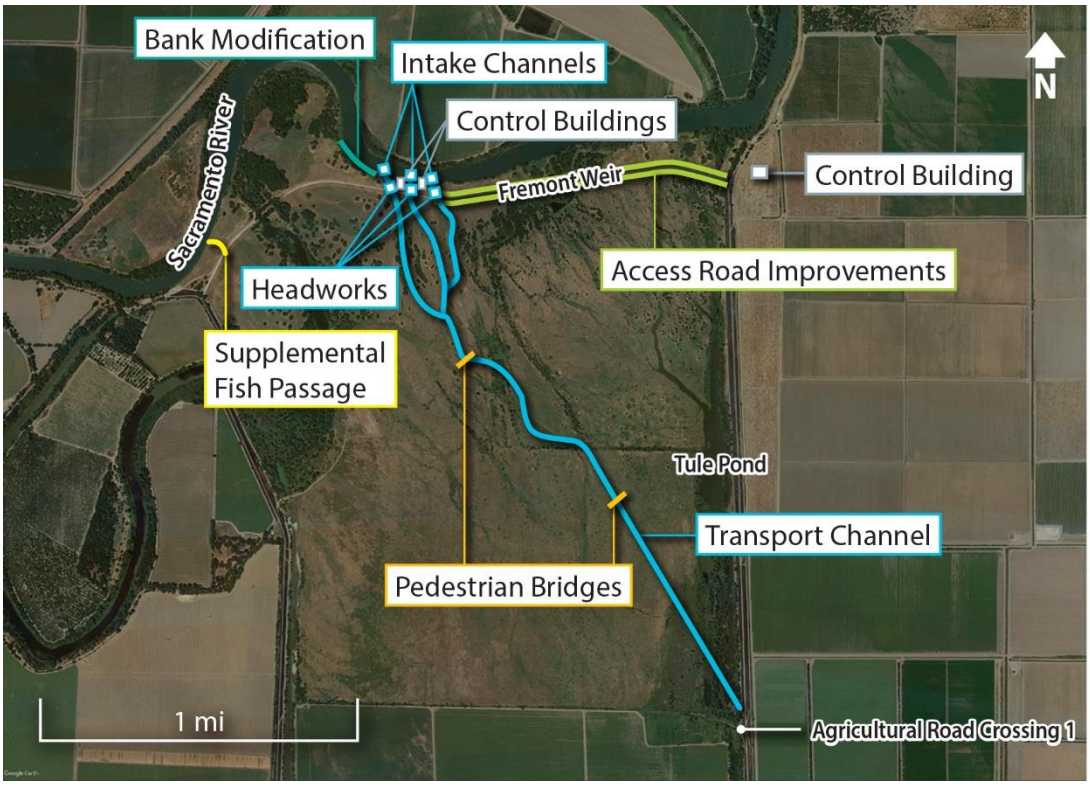

Figure ES-6. Alternative 5 Key Components

ES.6.8 Alternative 6: West Side Large Gated Notch

Alternative 6, West Side Large Gated Notch, is a large notch in the western location that would allow flows up to 12,000 cfs to enter the Yolo Bypass from November 1 through March 15. It was designed with the goal of entraining more fish while allowing more flow into the bypass and capture more fish when the Sacramento River is at lower elevations. Typically, winter-run Chinook salmon move downstream during the first high flow event of the season. This flow event is sometimes not high enough to result in what would be considered substantial flows into the bypass under Alternatives 1 through 5. The gated notch could allow more flow to enter during winter-run Chinook salmon outmigration, potentially maximizing fish entrainment. The gated notch would be at the same invert as Alternatives 4 and 5 (16.1 feet) but would be wider. This alternative would include a supplemental fish passage facility on the eastern side of Fremont Weir and improvements to allow fish passage through Agricultural Road Crossing 1 and the channel north of Agricultural Road Crossing 1. The alignment is the same as shown for Alternative 3 in Figure ES-4. Figure ES-7 shows the key components of Alternative 6.

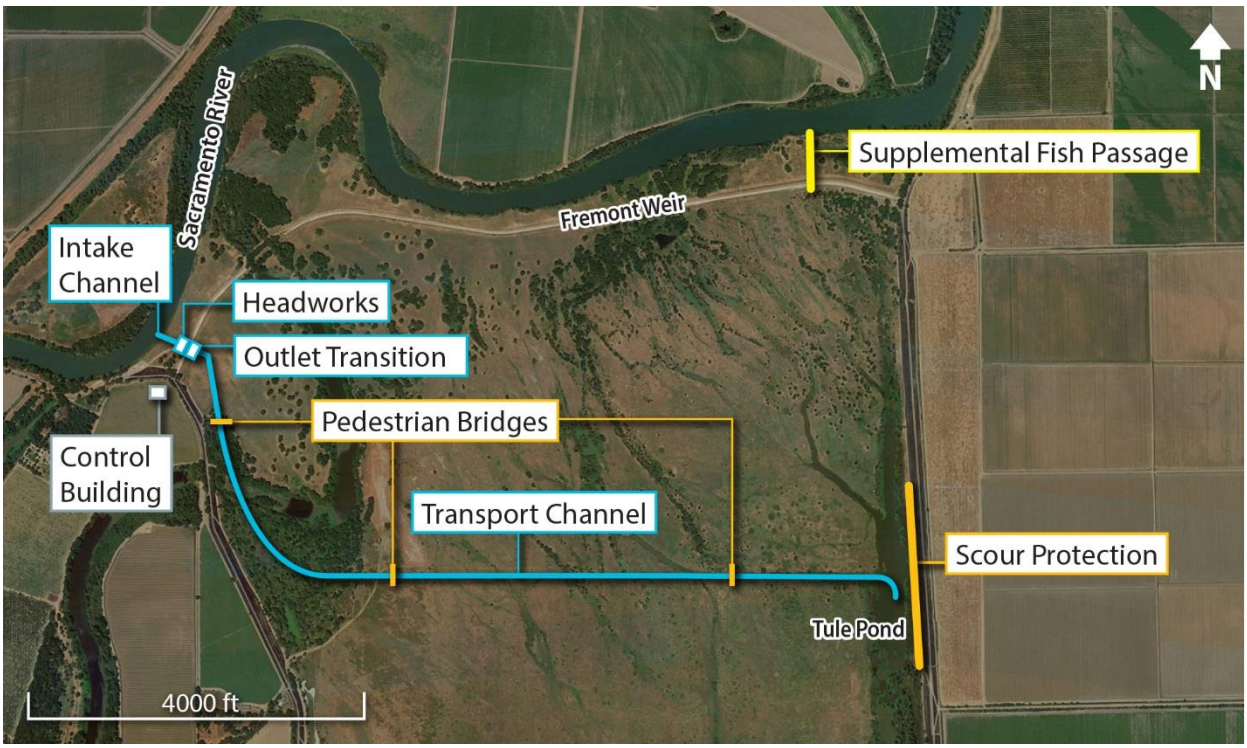

Figure ES-7. Alternative 6 Key Components

ES.7 Issues of Known Controversy

Key issues raised during and throughout the public scoping process that warrant inclusion in the EIS/EIR are listed below.

- **Fish**.
  - The Project could affect how many fish enter the Yolo Bypass. The EIS/EIR should establish a target of how many additional fish to include in the Yolo Bypass and analyze how well each alternative meets that target. The analysis should estimate fish passage performance and juvenile entrainment performance.
  - There are concerns regarding increased inundation periods and how shallow water habitats could expose fish to warm weather conditions during the months of January to May, creating a potentially uninhabitable environment. Increased water temperatures within the Yolo Bypass could also cause increased temperatures downstream in the Sacramento-San Joaquin Delta (Delta).
  - The fish stage that would most benefit from rearing habitat would be younger juveniles (fry and parr), but these fish are generally too small to tag and track during scientific investigations. Many studies track movement of larger juveniles (smolts) as a proxy for fry and parr, but it is uncertain if the smolts behave in the same way.
- **Terrestrial Resources.**
  - Changing the inundation pattern of the Yolo Bypass could reduce habitat for waterfowl that need a specific depth for foraging. The EIS/EIR should evaluate the change in habitat for migratory birds.
  - Increasing the duration and area of inundation could affect terrestrial resources, including the giant garter snake, and must be analyzed in the environmental document.
- **Water Quality**.
  - The Project could affect salt water intrusion in the statutory Delta. The EIS/EIR should analyze the Project alternatives for their influence on salt water intrusion.
  - The alternatives could have the potential to increase methylmercury production within the Yolo Bypass through increases in depth and duration of inundation. The EIS/EIR should examine the potential for resuspension of mercury or methylmercury from in-water work in terms of both overall water quality and the region's compliance with total maximum daily loads.
  - The EIS/EIR should address whether the Project could increase regulations on agricultural drainage into the Yolo Bypass.
- **Agriculture**. Cultivation of crops, particularly rice, could be affected by the seasonal timing of inundation of the Yolo Bypass. Increased inundation could have adverse economic effects to both the landowners and the local economy. The EIS/EIR should consider potential impacts on a scale to understand impacts to individual landowners.

- **Mosquito Vector Control**. The EIS/EIR should evaluate the potential for unintended and secondary effects from late spring flooding that could result in increased mosquito populations.
- **Flood Control**. The EIS/EIR should evaluate the extent to which land use changes could affect vegetation growth and reduce flood carrying capacity.

ES.8 Summary and Comparison of Impacts and Mitigation Measures

The impact conclusions and associated mitigation measures for the 19 resource topics evaluated in this EIS/EIR are summarized in Tables ES-2 and ES-3. Most action alternatives have the same impact level of significance before and after mitigation. Table ES-2 uses the following abbreviations:

- B = beneficial
- LTS = less than significant
- MM = mitigation measure
- NI = no impact
- PS = potentially significant
- S = significant
- SU = significant and unavoidable

Table ES-2. Summary of Impacts and Mitigation Measures

Impact	Alternative	CEQA Level of Significance Before Mitigation	NEPA Magnitude and Direction of Impacts	Mitigation Measures	CEQA Level of Significance After Mitigation
Flood Control					
Impact HYD-1: Change in occurrence of flows exceeding the maximum existing conditions monthly flow from the Sacramento River into the Yolo Bypass	No Action	S	2 additional occurrences of monthly flows greater than the maximum existing conditions monthly flow, 136,869 cfs.	--	S
	All Action Alternatives	LTS	Differences in month-to-month flow, but no change in number of occurrences of monthly flows greater than 136,869 cfs, compared to existing conditions. There would be no change compared to the No Action Alternative.	--	LTS
Impact HYD-2: Change in occurrence of flows exceeding the maximum existing conditions monthly flow in the Sacramento River at Freeport	No Action	S	2 additional occurrences of monthly flows greater than the maximum existing conditions monthly flow, 72,231 cfs	--	S
	All Action Alternatives	LTS	Differences in month-to-month flow, but the same number of occurrences of monthly flow greater than 72,231 cfs compared to existing conditions. There would be no change compared to the No Action Alternative.	--	LTS
Impact HYD-3: Change in 100-year Flood Hazard Area	No Action	LTS	No changes would occur to channel geometry and peak flood flows would not be impeded or redirected.	--	LTS
	1, 2, 3	LTS	Increases in peak WSE in the Yolo Bypass of up to 0.01 foot; decreases in peak WSE on the Sacramento River of up to 0.04 feet compared to existing conditions and the No Action Alternative.	--	LTS

Impact	Alternative	CEQA Level of Significance Before Mitigation	NEPA Magnitude and Direction of Impacts	Mitigation Measures	CEQA Level of Significance After Mitigation
	4	LTS	Decreases in peak WSE in the Yolo Bypass and on the Sacramento River of up to 0.15 feet compared to existing conditions and the No Action Alternative.	--	LTS
	5	LTS	Increases in peak WSE in the Yolo Bypass of up to 0.01 feet; decreases in peak WSE on the Sacramento River of up to 0.1 feet compared to existing conditions and the No Action Alternative.	--	LTS
	6	LTS	Increases in peak WSE in the Yolo Bypass of up to 0.02 feet; decreases in peak WSE on the Sacramento River of up to 0.16 feet compared to existing conditions and the No Action Alternative.	--	LTS
Surface Water Supply					
Impact WS-1: Changes in CVP Water Supply Deliveries North of Delta	No Action	LTS	Average water supply changes were less than 5% relative to existing conditions. Dry and critical years would be as high as 6% but annual change would be 2%	---	LTS
	1, 2, 3, 4, 5 (Project), 6	LTS	The change would be less than 1% for all build alternatives	---	LTS
	5 (Program)	NI	----	----	NI
Impact WS-2: Changes in CVP Water Supply Deliveries South of Delta	No Action	S	Long term decreases would be on average between 11-18%. In dry and critical years, there would be an average annual reduction of 6% and as much as 20% decrease in January.	---	S

Impact	Alternative	CEQA Level of Significance Before Mitigation	NEPA Magnitude and Direction of Impacts	Mitigation Measures	CEQA Level of Significance After Mitigation
	1, 2, 3, 4, 5 (Project), 6	LTS	The change would be less than 1% for all build alternatives	---	LTS
	5 (Program)	NI	----	----	NI
Impact WS-3: Changes in SWP Water Supply Deliveries North of Delta	No Action	S	During average years, there would be 4% decrease compared to existing conditions and during dry and critical years a decrease by as much as 17% in February.	---	S
	1, 2, 3, 4, 5 (Project), 6	LTS	The change would be less than 1% for all build alternatives	---	LTS
	5 (Program)	NI	----	----	NI
Impact WS-4: Changes in SWP Water Supply Deliveries South of Delta	No Action	S	During average years, there would be an increase compared to existing conditions and during dry and critical years a decrease by as much as 11% in November.	---	S
	1, 2, 3, 4, 5 (Project), 6	LTS	The change would be less than 1% for all build alternatives	---	LTS
	5 (Program)	NI	----	----	NI
Impact WS-5: Increase in Incidents of Term 91 being Triggered	No Action	S	There would be 84 instances when Term 91 would be initiated but not in the existing conditions.	---	S
	All Action Alternatives	NI	---	---	NI
Water Quality					
Impact WQ-1: Construction-or maintenance related degradation of surface water quality such that it would exceed regulatory standards or would substantially impair beneficial uses of surface water	No Action	NI	---	---	NI

Impact	Alternative	CEQA Level of Significance Before Mitigation	NEPA Magnitude and Direction of Impacts	Mitigation Measures	CEQA Level of Significance After Mitigation
	All Action Alternatives	S	Construction activities could increase downstream sedimentation and turbidity and might mobilize sediment-associated contaminants.	MM-HAZ-1 MM-WQ-1-3	LTS
Impact WQ-2: Operation-related degradation of surface water quality such that it would exceed regulatory standards or would substantially impair beneficial uses of surface water	No Action	NI	---	---	NI
	1, 2, 3, 4, 5 (Project), 6	S	Project-related flow through bypass may increase the rate and area of inundation and could increase the amount of sediment and constituents of concern entering the bypass.	MM-WQ-4	SU
	5 (Program)	LTS	The surrounding areas could experience inundation due to operation as managed wetland habitat.	----	LTS
Groundwater					
Impact GRW-1: Temporary and Short-Term Construction-Related Effects on Groundwater Levels	No Action	NI	---	---	NI
	1, 2, 3, 4, 5 (Project), 6	LTS	Temporary dewatering activities would affect groundwater levels.	---	LTS
	5 (Program)	NI	---	---	NI
Impact GRW-2: Temporary and Short-Term Construction-Related Effects on Groundwater Quality	No Action	NI	---	---	NI
	1, 2, 3, 4, 5 (Project), 6	S	On-site spills or waste discharge runoff during construction could impact groundwater quality.	MM-HAZ-1, MM-WQ-1-3	LTS
	5 (Program)	NI	---	---	NI

Impact	Alternative	CEQA Level of Significance Before Mitigation	NEPA Magnitude and Direction of Impacts	Mitigation Measures	CEQA Level of Significance After Mitigation
Impact GRW-3: Operational Impacts to Groundwater Recharge Could Cause a Lowering of the Local Groundwater Level that Would Impact Pre-existing or Planned Land Uses in the Area Surrounding the Yolo Bypass	No Action	NI	---	---	NI
	1, 2, 3, 4, 5 (Project), 6	LTS	Recharge to the groundwater aquifer could be slightly impeded.	---	LTS
	5 (Program)	NI	---	---	NI
Impact GRW-4: Operational Impacts to Groundwater Quality in the Area Surrounding the Yolo Bypass	No Action	NI	---	---	NI
	1, 2, 3, 4, 5 (Project), 6	LTS	Increased recharge groundwater could introduce new contaminants of concern.	---	LTS
	5 (Program)	NI	---	---	NI
Impact GRW-5: Long-Term Changes to Groundwater Levels due to Decreased Allocation to North of Delta and South of Delta Contractors	No Action	NI	---	---	NI
	1, 2, 3, 4, 5 (Project), 6	LTS	Reductions in supplies would be short-term and infrequent.	---	LTS
	5 (Program)	NI	---	---	NI
Impact GRW-6: Long-Term Changes to Groundwater Quality due to Decreased Allocation to North of Delta and South of Delta Contractors	No Action	NI	---	---	NI
	1, 2, 3, 4, 5 (Project), 6	LTS	The potential increase in groundwater pumping in lieu of surface water deliveries would be short-term, infrequent and of small magnitude.	---	LTS
	5 (Program)	NI	---	---	NI

Impact	Alternative	CEQA Level of Significance Before Mitigation	NEPA Magnitude and Direction of Impacts	Mitigation Measures	CEQA Level of Significance After Mitigation
Impact GRW-7: Increased Potential for Land Subsidence due to Decreased Allocation to North of Delta and South of Delta Contractors	No Action	NI	---	---	NI
	1, 2, 3, 4, 5 (Project), 6	LTS	The potential increase in groundwater pumping in lieu of surface water deliveries would be short-term and infrequent.	---	LTS
	5 (Program)	NI	---	---	NI
Aquatic Resources					
Impact FISH-1: Potential Disturbance to Fish Species or their Habitat due to Erosion, Sedimentation, and Turbidity	No Action	NI	---	—	NI
	All Action Alternatives	S	A minimal increase in sedimentation and turbidity during construction could temporarily adversely affect fish	MM-WQ-2, 3	LTS
Impact FISH-2: Potential Disturbance to Fish Species or their Habitat due to Hazardous Materials and Chemical Spills	No Action	NI	---	—	NI
	All Action Alternatives	S	A minimal increase in the potential to release hazardous materials or chemicals into water bodies could adversely affect fish species of focused evaluation in the immediate vicinity and downstream of the construction area	MM-WQ-1	LTS
Impact FISH-3: Potential Disturbance to Fish Species or their Habitat due to Aquatic Habitat Modification	No Action	NI	---	—	NI
	1	S	28.9 acres (temporary impacts) and 47.1 acres (permanent impacts) of vegetated area would have the potential to be disturbed during construction	MM-TERR-7; MM-FISH-1	LTS

Impact	Alternative	CEQA Level of Significance Before Mitigation	NEPA Magnitude and Direction of Impacts	Mitigation Measures	CEQA Level of Significance After Mitigation
	2	S	27.4 acres (temporary impacts) and 72.5 acres (permanent impacts) of vegetated area would have the potential to be disturbed during construction	MM-TERR-7; MM-FISH-1	LTS
	3	S	32.5 acres (temporary impacts) and 80.9 acres (permanent impacts) of vegetated area would have the potential to be disturbed during construction	MM-TERR-7; MM-FISH-1	LTS
	4	S	168.4 acres (temporary impacts) and 117.4 acres (permanent impacts) of vegetated area would have the potential to be disturbed during construction	MM-TERR-7; MM-FISH-1	LTS
	5	S	25.6 acres (temporary impacts) and 85.7 acres (permanent impacts) of vegetated area would have the potential to be disturbed during construction	MM-TERR-7; MM-FISH-1	LTS
	6	S	32.3 acres (temporary impacts) and 107.2 acres (permanent impacts) of vegetated area would have the potential to be disturbed during construction	MM-TERR-7; MM-FISH-1	LTS
Impact FISH-4: Potential Disturbance to Fish Species or their Habitat due to Hydrostatic Pressure Waves, Noise, and Vibration	No Action	NI	---	—	NI
	All Action Alternatives	S	Impacts would be substantial if impact pile driving was conducted in the Sacramento River; impact would be LTS if a vibratory pile driver can be used for construction of cofferdam	MM-FISH-2	LTS

Impact	Alternative	CEQA Level of Significance Before Mitigation	NEPA Magnitude and Direction of Impacts	Mitigation Measures	CEQA Level of Significance After Mitigation
Impact FISH-5: Potential Disturbance to Fish Species or their Habitat due to Stranding and Entrainment	No Action	NI	---	—	NI
	All Action Alternatives	S	Minimal and temporary increase in the potential for fish species of focused evaluation to be entrained or stranded could occur during construction	MM-FISH-3	LTS
Impact FISH-6: Potential Disturbance to Fish Species or their Habitat due to Predation Risk	No Action	NI	---	—	NI
	All Action Alternatives	S	A minimal and temporary increase in the risk of predation for species of focused evaluation could occur due to potential indirect effects of construction and maintenance activities	MM-WQ-1-3; MM-FISH-2-3	LTS
Impact FISH-7: Potential Disturbance to Fish Species due to changes in Fish Passage Conditions	No Action	NI	---	—	NI
	All Action Alternatives	LTS	Fish species of focused evaluation would either not be present near temporary fish passage blockages, or would not be substantially affected by temporary blockages	---	LTS
Impact FISH-8: Potential Disturbance to Fish Species or their Habitat due to Direct Harm	No Action	NI	---	—	NI
	All Action Alternatives	S	Minimal and temporary increase in the risk of direct harm for fish species of focused evaluation could occur due to construction and maintenance-related equipment, personnel, or debris	MM-FISH-3-4	LTS

Impact	Alternative	CEQA Level of Significance Before Mitigation	NEPA Magnitude and Direction of Impacts	Mitigation Measures	CEQA Level of Significance After Mitigation
Impact FISH-9: Impacts to Fish Species of Focused Evaluation and Fisheries Habitat Conditions due to changes in Flows in the Sacramento River	No Action	S	Substantial changes in Sacramento River flows could adversely affect fish species of focused evaluation	—	SU
	All Action Alternatives	LTS	Minimal changes in Sacramento River flows would not adversely affect fish species of focused evaluation	—	LTS
Impact FISH-10: Impacts to Fish Species of Focused Evaluation and Fisheries Habitat Conditions due to changes in Water Temperatures in the Sacramento River	No Action	S	Substantially less suitable water temperatures in the Sacramento River could adversely affect fish species of focused evaluation	—	SU
	All Action Alternatives	LTS	Similar Sacramento River water temperatures would not adversely affect fish species of focused evaluation	—	LTS
Impact FISH-11: Impacts to Fish Species of Focused Evaluation and Fisheries Habitat Conditions due to Changes in Delta Hydrologic and Water Quality Conditions	No Action	S	Delta habitat conditions would be substantially more suitable for fish species of focused evaluation during some months, and substantially less suitable during some months	—	SU
	All Action Alternatives	LTS	Similar Delta habitat conditions would not adversely affect fish species of focused evaluation	—	LTS
Impact FISH-12: Impacts to Fisheries Habitat Conditions due to Changes in Flow-Dependent Habitat Availability in the Study Area (Yolo Bypass/Sutter Bypass)	No Action	B	Expected increases in floodplain inundation in the Yolo and Sutter bypasses may increase hydraulic habitat availability for fish species of focused evaluation	—	B

Impact	Alternative	CEQA Level of Significance Before Mitigation	NEPA Magnitude and Direction of Impacts	Mitigation Measures	CEQA Level of Significance After Mitigation
	All Action Alternatives	B/LTS	Substantial increases in hydraulic habitat availability in the Yolo Bypass would improve conditions for fish species of focused evaluation; minimal reductions in hydraulic habitat availability in the Sutter Bypass would not adversely affect fish species of focused evaluation	—	B/LTS
Impact FISH-13: Impacts to Fisheries Habitat Conditions due to Changes in Water Quality in the Study Area	No Action	LTS	Minor potential for increased concentrations of contaminants in the Yolo Bypass and Delta would not be expected to adversely affect fish species of focused evaluation	—	LTS
	All Action Alternatives	LTS	Minor potential for increased concentrations of contaminants in the Yolo Bypass and Delta would not be expected to adversely affect fish species of focused evaluation	—	LTS
Impact FISH-14: Impacts to Aquatic Primary and Secondary Production in the Study Area	No Action	B	Expected increases in primary and secondary production in the Yolo and Sutter bypasses and the Delta would improve conditions for fish species of focused evaluation	—	B
	All Action Alternatives	LTS	Expected increases in primary and secondary production in the Yolo Bypass and Delta would improve conditions for fish species of focused evaluation; minor reductions in primary and secondary production in the Sutter Bypass are not expected to adversely affect fish species of focused evaluation	—	LTS

Impact	Alternative	CEQA Level of Significance Before Mitigation	NEPA Magnitude and Direction of Impacts	Mitigation Measures	CEQA Level of Significance After Mitigation
Impact FISH-15: Impacts to Fish Species of Focused Evaluation due to changes in Adult Fish Passage Conditions through the Yolo Bypass	No Action	B	Increased flows entering the Yolo Bypass would be expected to improve adult fish passage conditions through the Yolo Bypass, benefiting fish species of focused evaluation	—	B
	1, 2, 3, 5	B	Adult fish passage through the Yolo Bypass would occur more often, benefiting fish species of focused evaluation	—	B
	4	S	Adult fish passage through the Yolo Bypass would occur less frequently, adversely affecting fish species of focused evaluation	MM-FISH-5	LTS
	6	S	Adult fish passage through the Yolo Bypass could occur less frequently, potentially adversely affecting fish species of focused evaluation	—	SU
Impact FISH-16: Impacts to Fish Species due to changes in Potential for Stranding and Entrainment	No Action	LTS	No facilities would be constructed that would increase the potential for stranding and entrainment of fish species of focused evaluation; therefore, there would be no change from existing conditions	—	LTS
	1, 2, 3, 5, 6	LTS	Minor increased potential for fish stranding in the Yolo Bypass would not be expected to adversely affect fish species of focused evaluation	—	LTS
	4	S	The presence of substantially different hydraulic conditions in the Yolo Bypass could increase the potential for stranding, potentially adversely affecting fish species of focused evaluation	—	SU

Impact	Alternative	CEQA Level of Significance Before Mitigation	NEPA Magnitude and Direction of Impacts	Mitigation Measures	CEQA Level of Significance After Mitigation
Impact FISH-17: Impacts to Fish Species due to changes in Potential for Predation	No Action	LTS	—	—	LTS
	1, 2, 3, 5, 6	LTS	Minor increased potential for predation of fish species would not be expected to adversely affect fish species of focused evaluation	—	LTS
	4	S	The presence of the water control structures and bypass channels could adversely affect fish species of focused evaluation due to increased potential for predation	—	SU
Impact FISH-18: Impacts to Chinook Salmon Species/Runs due to Changes in Viable Salmonid Population Parameters	No Action	LTS	—	—	LTS
	All Action Alternatives	LTS	Viable Salmonid Population parameters would be similar or improved for all Chinook salmon runs	—	LTS
Impact FISH-19: Impacts to Fish Species of Focused Evaluation and Fisheries Habitat Conditions due to Changes in Hydrologic Conditions in the SWP/CVP System	No Action	S	Substantial reductions in reservoir storages could adversely affect fish species of focused evaluation	—	SU
	All Action Alternatives	LTS	Generally insubstantial changes in reservoir storages and instream flows would not be expected to adversely affect fish species of focused evaluation	—	LTS

Impact	Alternative	CEQA Level of Significance Before Mitigation	NEPA Magnitude and Direction of Impacts	Mitigation Measures	CEQA Level of Significance After Mitigation
Impact FISH-20: Conflict with Adopted Habitat Conservation Plan, Natural Community Conservation Plan, or Other Approved Local, Regional, or State Habitat Conservation Plan	No Action	LTS	—	—	LTS
	All Action Alternatives	LTS	No conflicts with habitat conservation plans would be expected	—	LTS
Impact FISH-21: Impacts to Fish Species of Focused Evaluation and Fisheries Habitat Conditions due to Tule Canal Floodplain Improvements (Program Level)	No Action	NI	—	—	NI
	5 (Program)	S	Could result in construction-related impacts to habitat in the Yolo Bypass, and operations of the water control structure and bypass channel could adversely affect fish species of focused evaluation	MM-WQ-1-3; MM-TERR-7; MM-FISH-1-5	SU
Vegetation, Wetlands, and Wildlife Resources					
Impact TERR-1: Potential Mortality or Loss of Habitat for Special-Status Plant Species	No Action	NI	---	—	NI
	1	S (C, M), LTS (O)	Lowest construction-related impacts to suitable and occupied habitat; approximately 29 acres of temporary habitat and 48 acres of permanent habitat losses; 1 woolly rose-mallow plant would be directly affected during construction.	MM-TERR-1	LTS

Impact	Alternative	CEQA Level of Significance Before Mitigation	NEPA Magnitude and Direction of Impacts	Mitigation Measures	CEQA Level of Significance After Mitigation
	2	S (C, M), LTS (O)	Approximately 31 acres of temporary habitat and 85 acres of permanent habitat losses; 1 woolly rose-mallow plant would be directly affected during construction; potential for impacts to other special-status plant species if found during pre-construction surveys.	MM-TERR-1, 19	LTS
	3	S (C, M), LTS (O)	Approximately 33 acres of temporary habitat and 82 acres of permanent habitat losses; 1 woolly rose-mallow plant would be directly affected during construction; potential for impacts to other special-status plant species if found during pre-construction surveys	MM-TERR-1, 19	LTS
	4	S (C, M), LTS (O)	Highest construction-related impacts to suitable and occupied habitat; approximately 139 acres of temporary habitat and 146 acres of permanent habitat losses; 1 woolly rose-mallow plant would be directly affected during construction; potential for impacts to other special-status plant species if found during pre-construction surveys.	MM-TERR-1, 19	LTS
	5	S (C, M), LTS (O)	Approximately 28 acres of temporary habitat and 96 acres of permanent habitat losses; 1 woolly rose-mallow plant would be directly affected during construction; potential for impacts to other special-status plant species if found during pre-construction surveys.	MM-TERR-1, 19	LTS

Impact	Alternative	CEQA Level of Significance Before Mitigation	NEPA Magnitude and Direction of Impacts	Mitigation Measures	CEQA Level of Significance After Mitigation
	6	S (C, M), LTS (O)	Approximately 34 acres of temporary habitat and 109 acres of permanent habitat losses; 1 woolly rose-mallow plant would be directly affected during construction; potential for impacts to other special-status plant species if found during pre-construction surveys.	MM-TERR-1, 19	LTS
Impact TERR-2: Potential Disturbance or Mortality of Valley Elderberry Longhorn Beetle and Loss of Its Habitat (Elderberry Shrubs)	No Action	NI	—	—	NI
	1, 2, 5	S (C, M), LTS (O)	No elderberry shrubs identified in the APE; potential for disturbance if elderberry shrubs colonize the area before construction or during maintenance activities	MM-TERR-2–11	LTS
	3, 4	S (C, M), LTS (O)	Approximately 1.3 acre of temporary habitat and 1.8 acres of permanent habitat losses; potential for disturbance if elderberry shrubs colonize the area before construction or during maintenance activities	MM-TERR-2–11	LTS
	6	S (C, O, M)	Approximately 1.2 acre of temporary habitat and 2.7 acres of permanent habitat losses; potential for disturbance if elderberry shrubs colonize the area before construction or during maintenance activities; additional adverse effects on elderberry shrubs could occur in areas with more flooding during operations than elderberry can tolerate.	MM-TERR-2–11	LTS

Impact	Alternative	CEQA Level of Significance Before Mitigation	NEPA Magnitude and Direction of Impacts	Mitigation Measures	CEQA Level of Significance After Mitigation
Impact TERR-3: Potential Disturbance or Mortality of, and Loss of Suitable Habitat for, Giant Garter Snake	No Action	NI	—	—	NI
	1	S (C, M), LTS (O)	Approximately 24 acres of temporary habitat and 33 acres of permanent habitat losses; permanent loss of the 20-acre Tule Pond, flooding of occupied burrows, and long-term maintenance activities.	MM-TERR-2–6, 11–14; WQ-1, 2	LTS
	2	S (C, M), LTS (O)	Approximately 15 acres of temporary habitat and 25 acres of permanent habitat losses; permanent loss of the 20-acre Tule Pond, flooding of occupied burrows, and long-term maintenance activities.	MM-TERR-2–6, 11–14; WQ-1, 2	LTS
	3	S (C, M), LTS (O)	Approximately 19 acres of temporary habitat and 30 acres of permanent habitat losses; permanent loss of the 20-acre Tule Pond, flooding of occupied burrows, and long-term maintenance activities.	MM-TERR-2–6, 11–14; WQ-1, 2	LTS
	4	S (C, M), LTS (O)	Approximately 117 acres of temporary habitat and 91 acres of permanent habitat losses; permanent loss of the 20-acre Tule Pond, flooding of occupied burrows, and long-term maintenance activities.	MM-TERR-2–6, 11–14; WQ-1, 2	LTS
	5	S (C, M), LTS (O)	Less than 2 acres of temporary habitat and 16 acres of permanent habitat losses; flooding of occupied burrows and long-term maintenance activities.	MM-TERR-2–6, 11–14; WQ-1, 2	LTS

Impact	Alternative	CEQA Level of Significance Before Mitigation	NEPA Magnitude and Direction of Impacts	Mitigation Measures	CEQA Level of Significance After Mitigation
	6	S (C, M), LTS (O)	Approximately 20 acres of temporary habitat and 29 acres of permanent habitat losses; permanent loss of the 20-acre Tule Pond, flooding of occupied burrows, and long-term maintenance activities.	MM-TERR-2–6, 11–14; WQ-1, 2	LTS
Impact TERR-4: Potential Disturbance or Mortality of, and Loss of Suitable Habitat for, Western Pond Turtle	No Action	NI	—	—	NI
	1	S (C, M), NI (O)	Approximately 28 acres of temporary habitat and 44 acres of permanent habitat losses; permanent loss of the 20-acre Tule Pond and long-term maintenance activities.	MM-TERR-2–6, 11, 15; WQ-1, 2	LTS
	2	S (C, M), NI (O)	Approximately 28 acres of temporary habitat and 75 acres of permanent habitat losses; permanent loss of the 20-acre Tule Pond and long-term maintenance activities.	MM-TERR-2–6, 11, 15; WQ-1, 2	LTS
	3	S (C, M), NI (O)	Approximately 31 acres of temporary habitat and 73 acres of permanent habitat losses permanent loss of the 20-acre Tule Pond and long-term maintenance activities.	MM-TERR-2–6, 11, 15; WQ-1, 2	LTS
	4	S (C, M), NI (O)	Approximately 111 acres of temporary habitat and 115 acres of permanent habitat losses; permanent loss of the 20-acre Tule Pond and long-term maintenance activities.	MM-TERR-2–6, 11, 15; WQ-1, 2	LTS
	5	S (C, M), NI (O)	Approximately 28 acres of temporary habitat and 88 acres of permanent habitat losses; additional adverse effects from long-term maintenance activities.	MM-TERR-2–6, 11, 15; WQ-1, 2	LTS

Impact	Alternative	CEQA Level of Significance Before Mitigation	NEPA Magnitude and Direction of Impacts	Mitigation Measures	CEQA Level of Significance After Mitigation
	6	S (C, M), NI (O)	Approximately 31 acres of temporary habitat and 98 acres of permanent habitat losses; permanent loss of the 20-acre Tule Pond and long-term maintenance activities.	MM-TERR-2–6, 11, 15; WQ-1, 2	LTS
Impact TERR-5: Potential Disturbance or Mortality of Nesting Bird Species and Removal of Suitable Nesting and Foraging Habitat	No Action	NI	—	—	NI
	1	S (C, M), LTS (O)	Approximately 29 acres of temporary habitat and 48 acres of permanent habitat losses; adverse effects from long-term maintenance activities if conducted during the nesting season.	MM-TERR-2–6, 11, 16	LTS
	2	S (C, M), LTS (O)	Approximately 31 acres of temporary habitat and 85 acres of permanent habitat losses; adverse effects from long-term maintenance activities if conducted during the nesting season	MM-TERR-2–6, 11, 16	LTS
	3	S (C, M), LTS (O)	Approximately 33 acres of temporary habitat and 82 acres of permanent habitat losses; adverse effects from long-term maintenance activities if conducted during the nesting season.	MM-TERR-2–6, 11, 16	LTS
	4	S (C, M), LTS (O)	Approximately 139 acres of temporary habitat and 146 acres of permanent habitat losses; adverse effects from long-term maintenance activities if conducted during the nesting season	MM-TERR-2–6, 11, 16	LTS
	5	S (C, M), LTS (O)	Approximately 28 acres of temporary habitat and 96 acres of permanent habitat losses; adverse effects from long-term maintenance activities if conducted during the nesting season.	MM-TERR-2–6, 11, 16	LTS

Impact	Alternative	CEQA Level of Significance Before Mitigation	NEPA Magnitude and Direction of Impacts	Mitigation Measures	CEQA Level of Significance After Mitigation
	6	S (C, M), LTS (O)	Approximately 34 acres of temporary habitat and 109 acres of permanent habitat losses; adverse effects from long-term maintenance activities if conducted during the nesting season.	MM-TERR-2–6, 11, 16	LTS
Impact TERR-6: Potential Disturbance, Injury, or Mortality of Special-Status Tree-Roosting Bats and Removal of Roosting Habitat	No Action	NI	—	—	NI
	1	S (C, M), NI (O)	Approximately 25 acres of temporary habitat and 36 acres of permanent habitat losses; adverse effects from long-term maintenance activities if conducted during the maternity season.	MM-TERR-2–6, 11, 17	LTS
	2	S (C, M), NI (O)	Approximately 28 acres of temporary habitat and 72 acres of permanent habitat losses; adverse effects from long-term maintenance activities if conducted during the maternity season.	MM-TERR-2–6, 11, 17	LTS
	3	S (C, M), NI (O)	Approximately 29 acres of temporary habitat and 64 acres of permanent habitat losses; adverse effects from long-term maintenance activities if conducted during the maternity season.	MM-TERR-2–6, 11, 17	LTS
	4	S (C, M), NI (O)	Approximately 93 acres of temporary habitat and 93 acres of permanent habitat losses; adverse effects from long-term maintenance activities if conducted during the maternity season.	MM-TERR-2–6, 11, 17	LTS
	5	S (C, M), NI (O)	Approximately 27 acres of temporary habitat and 89 acres of permanent habitat losses; adverse effects from long-term maintenance activities if conducted during the maternity season.	MM-TERR-2–6, 11, 17	LTS

Impact	Alternative	CEQA Level of Significance Before Mitigation	NEPA Magnitude and Direction of Impacts	Mitigation Measures	CEQA Level of Significance After Mitigation
	6	S (C, M), NI (O)	Approximately 30 acres of temporary habitat and 88 acres of permanent habitat losses; adverse effects from long-term maintenance activities if conducted during the maternity season.	MM-TERR-2–6, 11, 17	LTS
Impact TERR-7: Potential Disturbance or Mortality of American Badger and Loss of Its Habitat	No Action	NI	—	—	NI
	1	S (C), NI (O, M)	Approximately 18 acres of temporary habitat and 19 acres of permanent habitat losses.	MM-TERR-2–6, 18	LTS
	2	S (C), NI (O, M)	Approximately 21 acres of temporary habitat and 49 acres of permanent habitat losses.	MM-TERR-2–6, 18	LTS
	3	S (C), NI (O, M)	Approximately 20 acres of temporary habitat and 43 acres of permanent habitat losses.	MM-TERR-2–6, 18	LTS
	4	S (C), NI (O, M)	Approximately 64 acres of temporary habitat and 66 acres of permanent habitat losses.	MM-TERR-2–6, 18	LTS
	5	S (C), NI (O, M)	Approximately 20 acres of temporary habitat and 72 acres of permanent habitat losses.	MM-TERR-2–6, 18	LTS
	6	S (C), NI (O, M)	Approximately 21 acres of temporary habitat and 60 acres of permanent habitat losses.	MM-TERR-2–6, 18	LTS
Impact TERR-8: Potential Loss of Sensitive Natural Communities	No Action	NI	—	—	NI
	1	S (C), NI (O, M)	Approximately 10 acres of temporary habitat and 25 acres of permanent habitat losses.	MM-TERR-2, 3, 5, 6, 11; WQ-1, 2	LTS

Impact	Alternative	CEQA Level of Significance Before Mitigation	NEPA Magnitude and Direction of Impacts	Mitigation Measures	CEQA Level of Significance After Mitigation
	2	S (C), NI (O, M)	Approximately 8 acres of temporary habitat and 26 acres of permanent habitat losses.	MM-TERR-2, 3, 5, 6, 11; WQ-1, 2	LTS
	3	S (C), NI (O, M)	Approximately 10 acres of temporary habitat and 29 acres of permanent habitat losses.	MM-TERR-2, 3, 5, 6, 11; WQ-1, 2	LTS
	4	S (C), NI (O, M)	Approximately 22 acres of temporary habitat and 34 acres of permanent habitat losses.	MM-TERR-2, 3, 5, 6, 11; WQ-1, 2	LTS
	5	S (C), NI (O, M)	Approximately 8 acres of temporary habitat and 17 acres of permanent habitat losses.	MM-TERR-2, 3, 5, 6, 11; WQ-1, 2	LTS
	6	S (C), NI (O, M)	Approximately 10 acres of temporary habitat and 36 acres of permanent habitat losses.	MM-TERR-2, 3, 5, 6, 11; WQ-1, 2	LTS
Impact TERR-9: Potential Effects on USACE, CDFW, and RWQCB Jurisdictional Areas	No Action	NI	—	—	NI
	1, 5	S (C), NI (O, M)	Alternatives 1 and 5 have a similar range of effects; Alternative 5 has the lowest construction effects on jurisdictional areas.	MM-TERR-2, 3, 5, 6, 11; MM-WQ-1, 2	LTS
	2, 3, 6	S (C), NI (O, M)	Alternatives 2, 3, and 6 have a similar range of effects.	MM-TERR-2, 3, 5, 6, 11; MM-WQ-1, 2	LTS
	4	S (C), NI (O, M)	Alternative 4 has the greatest construction effects on jurisdictional areas.	MM-TERR-2, 3, 5, 6, 11; MM-WQ-1, 2	LTS
Impact TERR-10: Potential Interference with Movement of Native Resident or Migratory Wildlife Species	No Action	NI	—	—	NI

Impact	Alternative	CEQA Level of Significance Before Mitigation	NEPA Magnitude and Direction of Impacts	Mitigation Measures	CEQA Level of Significance After Mitigation
	All Action Alternatives	LTS (C), NI (O, M)	During construction minimal effect would occur to migratory wildlife. No effect would occur over existing conditions for operations or maintenance.	—	LTS
Impact TERR-11: Conflict with Provisions of an Adopted HCP/NCCP or Other Approved Local, Regional, or State Habitat Conservation Plan	No Action	NI	—	—	NI
	All Action Alternatives	NI	No effect on an adopted HCP/NCCP or other conservation plans.	—	NI
Impact TERR-12: Potential Effects of Tule Canal Floodplain Improvements (Program Level)	No Action	NI	--	—	NI
	1, 2, 3, 4, 5 (Project), 6	NA	--	—	NI
	5 (Program)	S (C, O, M)	Permanent loss of approximately 324.9 acres of freshwater emergent wetland and 59 acres of other types of habitat.	MM-TERR-2–19; WQ-1, 2	LTS
Cultural Resources					
Impact CULT-1: Impacts on Identified Archaeological Sites and Historic-Era Built Resources Resulting from Construction	No Action	NI	---	—	NI
	All Action Alternatives	S	Potential for permanent adverse effects for cultural resources	MM-CULT-1	LTS
Impact CULT-2: Impacts on Archaeological Sites and Historic-Era Built Resources to Be Identified Through Future Inventory Efforts	No Action	NI	---	—	NI
	All Action Alternatives	S	Potential for permanent adverse effects for cultural resources	MM-CULT-2	LTS

Impact	Alternative	CEQA Level of Significance Before Mitigation	NEPA Magnitude and Direction of Impacts	Mitigation Measures	CEQA Level of Significance After Mitigation
Impact CULT-3: Impacts on Archaeological Sites that May Not Be Identified through Inventory Efforts	No Action	NI	---	—	NI
	All Action Alternatives	S	Potential for permanent adverse effects for cultural resources	MM-CULT-3, 4	SU
Impact CULT-4: Damage to Buried Human Remains	No Action	NI	---	—	NI
	1, 2, 3, 4, 5 (Project), 6	S	Potential for permanent adverse effects for cultural resources	MM-CULT-5	LTS
	5 (Program)	S	Potential for permanent adverse effects for cultural resources	MM-CULT-5	SU
Impact CULT-5: Impacts on Paleontological Resources Resulting from Construction	No Action	NI	---	—	NI
	All Action Alternatives	LTS	Limited potential for adverse effects on paleontological resources	—	LTS
Land Use and Agricultural Resources					
Impact AGR-1: Physically divide a community or conflict with a relevant land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect.	No Action	NI	---	---	NI
	All Action Alternatives	LTS	Actions associated with the Project would be consistent with relevant existing land use plans, policies, or regulations adopted for the purpose of avoiding or mitigating an environment effect and would not occur near a community.	---	LTS

Impact	Alternative	CEQA Level of Significance Before Mitigation	NEPA Magnitude and Direction of Impacts	Mitigation Measures	CEQA Level of Significance After Mitigation
Impact AGR-2: Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, which may also be protected under the Williamson Act or other conservation programs, to nonagricultural or incompatible uses	No Action	NI	---	---	NI
	1, 2, 3, 5 (Project), 5 (Program), 6	LTS	Impacts to agricultural land would occur, but Prime Farmland, Unique Farmland, or Farmland of Statewide Importance lands would not be converted to nonagricultural uses by construction or increased periods of inundation	---	LTS
	4	S	Impacts to agricultural land would occur and there would be a change to Prime Farmland and Unique Farmland.	MM-AGR-1	SU
Geology and Soils					
Impact GEO-1: Substantial increase in sediment deposition in the Yolo Bypass	No Action	NI	---	---	NI
	All Action Alternatives	LTS	The increased amount of sediment deposited in the Yolo Bypass would be removed during maintenance activities	---	LTS
Impact GEO-2: Induce levee instability at the Yolo Bypass east levee	No Action	NI	---	---	NI
	1, 2, 3, 4, 5 (Project), 6	LTS	Construction would take place outside of the waterside toe of the existing levee and could impact levee stability.	---	LTS
	5 (Program)	NI	---	---	NI

Impact	Alternative	CEQA Level of Significance Before Mitigation	NEPA Magnitude and Direction of Impacts	Mitigation Measures	CEQA Level of Significance After Mitigation
Impact GEO-3: Substantially increase soil erosion at the Yolo Bypass east levee	No Action	NI	---	---	NI
	1, 5	NI	---	---	NI
	2, 3, 4, 6	LTS	Soil erosion could increase, but the design incorporates erosion control measures at the Yolo Bypass east levee.	---	LTS
Recreation					
Impact REC-1: Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated	No Action	NI	---	—	NI
	All Action Alternatives	LTS	Construction effects would limit recreational uses (including hunting) in established wildlife areas for one construction period. Long term inundation effects for access for educational and other recreational activities would be reduced due to areas not being accessible due to water levels.	MM-REC-1	LTS
Visual Resources					
Impact VIS-1: Short-Term Construction-Related Changes in Scenic Vistas, Scenic Resources, and Existing Visual Character	No Action	NI	---	---	NI
	All Action Alternatives	LTS	Short-term construction activities would include the presence of heavy construction equipment.	---	LTS

Impact	Alternative	CEQA Level of Significance Before Mitigation	NEPA Magnitude and Direction of Impacts	Mitigation Measures	CEQA Level of Significance After Mitigation
Impact VIS-2: Long–Term Changes in Scenic Vistas, Scenic Resources, and Existing Visual Character	No Action	NI	---	---	NI
	All Action Alternatives	S	Changes to the physical environment would impact the visual composition, including vegetation removal and the addition of permanent structures.	MM-VIS-1	LTS
Impact VIS-3: Substantial Changes in Light or Glare	No Action	NI	---	---	NI
	All Action Alternatives	LTS	A new source of light or glare would not be created that would affect residents or visitors.	---	LTS
Public Services, Utilities, and Power					
Impact UTIL-1: Affect the provision of governmental services or facilities, including fire and police protection, parks, and schools	No Action	NI	---	---	NI
	All Action Alternatives	LTS	The use of the local workforce and construction controls for hazardous conditions would have limited effects.	---	LTS
Impact UTIL-2: Create the need for new stormwater facilities	No Action	NI	---	---	NI
	All Action Alternatives	S	The implementation of BMPs would control stormwater runoff and associated soil erosion and adequately treat anticipated stormwater runoff generated during construction and maintenance.	MM-WQ-3	LTS

Impact	Alternative	CEQA Level of Significance Before Mitigation	NEPA Magnitude and Direction of Impacts	Mitigation Measures	CEQA Level of Significance After Mitigation
Impact UTIL-3: Generate solid waste in need of disposal, which could exceed the capacity of landfills	No Action	NI	---	---	NI
	All Action Alternatives	LTS	There is adequate capacity at the landfill to accommodate disposal needs and excavated soil would not be disposed of at a public landfill.	---	LTS
Impact UTIL-4: Use and/or depletion of local or regional energy supplies	No Action	NI	---	---	NI
	All Action Alternatives	LTS	Electricity used would be provided to the site by temporary generators during construction and maintenance. Operation of the headworks structure would have low power requirements. Construction would require the transport of material to be hauled to and from the sites.	---	LTS
Transportation					
Impact TRAN-1: Construction Personnel Traffic	No Action	NI	----	----	NI
	All Action Alternatives	LTS	Construction personnel would not be expected to substantially encroach upon the peak travel periods in the region.	----	LTS
Impact TRAN-2: Construction Events and Vehicle Traffic	No Action	NI	----	----	NI
	1	LTS	Traffic associated with construction would not substantially alter traffic and transportation conditions in the area.	----	LTS
	2 - 6	S	Traffic associated with construction would potentially introduce congestion to nearby highway facilities due to the amount of expected hourly truck trips as a result of riprap and RSP hauling	MM-TRAN-3	LTS

Impact	Alternative	CEQA Level of Significance Before Mitigation	NEPA Magnitude and Direction of Impacts	Mitigation Measures	CEQA Level of Significance After Mitigation
Impact TRAN-3: Construction Roadway Conditions	No Action	NI	----	----	NI
	All Action Alternatives	S	Roadways would substantially degrade in quality due to vehicle weight and volume during material hauls and vehicle maneuvers.	MM-TRAN-1, 2	LTS
Impact TRAN-4: Maintenance related traffic	No Action	NI	---	---	NI
	All Action Alternatives	LTS	Traffic associated with maintenance would not substantially alter traffic and transportation conditions in the area.	---	LTS
Air Quality and Greenhouse Gases					
Impact AQ-1: Violate air quality standards or contribute substantially to an existing or projected air quality violation	No Action	NI	---	---	NI
	1, 2, 5	S	PM_{10} and NO_x construction emissions would exceed the significance thresholds established by the air districts, and NO_x operational emissions would exceed Yolo-Solano AQMD's significance threshold.	MM-AQ-1-4	SU
	3, 4	S	PM_{10} and NO_x construction emissions would exceed the significance thresholds for the air districts.	MM-AQ-1-5	SU
	6	S	PM_{10}, ROG, and NO_x construction emissions would exceed the significance thresholds for the air districts.	MM-AQ-1-5	SU

Impact	Alternative	CEQA Level of Significance Before Mitigation	NEPA Magnitude and Direction of Impacts	Mitigation Measures	CEQA Level of Significance After Mitigation
Impact AQ-2: Conflict with or obstruct implementation of the applicable air quality plan	No Action	NI	---	---	NI
	1, 2, 5	S	PM_{10} and NO_x construction emissions would exceed the significance thresholds for the air districts, and NO_x operational emissions would exceed Yolo-Solano AQMD's significance threshold.	MM-AQ-1-4	SU
	3, 4	S	PM_{10} and NO_x construction emissions would exceed the significance thresholds for the air districts.	MM-AQ-1-5	SU
	6	S	PM_{10}, ROG, and NO_x construction emissions would exceed the significance thresholds for the air districts.	MM-AQ-1-5	SU
Impact AQ-3: Expose sensitive receptors to substantial pollutant concentrations	No Action	NI	---	---	NI
	All Action Alternatives	LTS	TAC emissions would be temporary and no sensitive receptors are in the immediate vicinity of the construction footprint.	---	LTS
Impact AQ-4: Create objectionable odors affecting a substantial number of people	No Action	NI	---	---	NI
	All Action Alternatives	LTS	Construction would be temporary and no receptors are in the immediate vicinity.	---	LTS
Impact AQ-5: Generate criteria pollutants greater than general conformity *de minimis* thresholds	No Action	NI	---	---	NI

Impact	Alternative	CEQA Level of Significance Before Mitigation	NEPA Magnitude and Direction of Impacts	Mitigation Measures	CEQA Level of Significance After Mitigation
	1, 2, 3	LTS	Emissions would be less than the general conformity *de minimis* thresholds.	---	LTS
	4, 5, 6	S	NOx emissions would be greater than the general conformity *de minimis* thresholds.	MM-AQ-1-4	SU
Impact AQ-6: Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment	No Action	NI	---	---	NI
	1, 2, 3	LTS	GHG emissions would not exceed the significance threshold.	---	LTS
	4, 5, 6	S	GHG emissions would exceed the significance threshold.	MM-AQ-6	LTS
Impact AQ-7: Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of GHGs	No Action	NI	---	---	NI
	1, 2, 3	LTS	GHG emissions would not exceed the significance threshold.	---	LTS
	4, 5, 6	S	GHG emissions would exceed the significance threshold.	MM-AQ-6	LTS
Hazardous Materials and Health and Safety					
Impact HAZ-1: Increase risk of exposure from hazardous materials to the public and construction workers	No Action	NI	---	---	NI
	All Action Alternatives	S	The risk of exposure to the public and construction workers from hazardous materials associated with construction projects would increase.	MM-WQ-2	LTS

Impact	Alternative	CEQA Level of Significance Before Mitigation	NEPA Magnitude and Direction of Impacts	Mitigation Measures	CEQA Level of Significance After Mitigation
Impact HAZ-2: Accidental release of hazardous materials	No Action	NI	---	---	NI
	All Action Alternatives	S	The risk of accidental release of hazardous materials would increase during construction, operation, and maintenance activities.	MM-WQ-1	LTS
Impact HAZ-3: Accidental release of hazardous materials from contaminated soil and/or groundwater	No Action	NI	---	---	NI
	1, 2, 3, 5 (Project), 6	S	The risk of accidental release of hazardous materials from contaminated soil and/or groundwater would increase during construction activities due to proximity of well sites and unknown soil contamination.	MM-HAZ-1	LTS
	4, 5 (Program)	S	The risk of accidental release of hazardous materials from contaminated soil and/or groundwater would increase during construction activities due to proximity of well sites and natural gas pipelines and unknown soil contamination.	MM-HAZ-1, 3	LTS
Impact HAZ-4: Increase the risk of wildfire within the vicinity of the Project area	No Action	NI	---	---	NI
	1, 2, 3, 5, 6	S	The risk of accidental release of wildfire within the vicinity of the project area would increase during construction activities due to sparks or contact between power lines and construction equipment.	MM-HAZ-2	LTS

Impact	Alternative	CEQA Level of Significance Before Mitigation	NEPA Magnitude and Direction of Impacts	Mitigation Measures	CEQA Level of Significance After Mitigation
	4	S	The risk of accidental release of wildfire within the vicinity of the project area would increase during construction activities due to sparks or contact between power lines and construction equipment.	MM-HAZ-2, 3	LTS
Impact HAZ-5: Expose workers to hazardous materials and other safety risks associated with low flying aircraft	No Action	NI	---	---	NI
	All Action Alternatives	LTS	Construction workers could be exposed to pesticides and herbicides.	---	LTS
Impact HAZ-6: Temporarily interfere with emergency response and evacuation plan for the area	No Action	NI	---	---	NI
	All Action Alternatives	LTS	Conflicts with emergency vehicles or evacuation efforts would have a low potential of occurring.	---	LTS
Impact HAZ-7: Public use of Fremont Weir Wildlife Area for hunting or other uses could cause unsafe situations for the public and/or construction workers	No Action	NI	---	---	NI
	All Action Alternatives	S	Construction workers could be exposed unsafe conditions due to hunting or other recreation activities at the FWWA.	MM-REC-1	LTS
Impact HAZ-8: Risk of exposure to mosquito-borne viruses could increase as a result of inundation period expansion in the Yolo Bypass for fish passage and rearing	No Action	NI	---	---	NI
	All Action Alternatives	LTS	Increased inundation periods of the Yolo Bypass would increase the risk of exposure to mosquito-borne viruses.	---	LTS

Impact	Alternative	CEQA Level of Significance Before Mitigation	NEPA Magnitude and Direction of Impacts	Mitigation Measures	CEQA Level of Significance After Mitigation
Noise					
Impact NOI-1: Exposure of persons to or generation of noise and vibration levels in excess of standards established in the local general plan or noise ordinance or applicable standards of other agencies	No Action	NI	---	---	NI
	1, 2, 5	LTS	Noise and vibrations from construction, operation, and maintenance noise could occur, but levels would be consistent with the general plans of Yolo and Sutter counties.	---	LTS
	3, 4, 6	S	Construction noise would not be consistent with the Sutter County General Plan.	MM-NOI-1	SU
Impact NOI-2: Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels	No Action	NI	---	---	NI
	All Action Alternatives	S	Vibrations from loaded haul trucks along the haul routes could exceed the annoyance threshold for adjacent residential receptors during construction and maintenance	MM-NOI-1	SU
Impact NOI-3: A substantial permanent increase in ambient noise levels in the Project vicinity	No Action	NI	---	---	NI
	All Action Alternatives	LTS	Permanent increases in ambient noise levels could occur, but would be minimal.	---	LTS

Impact	Alternative	CEQA Level of Significance Before Mitigation	NEPA Magnitude and Direction of Impacts	Mitigation Measures	CEQA Level of Significance After Mitigation
Impact NOI-4: A substantial temporary or periodic increase in ambient noise levels in the Project vicinity	No Action	NI	---	---	NI
	All Action Alternatives	S	Ambient noise levels for road-side receptors along the haul and commute routes could increase substantially from construction- and maintenance-related traffic.	MM-NOI-1	SU
Impact NOI-5: Exposure of people residing or working in the Project area to excessive noise levels from public or private airports	No Action	NI	---	---	NI
	All Action Alternatives	LTS	People residing or working in the Project area would not be exposed to excessive noise levels from public or private airports.	---	LTS
Population and Housing					
Impact POP-1: Construction-Related Increase in Population and Corresponding Housing Needs	No Action	NI	---	---	NI
	All Action Alternatives	LTS	No new housing or infrastructure would be needed and there would be a negligible impact on population.	---	LTS

Key: APE = area of potential effect; AQMD = Air Quality Management District; B = beneficial; BMP = best management practice; C = construction; CDFW = California Department of Fish and Wildlife; cfs = cubic feet per second; CVP = Central Valley Project; FWWA = Fremont Weir Wildlife Area; GHG = greenhouse gases; HCP = Habitat Conservation Plan; LTS = less than significant; M = maintenance; NCCP = Natural Communities Conservation Plan; NI = no impact; NO_x = nitrogen oxides; O = operations; PM_{10} = inhalable particulate matter; ROG = reactive organic gases; RSP = rock slope protection; RWQCB = Regional Water Quality Control Board; S = significant; SU = significant and unavoidable; SWP = State Water Project; USACE = United States Army Corps of Engineers; WSE = water surface elevation

Table ES-3. Impacts for NEPA-only Resources

Impact	Alternative	Magnitude and Direction of Impacts	Effects Determination
Socioeconomics			
Impact SOC-1: Increase employment, income, and output in the regional economy	No Action	---	No adverse effect
	1	Construction would temporarily increase employment, labor income, and revenue. Maintenance would occur annually and would increase employment, labor income, and revenue.	Construction Impacts: Increase of 366 jobs, $18.8 M in labor income, $55.9 M in revenue Annual Maintenance Impacts: Increase of 6 jobs, $0.4 M in labor income, $0.9 M in revenue
	2	Construction would temporarily increase employment, labor income, and revenue. Maintenance would occur annually and would increase employment, labor income, and revenue.	Construction Impacts: Increase of 585 jobs, $31.2 M in labor income, $87.1 M in revenue Annual Maintenance Impacts: Increase of 6 jobs, $0.4 M in labor income, $1.0 M in revenue
	3	Construction would temporarily increase employment, labor income, and revenue. Maintenance would occur annually and would increase employment, labor income, and revenue.	Construction Impacts: Increase of 620 jobs, $32.7 M in labor income, $82.6 M in revenue Annual Maintenance Impacts: Increase of 6 jobs, $0.4 M in labor income, $1.0 M in revenue
	4	Construction would temporarily increase employment, labor income, and revenue. Maintenance would occur annually and would increase employment, labor income, and revenue.	Construction Impacts: Increase of 876 jobs, $35.7 M in labor income, $123.6 M in revenue Annual Maintenance Impacts: Increase of 8 jobs, $0.4 M in labor income, $1.2 M in revenue
	5 (Project)	Construction would temporarily increase employment, labor income, and revenue. Maintenance would occur annually and would increase employment, labor income, and revenue.	Construction Impacts: Increase of 1,127 jobs, $59.1 M in labor income, $138.9 M in revenue Annual Maintenance Impacts: Increase of 10 jobs, $0.5 M in labor income, $1.6 M in revenue

Impact	Alternative	Magnitude and Direction of Impacts	Effects Determination
	5 (Program)	Construction would temporarily increase employment, labor income, and revenue. Maintenance would occur annually and would increase employment, labor income, and revenue.	Construction Impacts: Increase of 286 jobs, $16.4 M in labor income, $63.0 M in revenue Annual Maintenance Impacts: Increase of 10 jobs, $0.5 M in labor income, $1.6 M in revenue
	6	Construction would temporarily increase employment, labor income, and revenue. Maintenance would occur annually and would increase employment, labor income, and revenue.	Construction Impacts: Increase of 1,045 jobs, $55.6 M in labor income, $152.0 M in revenue Annual Maintenance Impacts: Increase of 11 jobs, $0.5 M in labor income, $1.8 M in revenue
Impact SOC-2: Decrease employment, income, and output in the regional economy resulting from conversion of cropland to nonagricultural use	No Action	---	No adverse effect
	1, 2, 3	Conversion of croplands to nonagricultural use would have adverse effects on the regional economy.	Loss of 0.6 jobs, $33,100 in labor income, $102,300 in revenue; Minor impacts to regional economics due to changes to groundwater levels surrounding the bypass; no effect to forward linkages in the regional economy; potential loss of crop insurance policies or increase in premiums; increase of $1 to $29 per acre in operating costs
	4	Conversion of croplands to nonagricultural use would have adverse effects on the regional economy.	Loss of 1.3 to 1.5 jobs, $68,200 to $88,200 in labor income, $284,500 to $360,700 in revenue; Minor impacts to regional economics due to changes to groundwater levels surrounding the bypass; no effect to forward linkages in the regional economy; potential loss of crop insurance policies or increase in premiums; increase of $1 to $29 per acre in operating costs

Impact	Alternative	Magnitude and Direction of Impacts	Effects Determination
	5 (Project)	Conversion of croplands to nonagricultural use would have adverse effects on the regional economy.	Loss of 0.7 jobs, $39,900 in labor income, $135,200 in revenue; Minor impacts to regional economics due to changes to groundwater levels surrounding the bypass; no effect to forward linkages in the regional economy; potential loss of crop insurance policies or increase in premiums; increase of $1 to $29 per acre in operating costs
	5 (Program)	---	No effect
	6	Conversion of croplands to nonagricultural use would have adverse effects on the regional economy.	Loss of 0.9 jobs, $50,500 in labor income, $150,700 in revenue; Minor impacts to regional economics due to changes to groundwater levels surrounding the bypass; no effect to forward linkages in the regional economy; potential loss of crop insurance policies or increase in premiums; increase of $1 to $29 per acre in operating costs
Impact SOC-3: Changes to water supply to North of Delta and South of Delta contractors affecting the regional economy	No Action	---	No adverse effect
	1, 2, 3, 4, 5 (Project), 6	Reductions would not be substantial enough to warrant water rate increases that could affect the regional economy.	Infrequent, less than 1% reduction in monthly deliveries
	5 (Program)	---	No effect
Environmental Justice			
Impact EJ-1: Exposure of a minority and/or low-income population to adverse and disproportionately high effects or hazards from project construction	No Action	---	No Impact
	All Action Alternatives	Adverse and disproportionately high noise and air quality impacts would not occur to the minority populations surrounding the Project area due to construction.	Adverse and Disproportionate Effect Would Not Occur

Impact	Alternative	Magnitude and Direction of Impacts	Effects Determination
Impact EJ-2: Conversion of cropland to nonagricultural use could result in a disproportionately high effect on minority and/or low-income employment	No Action	---	No Impact
	All Action Alternatives	The conversion of croplands to a non-production state would result in a marginal (<1%) reduction in farmworker jobs, which are held largely by minority and low-income groups.	Adverse and Disproportionate Effect Would Not Occur
Impact EJ-3: Project construction activities and annual maintenance could increase minority and/or low-income employment.	No Action	---	No impact
	All Action Alternatives	Construction activities would create temporary jobs that would be supplied by workers in Yolo, Sutter, Solano, and Sacramento counties, which could include those in Census Tracts 101.02, 112.06, and 114, all of which have minority populations over 50 percent.	Beneficial
Impact EJ-4: Project actions could reduce educational opportunities offered in the YBWA on low-income students	No Action	---	No Impact
	All Action Alternatives	The reduction in the number of field trips available at the YBWA could affect up to 30 percent of Title 1 schools in DJUSD and up to 57 percent of Title 1 schools in SCUSD.	Adverse and Disproportionate Effect Could Occur

Key: DJUSD = Davis Joint Unified School District; M = million; SCUSD = Sacramento City Unified School District; YBWA = Yolo Bypass Wildlife Area

All alternatives would have beneficial impacts for resources FISH-12.

Table ES-4 presents beneficial impacts unique to specific action alternatives.

Table ES-4. Beneficial Impacts Unique to Specific Alternatives

Impact	Alternatives with Beneficial Impacts
Impact FISH-14: Impacts to Aquatic Primary and Secondary Production in the Study Area	No Action
Impact FISH-15: Impacts to Fish Species of Focused Evaluation due to changes in Adult Fish Passage Conditions through the Yolo Bypass	No Action, 1,2,3,5

Impacts WQ-2, CULT-3, AQ-1, AQ-2, NOI-2, and NOI-4 would be significant and unavoidable under all action alternatives. Table ES-5 presents significant and unavoidable impacts unique to specific action alternatives.

Table ES-5. Significant and Unavoidable Impacts to Specific Alternatives

Impact	Alternatives with Significant and Unavoidable Impacts
Impact FISH-15: Impacts to Fish Species of Focused Evaluation due to changes in Adult Fish Passage Conditions through the Yolo Bypass	6
Impact FISH-16: Impacts to Fish Species due to changes in Potential for Stranding and Entrainment	4
Impact FISH-17: Impacts to Fish Species due to changes in Potential for Predation	4
Impact FISH-21: Impacts to Fish Species of Focused Evaluation and Fisheries Habitat Conditions due to Tule Canal Floodplain Improvements (Program Level)	5
Impact CULT-4: Damage to Buried Human Remains	5 (Program)
Impact AGR-2: Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, which may also be protected under the Williamson Act or other conservation programs, to nonagricultural or incompatible uses	4
Impact AQ-5: Generate criteria pollutants greater than general conformity *de minimis* thresholds	4,5,6
Impact NOI-1: Exposure of persons to or generation of noise and vibration levels in excess of standards established in the local general plan or noise ordinance or applicable standards of other agencies.	3,4,6

Impacts with the potential to result in a cumulatively considerable contribution to a significant cumulative impact are shown in Table ES-6.

Table ES-6. Impacts of Action Alternatives with the Potential to Result in a Cumulatively Considerable Incremental Contribution to a Significant Cumulative Impact

Resource Area	Impact
Water Quality	Impacts associated with methylmercury in the Yolo Bypass are expected to be a cumulatively significant impact, and the increased inundation from the Project would be cumulatively considerable.
Aquatic Resources and Fisheries	Increasing levels of juvenile Chinook salmon stranding and predation above existing levels could reduce survival of juvenile Chinook salmon rearing in the Yolo Bypass under Alternatives 4 and 5. Decreasing the suitability of adult fish passage conditions through the Yolo Bypass for green and white sturgeon, Chinook salmon, and steelhead under Alternative 6 could increase mortality of adults and reduce spawning success.
Cultural Resources	Large-scale ground disturbing projects could contribute to the loss of archaeological sites that have not been identified through inventory efforts.
Air Quality and Greenhouse Gases	Several related and reasonably foreseeable projects and actions may result in air quality and greenhouse gas impacts in the Project area. Additional construction equipment in the area of analysis would increase criteria pollutant and greenhouse gas emissions. Annual emissions associated with the construction of the action alternatives would be individually significant.
Noise	Improvements to the Southern Water Control Structure and fish bypass channel and the Tule Canal Floodplain that would occur in the Lower Elkhorn Basin (Alternatives 4 and 5) would be cumulatively considerable.

ES.9 References

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Appendices

Tables

Figures

List of Abbreviations and Acronyms

µg/L	micrograms per liter
µg/m^3	micrograms per cubic meter
µS/cm	microSiemens per centimeter
A	ampere
AADT	annual average daily traffic
AASHTO	American Association of State Highway Transportation Officials
AB	Assembly Bill
ACS	American Community Survey
AEP	annual exceedance probability
AF	acre-feet
AFRP	Anadromous Fish Restoration Program
AP	air pollutant
APE	area of potential effects
AQMD	Air Quality Management District
ARCFP	American River Common Features Project
ARPA	Archaeological Resources Protection Act
ATCM	Airborne Toxic Control Measure
BACT	best available control technology
Banks	Harvey O. Banks Pumping Plant
Bay-Delta	San Francisco Bay/Sacramento-San Joaquin Delta
BCC	birds of conservation concern
BDCP	Bay-Delta Conservation Plan
BEP	Business Emergency Plan
bgs	below ground surface
BMO	basin management objective
BMP	best management practice
BO	biological opinion
BPM	Bypass Production Model
BWFS	Basin-Wide Feasibility Study
°C	degrees Celsius
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standard
CalEPA	California Environmental Protection Agency
Cal-IPC	California Invasive Plant Council
CalEEMod	California Emissions Estimator Model
CALFED	CALFED Bay-Delta Program
CAL FIRE	California Department of Forestry and Fire Protection
Cal OES	California Governor’s Office of Emergency Services
Cal OSHA	California Occupational Safety and Health Administration (
CalParks	California Department of Parks and Recreation

CalRecycle	California Department of Resources Recycling and Recovery
Caltrans	California Department of Transportation
CAPCOA	California Air Pollution Control Officers Association
CARB	California Air Resources Board
CASGEM	California Statewide Groundwater Monitoring
CBD	Colusa Basin Drain
CCAA	California Clean Air Act
CCCC	California Climate Change Center
CCF	Clifton Court Forebay
CCP	Comprehensive Conservation Plan
CCR	California Code of Regulations
CCSM	National Center for Atmospheric Research Community Climate System Model
CDC	California Debris Commission
CDEC	California Data Exchange Center
CDFA	California Department of Food and Agriculture
CDFG	California Department of Fish and Game
CDFW	California Department of Fish and Wildlife (after January 1, 2013)
CDPH	California Department of Public Health
CDPR	California Department of Pesticide Regulation
CEC	California Energy Commission
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CESA	California Endangered Species Act
CFCP	California Farmland Conservancy Program
CFR	Code of Federal Regulations
cfs	cubic foot per second
CGPS	continuous global positional system
CGS	California Geological Survey
CH_4	methane
CHRIS	California Historical Resources Information System
cm	centimeters
cms	cubic meter per second
CNDDB	California Natural Diversity Database
CNEL	Community Noise Equivalent Level
CNPS	California Native Plant Society
CNRA	California Natural Resources Agency
CNRM	Centre National de Recherches Meteorologiques
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent

COA	Coordinated Operations Agreement
CPUC	California Public Utilities Commission
CR	County Road
CRHR	California Register of Historical Resources
CRMP	Construction Risk Management Plan
CRPR	California Rare Plant Rank
CUPA	Certified Unified Program Agency
CVFMP	Central Valley Flood Management Planning
CVFPB	Central Valley Flood Protection Board
CVFPP	Central Valley Flood Protection Plan
CVHM	Central Valley Hydrologic Model
CVHS	Central Valley Hydrology Study
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
CWA	Clean Water Act
CWC	California Water Commission
CY	cubic yards
dB	decibel
dBA	A-weighted decibel
DMC	Delta-Mendota Canal
DDT	dichloro-diphenyl-trichloroethane
Delta	Sacramento-San Joaquin Delta
DFG	California Department of Fish and Game (prior to January 1, 2013)
DJUSD	Davis Joint Unified School District
DO	dissolved oxygen
DOC	California Department of Conservation
DOGGR	California Department of Conservation, Division of Oil, Gas, and Geothermal Resources
DOI	United States Department of the Interior
DOT	United States Department of Transportation
DPC	Delta Protection Commission
DPM	diesel particulate matter
DPR	California Department of Parks and Recreation
DPS	distinct population segment
DSC	Delta Stewardship Council
DTSC	California Department of Toxic Substances Control
DWR	California Department of Water Resources
DWSC	Deep Water Ship Canal
EC	electrical conductivity
EDD	California Employment Development Department
EDR	Environmental Data Resources
EFH	Essential Fish Habitat
EHD	Environmental Health Department
E/I ratio	Export/Inflow ratio
EIR	Environmental Impact Report

EIS	Environmental Impact Statements
ELAM	Eulerian-Lagrangian Agent Method
EMS	Emergency Medical Services
EO	Executive Order
EPOM	Environmental Permitting for Operations and Maintenance
ER	Environmental Resource
ESA	Endangered Species Act
ESRP	Endangered Species Recovery Program
Estuary	San Francisco Bay/Sacramento-San Joaquin River Delta Estuary
ESU	evolutionarily significant unit
°F	degrees Fahrenheit
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FETT	Fisheries and Engineering Technical Team
FHWA	Federal Highway Administration
FL	fork length
FMMP	Farmland Mapping and Monitoring Program
FPD	Fire Protection District
FR	Federal Regulation
FSZ	Farmland Security Zone
ft/sec	feet per second
FHWG	Fisheries Hydroacoustic Working Group
FTA	Federal Transit Authority
FWCA	Fish and Wildlife Coordination Act
FWWA	Fremont Weir Wildlife Area
GAMA	Groundwater Ambient Monitoring and Assessment
GCID	Glenn Colusa Irrigation District
GCM	global climate model
GGERP	Greenhouse Gas Emissions Reduction Plan
GHG	greenhouse gas
GIS	geographic information system
GMP	Groundwater Management Plan
gpm	gallons per minute
GPS	Global Positioning System
GRR	General Reevaluation Report
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
GWP	global warming potential
HAER	Historic American Engineering Record
HAP	hazardous air pollutant
HCM	Highway Capacity Manual
HCP	Habitat Conservation Plan
HD	United States House Document
HDR	HDR, Inc.

HEC-RAS	Hydrologic Engineering Center River Analysis System
Hg	mercury
HGWP	high global warming potential
HHW	household hazardous waste
HMBP	Hazardous Materials Business Plan
HMMP	Hazardous Materials Management Plan
hp	horsepower
HPS	Hantavirus Pulmonary Syndrome
Hz	hertz
I	Interstate
IMPLAN	Impact Planning and Analysis
in/sec	inches per second
IS/EA	Initial Study/Environmental Assessment
ITA	Indian Trust Asset
IWM	instream woody material
Jones	C.W. "Bill" Jones Pumping Plant
JPOD	joint points of diversion
KLOG	Knights Landing Outfall Gates
km	kilometer
km^2	square kilometer
kVA	kilovolt-amps
kW	kilowatt
lbs/ton	pounds per ton
lbs/VMT	pounds per vehicle mile traveled
LEBLS	Lower Elkhorn Basin Levee Setback Project
LESA	Land Evaluation and Site Assessment
LIER	Liberty Island Ecological Reserve
LMP	Land Management Plan
LOD	level of development
LOS	level of service
LSZ	low-salinity zone
LURMP	Land Use and Resources Management Plan
Lv	vibration velocity level
m	meter
M&I	municipal and industrial
MAF	million acre-feet
MBTA	Migratory Bird Treaty Act
MCL	maximum contaminant level
MeHg	methylmercury
mg/L	milligrams per liter
mg/m^3	milligrams per cubic meter
MIG	Minnesota IMPLAN Group
MLD	most likely descendent
mm	millimeter
MM	mitigation measure

MMRP	Mitigation Monitoring and Reporting Program
$MMTCO_2e$	million metric tons CO_2 equivalent
MOU	memorandum of understanding
mph	miles per hour
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
$MTCO_2e$	metric tons CO_2e
MVCAC	Mosquito and Vector Control Association of California
MVCD	Sacramento-Yolo Mosquito & Vector Control District
MWD	Metropolitan Water District of Southern California
N_2O	nitrous oxide
NAA	nonattainment area
NAAQS	National Ambient Air Quality Standard
NAGPRA	Native American Graves Protection and Repatriation Act
NAHC	Native American Heritage Commission
NAVD 88	North American Vertical Datum of 1988
NAWCA	North America Wetlands Conservation Act
NAWMP	North American Waterfowl Management Plan
NAWQA	National Water Quality Assessment Program
NCADAC	National Climate Assessment and Development Advisory Committee
NCAR	National Center for Atmospheric Research
NCCP	Natural Communities Conservation Plan
NCP	Noise Control Plan
NDOI	Net Delta Outflow Index
NEPA	National Environmental Policy Act
ng/L	nanograms per liter
NGO	non-governmental organization
NHPA	National Historic Preservation Act
NMFS	National Oceanic and Atmospheric Administration National Marine Fisheries Service
NMFS BO	Biological Opinion and Conference Opinion on the Long-Term Operations of the Central Valley Project and State Water Project
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
NOAA	National Oceanic and Atmospheric Administration
NOD	Notice of Determination
NOI	Notice of Intent
NOP	Notice of Preparation
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places

NTU	nephelometric turbidity unit
NVCP	Noise and Vibration Control Plan
O_3	ozone
O&M	operation and maintenance
OES	Office of Emergency Services
OHWM	ordinary high water mark
OMR	Old and Middle River
OPR	Office of Planning and Research
OSHA	United States Department of Labor, Occupational Safety and Health Administration
Pb	lead
PCB	polychlorinated biphenyl
PCM	Parallel Climate Model
PG&E	Pacific Gas and Electric Company
PLC	programmable logic controller
$PM_{2.5}$	fine particulate matter, particles up to 2.5 microns
PM_{10}	coarse particulate matter, particles up to 10 microns
Porter-Cologne Act	Porter-Cologne Water Quality Control Act
ppb	parts per billion
ppm	parts per million
ppt	parts per thousand
PPV	peak particle velocity
PRC	Public Resources Code
Project	Yolo Bypass Salmonid Habitat Restoration and Fish Passage Project
RBDD	Red Bluff Diversion Dam
RBPP	Red Bluff Pumping Plant
RCRA	Resource Conservation and Recovery Act
RD	Reclamation District
RD 1641	Revised Decision 1641
Reclamation	United States Department of the Interior, Bureau of Reclamation
RM	river mile
ROD	Record of Decision
ROG	reactive organic gases
ROW	right-of-way
RPA	Reasonable and Prudent Alternative
RSP	rock slope protection
RST	rotary screw trap
RWMP	Regional Flood Management Plan
RWQCB	Regional Water Quality Control Board
SACOG	Sacramento Area Council of Governments
SARA	Superfund Amendments and Reauthorization Act
SB	Senate Bill
SBM	Salmon Benefits Model
SBWA	Sacramento Bypass Wildlife Area

SCH	State Clearinghouse
SCORP	Statewide Comprehensive Outdoor Recreation Plan
SCUSD	Sacramento City Unified School District
SCVWD	Santa Clara Valley Water District
SD 18	Swampland District No. 18
SDWA	Safe Drinking Water Act
Secretary	Secretary of the Interior
SEL	sound exposure level
SFCWA	State and Federal Contractors Water Agency
SGMA	Sustainable Groundwater Management Act
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SMARA	Surface Mining and Reclamation Act of 1975
SMP	Suisun Marsh Plan
SNE	Sacramento Northern Electric
SO_2	sulfur dioxide
SO_x	sulfur oxides
SP	State Park
SPCCP	Spill Prevention, Control, and Countermeasure Plan
SPFC	State Plan of Flood Control
SPOA	Survey on Public Opinions and Attitudes on Outdoor Recreation
SR	State Route
SRA	shaded riverine aquatic
SRBPP	Sacramento River Bank Protection Project
SRFCP	Sacramento River Flood Control Project
SRGRR	Sacramento River General Reevaluation Report
SRH-2D	Sedimentation and River Hydraulics – Two Dimensional Model
SSC	Species of Special Concern
SSIA	State Systemwide Investment Approach
State	State of California
SVAB	Sacramento Valley Air Basin
SVI	Sacramento Valley Index
SWP	State Water Project
SWPPP	Stormwater Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TAC	toxic air contaminant
TAF	thousand acre-feet
TAF/yr	thousand acre-feet per year
TCP	traditional cultural property
TDS	total dissolved solids
Term 91	Standard Permit Term 91
TMDL	total maximum daily load
TN	ton
tpd	tons per day

tpy	tons per year
TSCA	Toxic Substances Control Act
TUFLOW	Two-Dimensional Unsteady Flow Model
UCCE	University of California Cooperative Extension
UC Davis	University of California at Davis
USACE	United States Army Corps of Engineers
USC	United States Code
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UST	underground storage tank
VAC	volts alternating current
VdB	vibration decibels
VOC	volatile organic compound
vs	versus
VSP	viable salmonid population
WQCP	Water Quality Control Plan
WRDA	Water Resources Development Act
YBFEPT	Yolo Bypass Fisheries Enhancement Planning Team
YBPASS Tool	Yolo Bypass Passage for Adult Salmonids and Sturgeon Tool
YBWA	Yolo Bypass Wildlife Area
YCP	Yolo Conservation Plan
YHC	Yolo Habitat Conservancy

1 Introduction

The Yolo Bypass Salmonid Habitat Restoration and Fish Passage Project (Project) has been developed to improve fish passage and increase floodplain fisheries rearing habitat in the Yolo Bypass and the lower Sacramento River basin. The United States Department of the Interior, Bureau of Reclamation (Reclamation), as the Federal lead agency under the National Environmental Policy Act (NEPA), and the California Department of Water Resources (DWR), as the State of California (State) lead agency under the California Environmental Quality Act (CEQA), have prepared this joint Draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR) to assess impacts of the Project. The Project actions would implement Reasonable and Prudent Alternative (RPA) action I.6.1 and, in part, RPA action I.7, as described in the 2009 National Oceanic and Atmospheric Administration National Marine Fisheries Service (NMFS) *Biological Opinion and Conference Opinion on the Long-Term Operations of the Central Valley Project and State Water Project* and the 2012 Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan (Reclamation and DWR 2012).

Authority for combined Federal and State documents is provided in Title 40, Code of Federal Regulations (CFR), Sections 1502.25, 1506.2, and 1506.4 (Council on Environmental Quality's Regulations for Implementing NEPA [CEQ Regulations]) and California Code of Regulations (CCR) Title 14, Division 6, Chapter 3 (State CEQA Guidelines), Section 15222 (Preparation of Joint Documents). This document was prepared consistent with United States Department of the Interior regulations specified in 43 CFR, Part 46 (United States Department of the Interior Implementation of NEPA, Final Rule).

This Draft EIS/EIR evaluates reasonably foreseeable potential direct, indirect, and cumulative impacts on the environment that could result from implementing the Project alternatives. In addition, this Draft EIS/EIR includes feasible mitigation measures to avoid, minimize, rectify, reduce, or compensate for adverse impacts.

1.1 Background

Substantial modifications have been made to the historical floodplain of California's Central Valley for water supply and flood control purposes. These activities, and other environmental stressors, have resulted in losses of rearing habitat, migration corridors, and food web production for fish, adversely affecting native fish species that rely on floodplain habitat during part or all of their life history.

DWR is responsible for operating and maintaining the State Water Project (SWP), and Reclamation is responsible for managing the Central Valley Project (CVP). The SWP and CVP are operated in a coordinated manner to deliver water to agricultural, municipal, and industrial contractors throughout California. The NMFS BO, issued on June 4, 2009, concluded that, if left unchanged, CVP and SWP operations are likely to jeopardize the continued existence of four anadromous fish species listed under the Federal Endangered Species Act (ESA): Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley

steelhead, and the Southern Distinct Population Segment (DPS) of North American green sturgeon. In addition, the NMFS BO concluded that operations were likely to destroy or adversely modify designated critical habitat for the four anadromous fish species. The NMFS BO sets forth RPA actions that would allow CVP and SWP operations to remain in compliance with the ESA.

The NMFS BO identified activities in RPA actions I.7 and I.6.1 to improve fish passage and habitat restoration actions in the lower Sacramento River basin, including the Yolo Bypass. The Yolo Bypass, which currently experiences at least some flooding in approximately 70 percent of years (Nurmi 2017), retains many characteristics of the historical floodplain habitat that are favorable to various fish species. Implementation of the RPA actions would expand the availability of floodplain rearing habitat in the lower Sacramento River basin and improve fish passage in the Yolo Bypass. The primary function of the Yolo Bypass is flood control, with much of it also managed as agricultural land or wetland waterfowl habitat. Major California restoration planning efforts (e.g., CALFED Bay-Delta Program, the Bay Delta Conservation Plan, and California EcoRestore) have identified the Yolo Bypass, as well as other areas, as a prime area of the Sacramento Valley for enhancement of seasonal floodplain fisheries rearing habitat.

The two RPA actions that formed the basis for alternatives considered for analysis in this EIS/EIR are summarized below:

- RPA Action I.6.1: Restore floodplain rearing habitat for juvenile Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley steelhead through increased acreage of seasonal floodplain inundation within the lower Sacramento River basin.
- RPA Action I.7: Reduce migratory delays and loss of salmon, steelhead, and sturgeon at Fremont Weir and other structures in the Yolo Bypass (NMFS 2009).

In addition to the species included in the NMFS BO, two other species designated as California Department of Fish and Wildlife (CDFW) Species of Special Concern may benefit from increased floodplain rearing habitat: Sacramento splittail and Sacramento River fall-run Chinook salmon.

1.2 Purpose and Uses of this EIS/EIR

The purpose of this Draft EIS/EIR is to disclose the potential direct, indirect, and cumulative impacts of implementing any of the Project alternatives, pursuant to RPA Action I.6.1 and, in part, RPA Action I.7, consistent with NEPA and CEQA requirements. This Draft EIS/EIR serves as an informational document for decision makers, public agencies, non-governmental organizations, and the public.

As discussed in Chapter 23.6, DWR has identified Alternative 1 as the preferred alternative for CEQA purposes. DWR's identification of a preferred alternative does not foreclose any alternatives or mitigation measures, however, and any alternative could be selected by the lead agencies following the conclusion of environmental review. Reclamation has not identified a preferred alternative in this Draft EIS/EIR for NEPA purposes. Consistent with CEQ Regulations

40 CFR Part 46.425, the Final EIS/EIR will identify a NEPA preferred alternative for implementation (or alternatives if more than one exists).

1.2.1 NEPA

NEPA provides an interdisciplinary framework for Federal agencies to take environmental factors into account during a decision-making process (42 United States Code 4321, 40 CFR 1500.1). NEPA requires an EIS whenever a proposed major Federal action (e.g., a proposal for legislation or an activity financed, assisted, conducted, or approved by a Federal agency with Federal agency control) significantly affects the quality of the human environment. Section 1508.14 of the CEQ Regulations defines the human environment to include "the natural and physical environment and the relationship of people with that environment."

The EIS, in conjunction with other relevant material, is used by the Federal government to plan actions and make decisions. Section 1502.1 of the CEQ Regulations states that an EIS primarily serves as an action-forcing device to infuse the policies and goals defined in NEPA into ongoing programs and actions of the Federal government. As an informational document, an EIS provides a rigorous and objective evaluation of all reasonable alternatives, full and open disclosure of environmental consequences before agency action, an interdisciplinary approach to project evaluation, identification of measures to mitigate impacts, and an avenue for public and agency participation in decision making (40 CFR 1502.1). NEPA defines mitigation as avoiding, minimizing, rectifying, reducing, or compensating for significant effects of a proposed action (40 CFR 1508.20). NEPA also requires evaluating a proposed action and alternatives at an equal level of detail.

1.2.2 CEQA

The State CEQA Guidelines (14 CCR Section 15064(f)(1)) require that an EIR be prepared whenever a project may result in a significant environmental impact. Section 15064(d) states that "in evaluating the significance of the environmental effect of a project, the lead agency shall consider direct physical changes in the environment which may be caused by the project and reasonably foreseeable indirect physical changes in the environment which may be caused by the project." An EIR is an informational document used to inform public agency decision makers and the public of the significant environmental effects of a project and identify possible ways to mitigate or avoid the significant effects. When determining whether to approve a project, State and local public agencies are required by CEQA to consider the information presented in the EIR.

Section 15126.6(a) of the State CEQA Guidelines also requires that an EIR describe and evaluate a reasonable range of alternatives that feasibly would attain most of the basic project objectives and avoid or substantially lessen any significant impact of the project, as proposed. A range of reasonable alternatives is analyzed to define issues and provide a clear basis for choice among options. CEQA requires that the lead agency consider alternatives that would avoid or reduce one or more of the significant impacts identified for a project in an EIR. The State CEQA Guidelines state that the range of alternatives required to be evaluated in an EIR is governed by the "rule of reason"—the EIR needs to describe and evaluate only those alternatives necessary to permit a reasonable choice and foster informed decision making and informed public participation (Section 15126.6(f)). Consideration of alternatives focuses on those that can either

eliminate significant adverse environmental impacts or reduce them to less-than-significant levels. Alternatives considered in this context may include those that are more costly and those that could impede to some degree the attainment of all project objectives (Section 15126(b)). CEQA does not require alternatives to be evaluated at the same level of detail as the proposed project.

1.2.3 Compliance and Permits Supported by the EIS/EIR

Reclamation and DWR will obtain all necessary permits, as required by law. This EIS/EIR supports the needed permits, petitions, and similar compliance, coordination, and consultation efforts for the proposed Project actions. Permits that may be required are shown in Table 1-1.

Table 1-1. Compliance, Consultation, and Coordination to Be Supported by this EIS/EIR

Applicable Resource	Laws/Regulations/Permits	Regulating Agency/Agencies
Wetlands and Waters of the United States	Section 10 of the Rivers and Harbors Act – Individual or General Permit	United States Army Corps of Engineers (USACE)
	Section 401 of the Clean Water Act – Water Quality Certification or Waiver	Regional Water Quality Control Board
	Section 402 of the Clean Water Act – National Pollutant Discharge Elimination System permit(s)	State Water Resources Control Board and Regional Water Quality Control Board
	Section 404 of the Clean Water Act – Individual or General Permit	USACE
Federally Listed Species	Section 7 of the ESA – Section 7 Consultation	United States Fish and Wildlife Service (USFWS) and NMFS
State Protected Species	California Fully Protected Species	CDFW
Fish and Wildlife Resources	Magnuson-Stevens Fishery Conservation and Management Act	NMFS
	Fish and Wildlife Coordination Act report	USFWS
	Migratory Bird Treaty Act	USFWS
	Bald and Golden Eagle Protection Act	USFWS
	California Endangered Species Act (CESA)	CDFW
	Lake and Streambed Alteration, Section 1602	CDFW
Cultural Resources	National Historic Preservation Act – Section 106 Consultation	State Historic Preservation Officer
Levees and Floodways	Section 14 of the Rivers and Harbors Act (“Section 408”) – Permission	USACE and Central Valley Flood Protection Board (CVFPB)
	Section 208 of the 1954 Flood Control Act	USACE and CVFPB
	Encroachment Permit	CVFPB
Air Quality	Authority to Construct, Permit to Operate	Yolo-Solano Air Quality Management District

1.3 Purpose and Need and Project Objectives

The planning objectives are described in the purpose and need statements (under NEPA) and objectives (under CEQA), which describe the underlying need for and purpose of a project. The purpose statement is a critical part of the environmental review process because it helps to set the overall direction of an EIS/EIR, identify the range of reasonable alternatives, and focus the scope of analysis.

1.3.1 Purpose and Need

The need for action is to address decreased habitat quality in the Sacramento River and an inadequate ability to access higher quality habitat, which has led to a decline in abundance, spatial distribution, and life history diversity for native ESA-listed and CESA-listed fish species. The purpose of the action is to enhance floodplain rearing habitat and fish passage in the Yolo Bypass and/or other suitable areas of the lower Sacramento River basin by implementing RPA action I.6.1 and, in part, RPA action I.7, as described in the NMFS BO, to benefit Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley steelhead, and the Southern DPS of North American green sturgeon.

1.3.2 Project Objectives

The objective of RPA action I.6.1 is to increase the availability of floodplain fisheries rearing habitat for juvenile Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley steelhead. This action can also improve conditions for Sacramento splittail and Central Valley fall-run Chinook salmon. Specific biological objectives include:

- Improve access to seasonal habitat through volitional entry
- Increase access to and acreage of seasonal floodplain fisheries rearing habitat
- Reduce stranding and presence of migration barriers
- Increase aquatic primary and secondary biotic production to provide food through an ecosystem approach

The objective of RPA action I.7 is to reduce migratory delays and loss of fish at Fremont Weir and other structures in the Yolo Bypass. Specific biological objectives include:

- Improve connectivity within the Yolo Bypass for passage of salmonids and green sturgeon
- Improve connectivity between the Sacramento River and the Yolo Bypass to provide safe and timely passage for:
  - Adult Sacramento River winter-run Chinook salmon between mid-November and May when water surface elevations in the Sacramento River are amenable to fish passage
  - Adult Central Valley spring-run Chinook salmon between January and May when water surface elevations in the Sacramento River are amenable to fish passage

- Adult Central Valley steelhead in the event their presence overlaps with the defined seasonal window for other target species when water surface elevations in the Sacramento River are amenable to fish passage
- Adult Southern DPS of North American green sturgeon between February and May when water surface elevations in the Sacramento River are amenable to fish passage

1.4 Responsibilities of Lead Agencies and Responsible Agencies

Reclamation is the lead NEPA agency, and DWR is the lead CEQA agency for this EIS/EIR. As Lead Agencies, Reclamation and DWR will be responsible for completing the Draft and Final EIS/EIR documents, selecting a preferred alternative, approving an alternative, completing the Record of Decision (Reclamation) and Notice of Determination (DWR), implementing the project as ultimately approved, and ensuring completion of all project mitigation measures in the Environmental Commitment Plan/Mitigation, Monitoring, and Reporting Plan. The Lead Agencies will be responsible for obtaining all required approvals and permits necessary to implement the Project.

1.5 Project Area

The Project area includes the lower Sacramento River basin, including the Yolo Bypass, in Sacramento, Solano, Sutter, and Yolo counties, California. Figure 1-1 shows the neighboring local jurisdictions, including the cities of Davis, Sacramento, West Sacramento, and Woodland. Major water bodies and infrastructure located within the Project area include the Sacramento River; Fremont, Sacramento, and Lisbon weirs; Knights Landing Ridge Cut and Wallace Weir; Cache and Putah creeks; Willow Slough Bypass; Tule Canal; and the Toe Drain. Project actions are primarily located along Fremont Weir and within the Fremont Weir Wildlife Area south to Agricultural Road Crossing 1. Some alternatives include additional actions farther south within the Yolo Bypass.

1.5.1 Yolo Bypass

The Yolo Bypass is part of the Sacramento River Flood Control Project, which includes levees, weirs, and bypass facilities that help manage the historic flooding in the Sacramento Valley (DWR 2010). The Yolo Bypass is about a 59,000-acre area that can convey a design flow of 343,000 cubic feet per second, which is about 80 percent of the floodwaters in this area (DWR 2010). Flows enter the Yolo Bypass through Fremont Weir, which is on the Sacramento River just upstream of the confluence with the Feather River, and Sacramento Weir, which is on the Sacramento River just upstream of the confluence with the American River. The water that enters the Yolo Bypass helps protect the cities of Sacramento and West Sacramento from flood flows on the Sacramento River system. Water flows through the Yolo Bypass and into the Cache Slough complex, then joins the Sacramento River just north of Rio Vista.

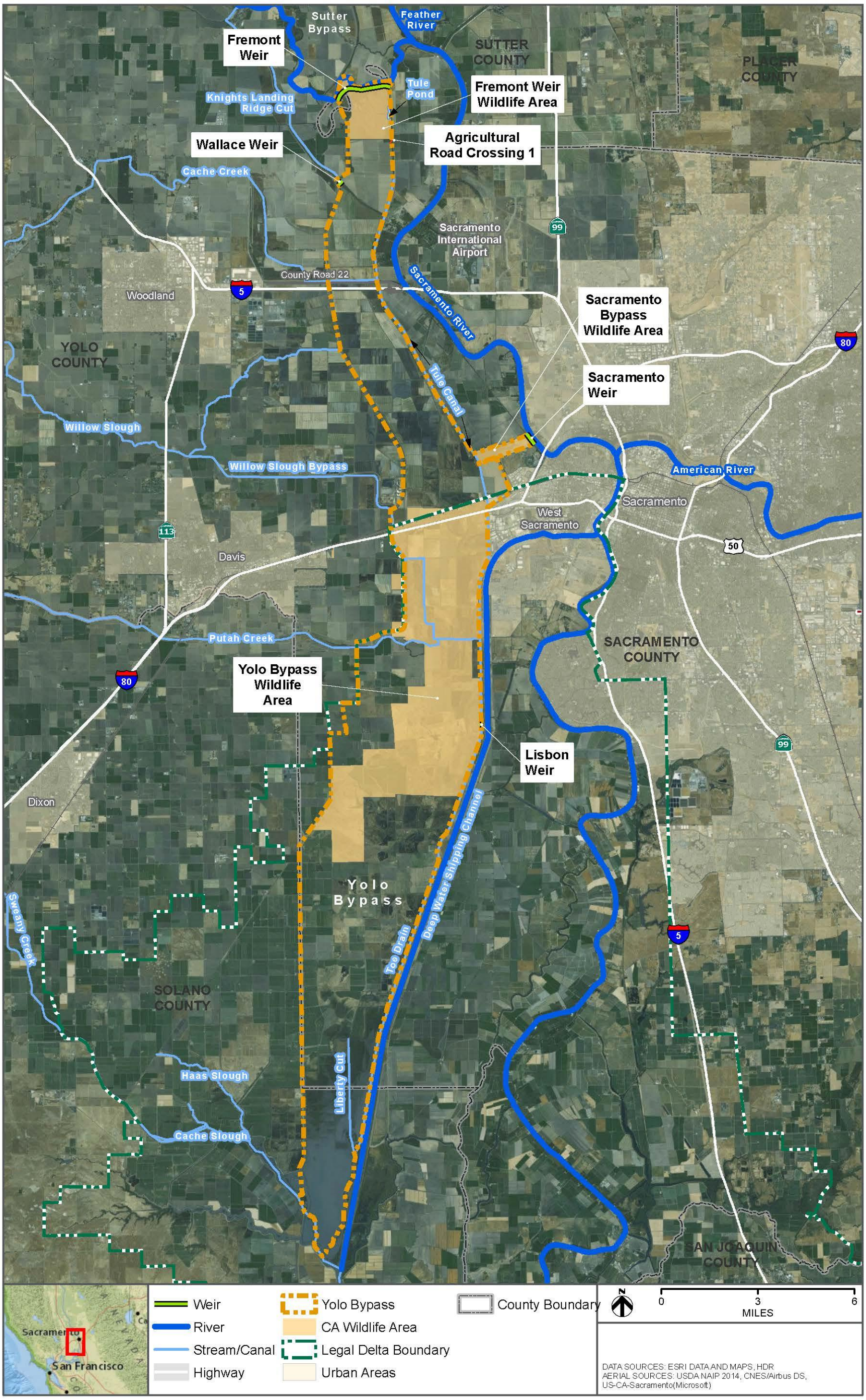

Figure 1-1. Project area

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1.5.2 Fremont Weir

The Fremont Weir is an ungated, fixed-crest, concrete weir measuring 1.8 miles long, 6 feet high, and 35 feet wide, located on the downstream right bank of the Sacramento River. The Fremont Weir was designed to allow flow into the Yolo Bypass during high-flow events when the Sacramento River is higher than the Fremont Weir 32-foot weir crest elevation. The weir is a "J" shaped concrete structure with a 5- to 6-foot high north wall, 25- to 35-foot stilling basin and 1-foot high south wall. The weir was constructed to dissipate flood water energy and reduce erosion. Flood waters overtop the north wall, lose energy, and flow south into the Yolo Bypass. The approximately 1.8-mile weir is bisected at the west side by earthen fill higher than the crest of the weir (referred to as "Rattlesnake Island").

When the Sacramento River stage is two to three feet higher than the weir, passage is possible for salmonids and, to a lesser extent, sturgeon. When the river stage is just barely above the crest of the Fremont Weir, the lack of suitable water depth makes it difficult for salmonids to reach the Sacramento River and likely creates a complete barrier for sturgeon. For fish to volitionally reconnect with the Sacramento River, their arrival at the Fremont Weir must coincide when 1) the Sacramento River stage is high enough to allow fish to swim directly over the crest of Fremont Weir or 2) there is sufficiently deep water flowing through the Fremont Weir fish ladder to allow fish to reconnect with the river.

The Fremont Weir fish ladder is a 4-foot-wide and 6-foot-deep concrete modified Denil-type fish ladder with a crest elevation of 31.8 feet. It is in the process of being replaced with a new fish passage facility to improve fish passage after a Fremont Weir overtopping event (through the Fremont Weir Adult Fish Passage Modification Project, implemented under EcoRestore).

1.5.3 Sacramento Weir

Sacramento Weir is located along the right bank of the Sacramento River approximately two miles upstream from the mouth of the American River. Its primary purpose is to protect the City of Sacramento from excessive flood stages in the Sacramento River channel downstream of the American River. The weir limits flood stages (water surface elevations) in the Sacramento River to project design levels through the Sacramento/West Sacramento area. It is 1,920 feet long and consists of 48 gates that divert Sacramento and American rivers' floodwaters to the west down the mile-long Sacramento Bypass to the Yolo Bypass. The Sacramento Weir obstructs fish passage.

1.5.4 Tule Pond

Tule Pond is an approximately 20-acre perennial pond in the Yolo Bypass located about 13 miles north of Interstate (I) 80. It is likely that the pond is sustained by multiple sources, including impounded floodwater, leakage from an agricultural canal at its southern end, and groundwater.

Following overtopping events, adult sturgeon have been observed and rescued in Tule Pond (CDFW 2016). These stranded fish may have attempted to migrate upstream on the tail-end of a Fremont Weir overtopping event, which left them unable to navigate closer to Fremont Weir. Another possibility is that these stranded fish successfully made it to Fremont Weir but were unable to ascend the weir and retreated to Tule Pond.

1.5.5 Agricultural Road Crossing 1

Agricultural Road Crossing 1, which is the northernmost agricultural road crossing in Tule Canal at the southeastern corner of the Fremont Weir Wildlife Area (see Figure 1-1), serves as a vehicular crossing and a water delivery feature. The crossing consists of two earthen berms, with the southern used as the road crossing. Together the berms create a cross canal that conveys water across the Yolo Bypass from Wallace Weir to two 36-inch culverts that pass through the Yolo Bypass east levee. The culverts deliver water via gravity flow into the Elkhorn area for agricultural use.

The cross-canal berms are flow barriers in Tule Canal. The top of the berm has an elevation of approximately 21 feet, which backs up water originating from the Knights Landing Ridge Cut for conveyance east into the northern Elkhorn Basin. This cross-canal berm leaks in some years, which provides water inflow to the upstream wooded area and Tule Pond. Additionally, when overtopping of Fremont Weir ends and flows recede, the cross-canal berm continues to impound water to the north. The local landowners make periodic repairs to the cross canal to maintain functionality.

The cross-canal berms and road crossing create a migratory barrier for adult salmonids and sturgeon under low flows, which results in fish stranding. In addition, adult fish that are able to migrate upstream of the cross-canal berms become stranded in Tule Pond and are not able to migrate downstream to the Wallace Weir Fish Rescue Facility. After overtopping flows recede beneath the crest of Fremont Weir, the area upstream of Agricultural Road Crossing 1 has the potential to become isolated from Tule Canal and Tule Pond, resulting in stranding and the need for fish rescue at Fremont Weir.

1.5.6 Tule Canal

Tule Canal is a channel along the east side of the Yolo Bypass, which begins south of Agricultural Road Crossing 1. Tule Canal receives water from westside tributaries (Knights Landing Ridge Cut and Cache Creek, as shown on Figure 1-1), groundwater contributions, and agricultural diversions almost year-round. Tule Canal also drains the initial flows from the Sacramento River when the river rises above the crest of Fremont Weir.

There are four earthen agricultural road crossings/impoundments in Tule Canal that control water and provide access for vehicles and farming equipment from the Yolo Bypass east levee road to the agricultural fields. The crossings are commonly referred to as Agricultural Road Crossings 1, 2, 3, and 4 (from north to south). These structures control water during the agricultural season but sometimes wash out during overtopping events. Agricultural Road Crossings 2, 3, and 4 are being removed or replaced to provide fish passage by separate projects.

Adult salmonids and sturgeon may experience delays if they encounter Agricultural Road Crossing 1 at lower flows when the crossing may not be submerged. The agricultural road crossing becomes submerged during higher flow conditions, such as when Fremont Weir overtops, eventually allowing salmonids or sturgeon to move beyond them. Adult and juvenile migratory fish, including salmonids and sturgeon, may become trapped upstream of the crossing as higher flows recede.

Fremont Weir receding flows drain into Tule Canal and continue to provide attraction flows for fish in the Yolo Bypass after fish passage connectivity to the Sacramento River is compromised, which also contributes to stranding in this area (CDFW 2016).

1.5.7 Toe Drain

The Tule Canal becomes the Toe Drain south of the I-80 Yolo Causeway. The perennially wetted Toe Drain extends south approximately 20 miles and becomes increasingly tidal as it connects with Cache Slough. The water elevation in the Toe Drain is affected by tidal actions as far north as I-80 and the water surface elevation fluctuates zero to four feet a few hundred feet south of the Lisbon Weir (California Department of Fish and Game 2008).

The Toe Drain receives water from the Tule Canal, westside tributaries (Willow Slough Bypass and Putah Creek, as shown on Figure 1-1), groundwater contributions, and agricultural diversions almost year-round. During non-flooded periods, sturgeon and migrating adult salmonids are contained in the Toe Drain from where they enter at the south end of the Yolo Bypass. Fish are likely drawn into the Yolo Bypass initially by the tidal flux that occurs near Cache Slough but could be attracted farther north into the Yolo Bypass because of flow in the Toe Drain originating from westside tributaries and the Sacramento River.

1.5.8 Lisbon Weir

Lisbon Weir is the southernmost water-control structure that crosses the Toe Drain. Lisbon Weir provides higher and more stable water levels to water users north of the weir. The weir is composed of an earthen island, a rock weir, and flap gates. The main part of the weir is on the east side of the earthen island, which includes the rock weir reinforced on the downstream side with sheet piling. On the west side of the earthen island, there is a structure with tidally operated flap gates open during the flood tide to allow freshwater input to the Toe Drain and closed to impound water on the ebb tide. Lisbon Weir blocks the channel and limits the range of tidal fluctuation upstream of the weir. The weir operates passively by impounding upstream inflows and tidal water at a minimum elevation that is equal to the weir crest elevation. At high tide, the weir is completely submerged, but at low tide the water surface elevation can be 2.5 feet below the weir crest and impede fish passage. Lisbon Weir is being modified to improve fish passage as part of a separate project.

1.6 Public Involvement and Issues of Known Controversy

1.6.1 Public Scoping

The Lead Agencies conducted public and stakeholder outreach activities to engage all interested parties and inform them of Project activities. Reclamation initiated the NEPA process by issuing a Notice of Intent on March 4, 2013 to prepare an EIS and hold public scoping meetings. DWR initiated the CEQA process by issuing a Notice of Preparation on the same date to prepare an EIR and hold public scoping meetings. Reclamation and DWR accepted scoping comments throughout the public scoping period of March 4 through May 6, 2013.

The Lead Agencies held public scoping meetings on March 14, 2013 in the cities of West Sacramento and Woodland, California. During the scoping meetings and throughout the public scoping comment period, Reclamation and DWR accepted comments to help determine the range of alternatives, the environmental effects, and the mitigation measures to be considered in this EIS/EIR. Comments and suggestions regarding alternatives were documented in the Public Scoping Report published in July 2013 (Reclamation and DWR 2013).

Public and stakeholder involvement and outreach activities have continued since 2013 and have enabled the Lead Agencies to successfully involve stakeholders and incorporate public and stakeholder input into the development of this Draft EIS/EIR. These activities have sought to create an open and transparent process through which the public, stakeholders, and other interested parties can track and participate in Project activities, including the formulation of alternatives for this Draft EIS/EIR. Chapter 2, *Description of Alternatives*, describes stakeholder involvement in the alternatives formulation process in more detail, and Chapter 24, *Consultation and Coordination*, includes more details about general stakeholder and agency involvement.

1.6.2 Issues of Known Controversy

Key issues raised during and throughout the public scoping process that warrant inclusion in the EIS/EIR are listed below.

- **Fish**.
  - The Project could affect how many fish enter the Yolo Bypass. The EIS/EIR should establish a target of how many additional fish to include in the Yolo Bypass and analyze how well each alternative meets that target. The analysis should estimate fish passage performance and juvenile entrainment performance.
  - There are concerns regarding increased inundation periods and how shallow water habitats could expose fish to warm weather conditions during the months of January to May, creating a potentially uninhabitable environment. Increased water temperatures within the Yolo Bypass could also cause increased temperatures downstream in the Sacramento-San Joaquin Delta (Delta).
  - The fish stage that would most benefit from rearing habitat would be younger juveniles (fry and parr), but these fish are generally too small to tag and track during scientific investigations. Many studies track movement of larger juveniles (smolts) as a proxy for fry and parr, but it is uncertain if the smolts behave in the same way.
- **Terrestrial Resources.**
  - Changing the inundation pattern of the Yolo Bypass could reduce habitat for waterfowl that need a specific depth for foraging. The EIS/EIR should evaluate the change in habitat for waterfowl and other migratory birds.
  - Increasing the duration and area of inundation could affect terrestrial resources, including the giant garter snake, and must be analyzed in the environmental document.
- **Water Quality**.
  - The Project could affect salt water intrusion in the statutory Delta. The EIS/EIR should analyze the Project alternatives for their influence on salt water intrusion.

  - The alternatives could have the potential to increase methylmercury production within the Yolo Bypass through increases in depth and duration of inundation. The EIS/EIR should examine the potential for resuspension of mercury or methylmercury from in-water work in terms of both overall water quality and the region's compliance with total maximum daily loads.
  - The EIS/EIR should address whether the Project could increase regulations on agricultural drainage into the Yolo Bypass.

- **Agriculture**. Cultivation of crops, particularly rice, could be affected by the seasonal timing of inundation of the Yolo Bypass. Increased inundation could have adverse economic effects to both the landowners and the local economy. The EIS/EIR should consider potential impacts on a scale to understand impacts to individual landowners.
- **Mosquito Vector Control**. The EIS/EIR should evaluate the potential for unintended and secondary effects from late spring flooding that could result in increased mosquito populations.
- **Flood Control**. The EIS/EIR should evaluate the extent to which land-use changes could affect vegetation growth and reduce flood carrying capacity.

1.7 Organization of the EIS/EIR

The Draft EIS/EIR is organized into the following remaining chapters:

- Chapter 2, Description of Alternatives, summarizes the alternatives development process and describes the No Action Alternative and action alternatives.
- Chapter 3, Approach to the Environmental Analysis, presents the NEPA and CEQA requirements for the analysis.
- Chapters 4 through 22 describe the affected environment; evaluation methods; direct, indirect, and cumulative effects of the alternatives; and mitigation measures for environmental resources.
- Chapter 23, Other NEPA/CEQA Required Disclosures, describes irreversible and irretrievable commitment of resources, the relationship between short-term uses and long-term productivity, growth-inducing impacts, and unavoidable adverse impacts.
- Chapter 24, Consultation and Coordination, describes the consultation and outreach activities that have occurred during the EIS/EIR preparation process.
- Chapter 25, List of Preparers, lists the authors and other contributors to the development of the EIS/EIR and their qualifications.

Additional appendices are attached that provide more background and detailed technical information on the analysis conducted for the Draft EIS/EIR.

1.8 References

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