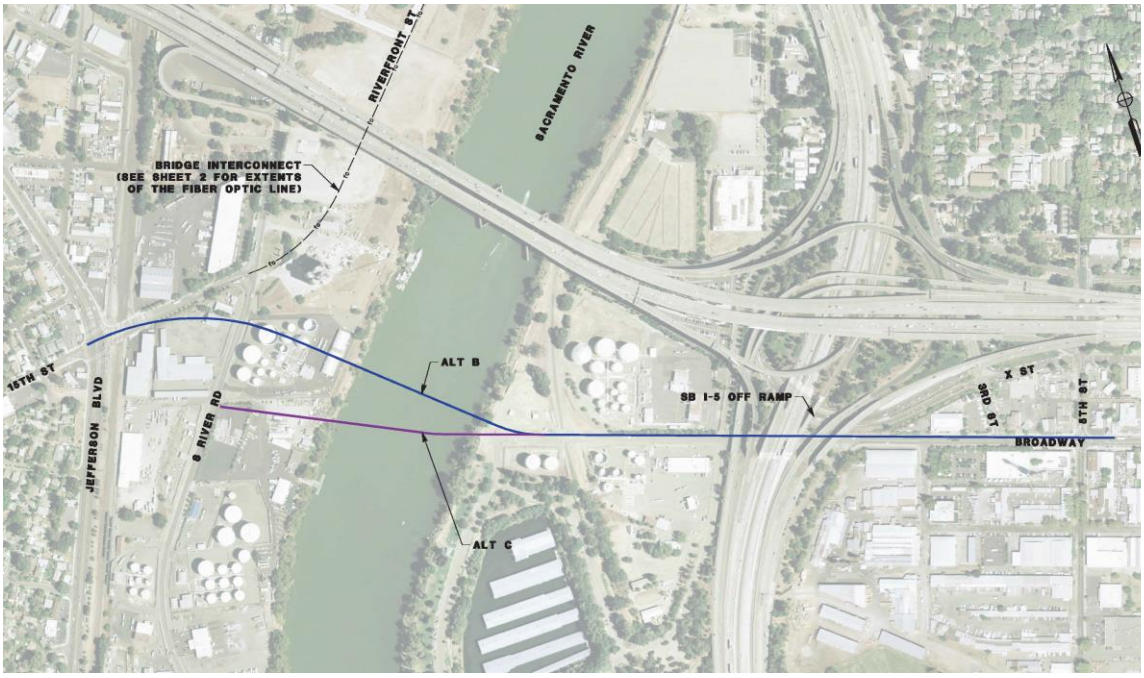

Natural Environment Study

Broadway Bridge Project

City of West Sacramento and City of Sacramento, California

Federal Project No.: TGR2DGL 5447(043)

February 2020

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Prepared By: _____ Date: February 5, 2020

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List of Abbreviated Terms

A	
AASHTO	American Association of State Highway and Transportation Officials
AIS	aquatic invasive species
B	
BA	Biological Assessment
BMPs	best management practices
BSA	biological study area
C	
°C	degrees Celsius
Cal-IPC	California Invasive Plant Council
Caltrans	California Department of Transportation
CCV	California Central Valley
CDFA	California Department of Food and Agriculture
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFGC	California Fish and Game Code
CFR	Code of Federal Regulations
CNDDB	California Natural Diversity Database
CNPPA	California Native Plant Protection Act of 1977
CNPS	California Native Plant Society
CSLC	California State Lands Commission
CV	Central Valley
CVFPB	Central Valley Flood Protection Board
CVFPP	Central Valley Flood Protection Plan
CVP	Central Valley Project
CWA	Clean Water Act
D	
dB	decibel(s)
dbh	diameter at breast height
DJFMP	Delta Juvenile Fish Monitoring Program
DPS	distinct population segment
dsh	diameter at standard height
DWR	California Department of Water Resources
E	
EFH	essential fish habitat
EIR	Environmental Impact Report
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESA	federal Endangered Species Act
ESU	evolutionary significant unit
F	
°F	degrees Fahrenheit
FHWA	Federal Highway Administration
FMP	Fishery Management Plan
FR	Federal Register

G	
GHG	greenhouse gas
H	
HAPC	Habitat Area of Particular Concern
HCP/NCCP	Habitat Conservation Plan/Natural Communities Conservation Plan
HUC	hydrologic unit code
I	
I-5	Interstate 5
IPaC	Information for Planning and Conservation
L	
LSAA	Lake or Streambed Alteration Agreement
M	
MBTA	Migratory Bird Treaty Act
mm	millimeter(s)
MOU	memorandum of understanding
MSA	Magnuson-Stevens Fishery Management and Conservation Act
MTP/SCS	*Metropolitan Transportation Plan/Sustainable Communities Strategy*
N	
NCCP	Natural Community Conservation Plan
NEPA	National Environmental Policy Act
NES	Natural Environment Study
NISC	National Invasive Species Council
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NTU	nephelometric turbidity unit
O	
OHWM	ordinary high water mark
P	
PAH	polycyclic aromatic hydrocarbon
PG&E	Pacific Gas and Electric Company
Porter-Cologne Act	Porter-Cologne Water Quality Control Act
ppt	parts per thousand
R	
RHA	River and Harbors Appropriation Act of 1899
RM	river mile
RMS	root mean square
RSP	rock slope protection
RWQCB	Regional Water Quality Control Board
S	
SACOG	Sacramento Area Council of Governments
SEL	sound exposure level
SPL	sound pressure level
SRA	shaded riverine aquatic
State Water Board	State Water Resources Control Board
SWP	State Water Project
SWPPP	Storm Water Pollution Prevention Plan
T	
TCE	temporary construction easement
TIGER	2014 Transportation Investment Generating Economic Recovery
TMP	Transportation Management Plan

TMP Guidelines	*Transportation Management Plan Guidelines*
TNW	traditional navigable water
U	
ULDC	Urban Levee Design Criteria
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USCG	U.S. Coast Guard
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
V	
VELB	valley elderberry longhorn beetle
W	
WDR	waste discharge requirement

Summary

S.1 Project Description

The City of West Sacramento, in cooperation with the City of Sacramento and the California Department of Transportation (Caltrans), proposes to construct a new bridge over the Sacramento River south of the Pioneer Bridge (US 50) to provide local interconnectivity across the river and between neighborhoods. The new connection would serve multiple modes of transportation and comply with current American Association of State Highway and Transportation Officials (AASHTO), Caltrans, and local agency design standards. The project would be located over the Sacramento River between the cities of West Sacramento and Sacramento, approximately 1,000 feet south of the existing Pioneer Bridge.

The build alternatives under consideration are two alignments for the new bridge and approach roadways.

- Alternative B would realign 15th Street to connect to Jefferson Boulevard in West Sacramento and connect to Broadway at 5th Street in Sacramento. This alignment would require modification to the planned mobility network for South River Road and 15th Street in Pioneer Bluff.
- Alternative C (a modified Alignment C from the Broadway Bridge Feasibility Study) would connect as a "T" intersection to South River Road in West Sacramento and connect to Broadway at 5th Street in Sacramento. This alignment would require modification to the planned mobility network for South River Road in Pioneer Bluff.

S.2 Project Purpose and Need

The purpose of the project is to construct a new bridge to increase the number of river crossings, meet current design standards, increase options for emergency response teams, improve connectivity and accessibility to businesses and recreation opportunities on both sides of the river, reduce traffic on local streets, and reduce greenhouse gas emissions.

The project is needed to reduce trip lengths and encourage walking and bicycling, reduce health effects from pollution, reduce emergency response times, create economic activity and social exchanges, achieve planned urban development and redevelopment of opportunity sites identified in the adopted plans of Sacramento and West Sacramento, use the riverfront for enjoyment and recreation, and to reduce congestion during commuting hours.

S.3 Summary of Impacts on Natural Communities of Special Concern

Two types of natural communities of special concern, cottonwood riparian forest and perennial stream (Sacramento River), were identified and mapped in the biological study area (BSA). The perennial stream and part of the cottonwood riparian forest also are considered waters of the United States and waters of the state. The temporary and permanent impacts on natural communities of special concern, as well as other land cover types, are summarized in Table S-1.

Table S-1. Permanent and Temporary Impacts on Land Cover Types in the Biological Study Area

Impacts by Alternative	Land Cover Type				
	Cottonwood Riparian Forest[a]	Perennial Stream[a]	Ruderal	Landscaped	Total
Alternative B, Interim Year					
Permanent impact (acres)	1.273	0.948	3.063	4.484	9.768
Temporary impact (acres)	0.625	4.211	1.030	1.286	7.152
Alternative B, Design Year					
Permanent impact (acres)	1.273	0.948	3.069	4.484	9.774
Temporary impact (acres)	0.625	4.211	1.030	1.260	7.126
Alternative C, Interim Year					
Permanent impact (acres)	1.290	1.196	2.248	4.819	9.553
Temporary impact (acres)	1.035	4.254	0.871	1.325	7.485
Alternative C, Design Year					
Permanent impact (acres)	1.290	1.196	2.253	4.819	9.558
Temporary impact (acres)	1.035	4.254	0.871	1.299	7.459

[a] These are sensitive natural communities.

S.4 Summary of Impacts on Special-Status Species

S.4.1 Special-Status Plants

The proposed project would not affect special-status plant species based on the negative results of appropriately timed botanical surveys, the lack of suitable habitat for most special-status plant species, the level of disturbance in potential habitat for four species, and the lack of recorded occurrences for any special-status plant species in or within three miles of the BSA.

S.4.2 Special-Status Wildlife

The following potential impacts on special-status wildlife species could result from project construction. Generally, Alternative C would affect more potential habitat for special-status wildlife due to greater impacts on cottonwood riparian forest, perennial stream, and landscaped areas, with only ruderal areas having fewer impacts (Table S-1). Ruderal areas generally provide poor-quality habitat for special-status wildlife.

- Both build alternatives would avoid direct effects on the one elderberry shrub that represents habitat for the valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) (a species federally listed as threatened) but both would affect cottonwood riparian forest habitat. Alternative C would result in slightly greater impacts (0.02 acre more of permanent and 0.41 more of temporary impacts than Alternative B). Both alternatives also could disrupt the species ability to disperse between the elderberry shrub and the nearby cottonwood riparian forest habitat, which could result in injury to or mortality of beetles.
- Western pond turtles (*Emys marmorata*) (a California species of special concern) could be injured or killed by construction equipment and activities under both build alternatives. Construction noise or activity could disturb turtles or cause them to avoid the BSA. Alternative C would affect more cottonwood riparian forest habitat that could be used for nesting and cover (0.02 acre of permanent and 0.41 acre of temporary impacts) and more perennial stream habitat (0.25 acre of permanent and 0.04 acre of temporary impacts) relative to Alternative B.
- Both build alternatives could result in the potential loss or disturbance of nesting Swainson's hawks (*Buteo swainsoni*) (a species state listed as threatened) and white-tailed kite (*Elanus leucurus*) (a species fully protected by the California Fish and Game Code) from construction noise and activity, if nesting in or near the BSA. Alternative C would result in slightly greater impacts on cottonwood riparian forest (0.02 acre of permanent and 0.41 acre of temporary impacts) than Alternative B.
- Construction activities under both build alternatives, such as tree removal and trimming, removal of buildings, and construction noise and vibrations, could result in direct effects on western red bat and pallid bat (designated as California species of special concern), including the destruction of active roosts, loss of roosting habitat, loss of individuals, or roost failure. Alternative C would result in slightly greater impacts on cottonwood riparian forest (0.02 acre of permanent and 0.41 acre of temporary impacts) than Alternative B.

S.4.3 Special-Status Fish

The following potential impacts on special-status fish species could result from project construction:

- Potential adverse effects on Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawytscha*), Central Valley spring-run Chinook salmon (*O. tshawytscha*), Central Valley fall/late fall–run Chinook salmon (*O. tshawytscha*), Central Valley steelhead (*O. mykiss*), North American green sturgeon (*Acipenser medirostris*), delta smelt (*Hypomesus transpacificus*), longfin smelt (*Spirinchus thaleichthys*), white sturgeon (*Acipenser transmontanus*), Sacramento splittail (*Pogonichthys macrolepidotus*), Sacramento hitch (*Lavinia exilicauda exilicauda*), hardhead (*Mylopharodon conocephalus*), Pacific lamprey (*Entosphenus tridentata*), and western river lamprey (*Lampetra ayresii*) from underwater noise produced by pile driving and other in-water activities, increased turbidity and sedimentation, and potential discharges of or exposure to contaminants.

- Temporary disturbance to aquatic habitat (substrate and water column) for all fish species equal to the cumulative substrate area and water column habitat disturbed and displaced, respectively, from installing temporary trestle and barge (spud) piles and cofferdams (Table S-2).
- Permanent loss of aquatic habitat (substrate and water column) in the BSA for all fish species equal to the cumulative substrate area and water column habitat removed and displaced, respectively, from installing the new bridge piers (piers 2–5), rock slope protection (RSP), and piles for the new bridge fender system (Table S-2).
- Temporary disturbance to and permanent loss of existing shaded riverine aquatic (SRA) cover vegetation on both banks of the Sacramento River in the BSA (Table S-3).
- Creation of temporary and permanent over-water structure (shade) on the Sacramento River in the BSA where no over-water structure currently exists (Table S-4).
- Temporary and permanent adverse effects on designated critical habitat for Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley steelhead, North American green sturgeon, and delta smelt from temporary underwater noise; temporary impacts on aquatic habitat (substrate and water column) associated with temporary trestle piles and cofferdam installation and removal; temporary water quality impacts on the water column during in-water construction; net permanent adverse effects on the channel substrate and water column from new bridge piers; and net permanent gain in overwater structure (shade) on aquatic habitat in the Sacramento River.
- Temporary and permanent adverse effects on Essential Fish Habitat for Pacific salmon (Chinook salmon) from temporary underwater noise, temporary impacts on aquatic habitat (substrate and water column) associated with temporary trestle piles and cofferdam installation and removal, temporary water quality impacts on the water column during in-water construction, net permanent adverse effects on the channel substrate and water column from new bridge piers, and net permanent gain in overwater structure (shade) on aquatic habitat in the Sacramento River.

Table S-2. Amount of Temporarily and Permanently Affected Aquatic Habitat in the Sacramento River

Feature/Habitat	Temporary Impact		Permanent Impact	
	Alternative B	Alternative C	Alternative B	Alternative C
Temporary Cofferdams				
Substrate area (square feet [acre])	6,650 (0.15)	9,000 (0.21)	NA	NA
Water column volume (cubic feet)	325,850	441,000	NA	NA
Temporary Trestle Piles				
Substrate area (square feet [acre])	327 (0.007)	327 (0.007)	NA	NA
Water column volume (cubic feet)	16,023	16,023	NA	NA
Temporary Barge Spud Piles				
Substrate area (square feet [acre])	22 (0.0005)	22 (0.0005)	NA	NA
Water column volume (cubic feet)	1,078	1,078	NA	NA
Piers 2 and 3				
Substrate area (square feet [acre])	NA	NA	13,500 (0.31)[a]	13,500 (0.31)[a]
Water column volume (cubic feet)	NA	NA	661,500[a]	661,500[a]
Piers 4 and 5				
Substrate area (square feet [acre])	NA	NA	360 (0.01)	360 (0.01)
Water column volume (cubic feet)	NA	NA	17,640	17,640
Piles for Bridge Fender System				
Substrate area (square feet [acre])	NA	NA	84 (0.002)	84 (0.002)
Water column volume (cubic feet)	NA	NA	4,106	4,106
Shoreline Rock Revetment (RSP)				
Substrate area (square feet [acre])	NA	NA	24,126 (0.55)	19,431 (0.45)
Total				
Substrate area (square feet [acre])	6,999 (0.16)	9,349 (0.21)	38,070 (0.87)	33,375
Water column volume (cubic feet)	342,951	458,101	683,246	683,246

NA = not applicable.
RSP = rock slope protection.
[a] Assumes bascule bridge type (worst-case scenario).

Table S-3. Temporary and Permanent Impacts on Overhead SRA Cover Vegetation in the Biological Study Area

Location	Shaded River Aquatic Cover			
	Temporary Disturbance (feet)		Permanent Loss (feet)	
	Alternative B	Alternative C	Alternative B	Alternative C
West riverbank	90	297	125	224
East riverbank	240	290	177	275
Total	**330**	**587**	**302**	**499**

SRA = shaded riverine aquatic.

Table S-4. Amount of Artificial Overwater Structure (Shade) Created on the Sacramento River in the Biological Study Area

Overwater Structure	Square Feet (acre) of Shaded Area	
	Alternative B (Barge/Trestle/Bridge)	Alternative C (Barge/Trestle/Bridge)
Barges (temporary)	36,000 (0.83)	36,000 (0.83)
Trestle (temporary)	33,500 (0.77)	33,500 (0.77)
Bridge (permanent)	56,000 (1.29)	56,800 (1.30)
Total		
Net change (temporary)	69,500 (1.60)	69,500 (1.60)
Net change (permanent)	56,000 (1.29)	56,800 (1.30)

S.5 Other Protected and Managed Biological Resources

S.5.1 Migratory Birds

Both build alternatives could result in the potential loss or disturbance of migratory birds from construction noise and activity, if nesting in or near the BSA. Alternative C would result in slightly greater impacts on areas that could be used by migratory birds for nesting, which includes cottonwood riparian forest (0.02 acre of permanent and 0.41 acre of temporary impacts) and landscaped areas (0.34 acre of permanent and 0.01 acre of temporary impacts) relative to Alternative B.

S.5.2 Bats

Construction activities under both build alternatives, such as building removal, tree removal and trimming, and construction noise and vibrations, could result in direct effects on roosting bats, including the destruction of active roosts, loss of roosting habitat, loss of individuals, or roost failure. Alternative C would result in slightly greater impacts on areas that could be used by bats for roosting, which includes cottonwood riparian forest (0.02 acre of permanent and 0.41 acre of temporary impacts) and landscaped areas (0.34 acre of permanent and 0.01 acre of temporary impacts) relative to Alternative B.

S.5.3 Protected Trees

Under both build alternatives, the proposed project would result in removal of protected trees that meet the criteria for the City of Sacramento protected trees or the City of West Sacramento Tree Preservation Ordinance. Alternative B would remove up to 4 protected riparian trees and potentially several street trees in the City of West Sacramento, and up to 8 protected riparian trees and additional street trees in the City of Sacramento. Alternative C would remove up to 6 protected riparian trees and potentially several street trees in the City of West Sacramento, and up to 13 protected riparian trees and additional street trees in the City of Sacramento. Under both alternatives, additional temporary impacts on protected trees could occur during construction.

S.5.4 Invasive Plants

Under both build alternatives, the proposed project has the potential to introduce and spread invasive plant species to uninfected areas within and adjacent to the BSA. This would be of particular concern for natural communities of special concern, where non-native invasive plants could outcompete and replace native vegetation.

S.6 Permits Required

The following federal and state permits and approvals related to biological resources could be required before construction of the proposed project.[1]

- Endangered Species Act Section 7: Consultation and Incidental Take Statement (USFWS and NMFS)
- Clean Water Act Section 404: Permit for Placement of Fill (USACE)
- Clean Water Act Section 401: Water Quality Certification (Central Valley RWQCB)
- Rivers and Harbors Act of 1899 Section 10: Permit for Work in Navigable Waters (USACE)
- Rivers and Harbors Act of 1899 Section 9 and General Bridge Act of 1946: Bridge permit (USGC)
- California Endangered Species Act Incidental Take Permit (possible) (CDFW)
- California Fish and Game Code Section 1602: Streambed Alteration Agreement (CDFW)
- California Code of Regulations Title 2 § 2002: Land Use Lease (CSLC)
- City of West Sacramento Tree Permit
- City of Sacramento Tree Permit

S.7 Mitigation Agreements

As part of the proposed project, the project proponent or their contractor will implement the avoidance, minimization, and compensation measures listed below (described in more detail in Chapter 4). These measures have been identified on the basis of natural resources that are present in, or have the potential to occur in or near, the BSA and the potential impacts that could result from the proposed project.

- Measure 1: Install Orange Construction Fencing between the Construction Area and Adjacent Sensitive Biological Resources
- Measure 2: Conduct Environmental Awareness Training for Construction Employees
- Measure 3: Conduct Periodic Biological Monitoring
- Measure 4: Compensate for Temporary Effects to and Permanent Loss of Cottonwood Riparian Forest (including SRA Cover)
- Measure 5: Protect Water Quality and Prevent Erosion and Sedimentation in Drainages and Wetlands

[1] CDFW = California Department of Fish and Wildlife; CSLC = California State Lands Commission; NMFS = National Marine Fisheries Service; RWQCB = Regional Water Quality Control Board; USACE = U.S. Army Corps of Engineers; USCG = U.S. Coast Guard; USFWS = U.S. Fish and Wildlife Service.

- Measure 6: Compensate for Loss of Perennial Stream
- Measure 7: Avoid and Minimize Impacts on Valley Elderberry Longhorn Beetle
- Measure 8: Conduct Preconstruction Surveys for Western Pond Turtle and Allow Turtles to Leave Work Area Unharmed
- Measure 9: Conduct Focused Surveys for Nesting Swainson's Hawk prior to Construction
- Measure 10: Conduct Tree Removal during Non-Sensitive Periods for Wildlife
- Measure 11: Monitor Active Swainson's Hawk Nests during Pile Driving and other Construction Activities
- Measure 12: Conduct Preconstruction Surveys for Nesting Migratory Birds, Including Special-Status Birds, and Establish Protective Buffers
- Measure 13: Conduct Preconstruction Surveys for Roosting Bats and Implement Protective Measures
- Measure 14: Conduct All In-Water Construction Activities between May 1 and November 30 and during Daylight Hours Only
- Measure 15: Implement Measures to Minimize Exceedance of Interim Threshold Sound Levels during Pile Driving
- Measure 16: Develop and Implement a Hydroacoustic Monitoring Plan
- Measure 17: Monitor Turbidity in the Sacramento River
- Measure 18: Implement Cofferdam Restrictions
- Measure 19: Prepare and Implement a Fish Rescue and Relocation Plan
- Measure 20: Develop and Implement a Barge Operation Plan
- Measure 21: Prevent the Spread or Introduction of Aquatic Invasive Species
- Measure 22: Minimize or Avoid Permanent Bridge Lighting from Directly Radiating on Water Surfaces of the Sacramento River
- Measure 23: Purchase Channel Enhancement Credits for Impacts on Critical Habitat
- Measure 24: Compensate for Loss of Protected Trees in Landscaping or Ruderal Habitat
- Measure 25: Avoid the Introduction and Spread of Invasive Plants

Chapter 1 Introduction

The City of West Sacramento, in cooperation with the City of Sacramento and the California Department of Transportation (Caltrans), proposes to construct a new bridge over the Sacramento River south of the Pioneer Bridge (US 50) to provide local interconnectivity across the river and between neighborhoods. The new connection would serve multiple modes of transportation and comply with current American Association of State Highway and Transportation Officials (AASHTO), Caltrans, and local agency design standards.

The project is subject to state and federal environmental review requirements because of use of 2014 Transportation Investment Generating Economic Recovery (TIGER) Discretionary Grant funds from the Federal Highway Administration (FHWA). Accordingly, project documentation is being prepared in compliance with both the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA). The City of West Sacramento is the lead agency under CEQA, with the City of Sacramento as a responsible agency, and Caltrans is the lead agency under NEPA. The FHWA's other responsibilities for environmental review, consultation, and any other action required in accordance with applicable federal laws for this project will be carried out by Caltrans under its assumption of responsibility pursuant to 23 U.S. Code (USC) 327 and the Memorandum of Understanding (MOU) dated December 23, 2016, executed by FHWA and Caltrans.

This project is included in the Sacramento Area Council of Governments (SACOG) 2016 *Metropolitan Transportation Plan/Sustainable Communities Strategy* (MTP/SCS).

The project also is identified in the 2003 Sacramento Riverfront Master Plan, the 2011 Sacramento River Crossings Alternatives Study, the 2014 Pioneer Bluff Transition Plan, the 2015 Broadway Bridge Feasibility Study, the West Sacramento General Plan 2035, the I-5 Subregional Corridor Mitigation Program, and two plans currently being prepared–West Sacramento's Pioneer Bluff and Stone Lock Reuse Master Plan and Sacramento's West Broadway Specific Plan.

The project would be located over the Sacramento River between the cities of West Sacramento and Sacramento, approximately 1,000 feet south of the existing Pioneer Bridge (Appendix A, Figure 1). The project limits include the combined area of each of the proposed project alternatives. In general, the project limits start in West Sacramento, along 15th Street at Jefferson Boulevard, continuing east and over the Sacramento River into the City of Sacramento along Broadway to the 5th Street intersection. The project limits also extend along Jefferson Boulevard approximately 1,300 feet south of the 15th Street intersection to Alameda Boulevard, along South River Road approximately 1,300 feet south and 650 feet north of 15th Street, along Marina View Drive approximately 400 feet south of Broadway, along Front Street approximately 350 feet north and south of Broadway, along 3rd Street approximately 350 feet north of Broadway to X Street, and along 5th Street approximately 200 feet north and south of Broadway. The project limits include proposed improvements to the northbound Interstate 5 (I-5) off-ramp to Broadway.

The limits of the installation of a proposed fiber optic line that would be placed in West Sacramento to connect communications of the Broadway Bridge with the proposed replacement for the I Street Bridge–the future connection over the river between C Street and Railyards Boulevard–and the existing Tower Bridge are depicted in Figure 1 (Appendix A) as extending north along Riverfront Street to Tower Bridge Gateway and 3rd Street, ending at the intersection of 3rd Street and C Street. Last, staging areas that would be accessed via South River Road in West Sacramento and Front Street in Sacramento also are proposed and included in the project limits.

1.1 Project History

1.1.1 Purpose and Need

The proposed project would construct a new bridge over the Sacramento River between the cities of Sacramento and West Sacramento.

1.1.1.1 Purpose

The purpose and objectives of the project are listed below.

- Increase the number of river crossings that meet current design standards and encourage travel by walking, bicycling, low-energy vehicles, and public transit.
- Increase the number of persons that can safely, efficiently, and reliably cross the river.
- Increase options for emergency response teams to cross the river.
- Increase options for evacuations.
- Improve the connectivity to, and accessibility of, business, recreational areas, and new or redevelopment opportunity sites located in the urban core of Sacramento and West Sacramento without affecting the use of Miller Regional Park or the Sacramento Marina and without precluding, or negatively restricting, redevelopment options in the Pioneer Bluff or West Broadway areas of the cities.
- Reduce trip length distances across the river between major origins and destinations.
- Reduce the growth in transportation-related energy use, air pollution emissions, and greenhouse gas (GHG) emissions.
- Reduce the growth in vehicle traffic on local neighborhood streets, especially cut-through traffic.
- Alleviate the growth of local trips on the State Highway System.
- Provide a project design that does not preclude the future addition of light-rail, streetcar, or other mass transit mode as a separate stand-alone project.

1.1.1.2 Need

The project is needed for the following reasons.

- Limited connectivity across the river creates longer trip lengths, which discourages walking and bicycling.
- Longer trip lengths create dependence on automobile use that generates negative public health effects and adverse environmental effects such as emissions of air pollutants and GHGs.
- Limited connectivity across the river creates concentrated vehicle traffic flows on existing bridges and their connecting approach roadways, resulting in undesirable travel delays for vehicular traffic, including public bus transit during weekday peak periods and special events.
- Limited connectivity across the river reduces options for emergency response teams, thereby increasing response times and limiting alternatives for evacuations.
- Limited connectivity across the river is a barrier to economic activity, social exchanges, recreational opportunities, and access to jobs within the urban core of Sacramento and West Sacramento.
- Limited connectivity to the riverfront reduces the potential to achieve planned urban development and redevelopment of opportunity sites identified in the adopted plans of Sacramento and West Sacramento.
- Limited connectivity reduces the opportunity to use the riverfront for enjoyment and recreation.
- Peak AM/PM congestion is caused by local intercity commuters using the State Highway System as a result of having few local river crossing options.

Construction of the proposed project has independent utility because it can provide a local roadway connection between West Sacramento and Sacramento and their existing roadway networks that does not rely on construction of other facilities to operate. The project would meet the purpose and need without being dependent on construction of other projects or improvements.

1.2 Project Description

This section describes the proposed action and the design alternatives that were developed to meet the identified need through accomplishing the defined purpose(s) while minimizing environmental impacts where feasible. The proposed project is in both Yolo and Sacramento Counties and would cross over the Sacramento River and between the cities of West Sacramento and Sacramento. The proposed project is located approximately 400 to 1,000 feet south of the Pioneer Bridge (Appendix A, Figure 1). The total length of the project is approximately 1.0 mile from Jefferson Boulevard in West Sacramento to the 5th Street and Broadway intersection in Sacramento. The purpose of the project is to increase the number of river crossings over the

Sacramento River between West Sacramento and Sacramento. The project is needed because of the existing limited connectivity and longer trip lengths currently required.

The build alternatives under consideration are two alignments for the new bridge and approach roadways. The lettering of each build alternative reflects its similarity to alignments considered in the feasibility study. Figure 2 (Appendix A) depicts the location of the build alternatives. Appendix A includes preliminary plan view drawings, by phase. A No Build (No-Project) Alternative also is considered.

- Alternative B would realign 15th Street to connect to Jefferson Boulevard in West Sacramento and connect to Broadway at 5th Street in Sacramento. This alignment would require modification to the planned mobility network for South River Road and 15th Street in Pioneer Bluff (Appendix A, Figure 3).
- Alternative C (a modified Alignment C from the *Broadway Bridge Feasibility Study*) would connect as a "T" intersection to South River Road in West Sacramento and connect to Broadway at 5th Street in Sacramento. This alignment would require modification to the planned mobility network for South River Road in Pioneer Bluff (Appendix A, Figure 4).
- No Build (No-Project) Alternative would *not* build a bridge across the Sacramento River from the Pioneer Bluff area of West Sacramento to Broadway in Sacramento. The future no-project conditions planned by both cities would be developed as proposed.

1.2.1 Build Alternatives

The build alternatives proposed to satisfy the purpose and need for the project are discussed in this section. Each alternative includes design features common to both build alternatives such as construction of a new bridge across the Sacramento River and roadway modifications in West Sacramento and Sacramento. The common design features are discussed first, followed by the unique features of each alternative.

1.2.1.1 Common Design Features of the Build Alternatives

The proposed project would construct a new bridge over the Sacramento River between West Sacramento and Sacramento to facilitate vehicular and multi-modal traffic over the river and to reduce traffic congestion, improve multi-modal transportation, and increase emergency options.

The Sacramento River is a navigable waterway of the United States. Under the provisions of the General Bridge Act of 1946, as amended, the U.S. Coast Guard (USCG) must approve the proposed location and plans for bridges over navigable waters of the United States prior to commencing construction.

New Bridge Construction and Roadway Modifications

Bridge Construction

The proposed project would construct a new bridge over the Sacramento River, south of the Pioneer Bridge. The total length of the new bridge would vary from approximately 800 to 1,020 feet, with an up to 83-foot-wide deck consisting of two vehicle lanes, a median, on-street Class II buffered bike lanes, and sidewalks along both sides of the bridge. The bridge would include two fixed-span approach structures that tie into the banks of the river; the structures would vary from approximately 200 to 300 feet in length on the West Sacramento bank and from 450 to 600 feet in length on the Sacramento bank. The center span of the bridge would be movable (see below under *Bridge Type* for more information on the movable span). The bridge soffit elevation would be set a minimum of 3 feet above the 200-year water surface elevation to comply with the Central Valley Flood Protection Board (CVFPB) freeboard requirements. Rock slope protection (RSP) (assumed 1/4 ton stone weight, machine positioned [i.e., Method B]) would be installed on the river side of the bridge abutments both above and below the ordinary high water mark (OHWM) to stabilize approximately 400 linear feet of shoreline on each side of the river.

The two fixed-span approach structures would have a superstructure depth (or total bridge thickness) of approximately 4 to 10 feet, depending on the selected alternative. Each approach structure would be a one- to six-span bridge.

The required length of the movable span portion of the bridge was determined through coordination with the USCG. The movable span would provide a 170- to 230-foot clear channel opening (depending on the alignment alternative) that would line up with the western pier of the existing Pioneer Bridge (US 50 bridge) located upstream. The new bridge would have the same minimum vertical clearance of 59 feet above the maximum river elevation of 31 feet in the open position that the existing Pioneer Bridge provides (measured to the 29 National Geodetic Vertical Datum).

Bridge Type

One of three movable span types would be constructed: a vertical lift span, a swing span, or a bascule span. Each bridge alignment alternative could be built as any one of the three types. To address the possible impacts of the bridge type that ultimately is built, the largest in- and over-water footprint and the greatest number of construction-related impacts of the three types were assumed for the analysis.

After an alignment alternative is selected and the project is approved, final aesthetic design criteria would be developed in cooperation with the selected bridge architect. Some of the guiding principles of the bridge aesthetics will be how the bridge fits within the surrounding setting and within the overall Sacramento region history, values, and vision. Selection of the type of movable span would be part of the aesthetic design of the bridge.

Regardless of the bridge type that is constructed over the Sacramento River as part of the proposed project, a bridge fender system would be installed around the movable span piers to protect the piers from errant watercrafts that are navigating along the river.

A brief description of each of the three movable span types follows.

Vertical lift span bridges have a movable span that is lifted vertically to permit passage of boats beneath it. The Tower Bridge over the Sacramento River upstream of the proposed Broadway Bridge is an example of a vertical lift span bridge.

Swing span bridges rotate the movable span on a center pivot pier, allowing navigational traffic to pass the bridge on either side of the center pier. Because of the span lengths required by the USCG for the proposed project and the requirement of creating a neighborhood-friendly river crossing with low vertical grades, the superstructure of a swing span most likely would be a through-truss design (the truss would be cross-braced above and below vehicular traffic). The existing I Street Bridge is an example of a swing span bridge.

Bascule span bridges operate by raising into the air one side of a counterweighted movable span while the other side rotates on a horizontal axis. The rotating axis could be fixed (like a hinge) or rolling (like a rocking chair). A bascule bridge can be designed with a single movable span or two movable spans (double bascule bridge). The Freeport Bridge over the Sacramento River in the town of Freeport is a double bascule span bridge.

Over-Water Construction Site Access

Temporary trestles and barges would be used to provide the contractor with access to the river portion of the project area. Together, the trestles and barges would be used to stage construction materials, to provide a working platform for cranes, and for general construction support. The temporary trestles would consist of steel piles that would be driven into place with an impact hammer. Although the temporary work platforms would be removed at the end of the first construction season before the onset of winter, the temporary trestle piles could remain in place for the duration of construction. The barges would be anchored to the river bottom with piles that would be driven into place with an impact hammer. Up to two barges would be anchored in the river at one time. The barges would be repositioned in the channel throughout construction only as needed to complete the work. The barges and temporary piles would be removed after bridge construction is completed.

In-Water Construction Activities

In-water construction activities consist of those that would occur below the OHWM. The activities would be limited to the period of May 1 to November 30 during the two construction seasons. The in-water construction window allows sufficient time for most in-water work to be completed within the first “in-water work season,” thus limiting potential impacts on fish and other species from the activities to primarily one construction season. The in-water work window was selected after consideration of agency in-water work restrictions, timing of the presence of multiple special-status fish species, timing of breeding seasons for other special-status species in the project area, and other constraints. Other construction activities occurring above the OHWM

(e.g., work on the abutments and approach superstructure) would not be limited to the in-water window of May 1 to November 30. Additional information on sequencing of construction activities is provided in Figure 5 (Appendix A).

Temporary falsework platforms would be required to construct the proposed bridge foundations and approach structures. The platforms would be constructed using temporary piles within the river. In addition, temporary cofferdams would be required to construct the bridge piers within the water. The cofferdams would consist of temporary sheetpiles installed around the individual piers. Dewatering inside the cofferdams would be required. In-water construction activities would include the following.

- Installation and removal of steel piles with a vibratory hammer and an impact hammer for the temporary falsework platforms (trestles).
- Installation and removal of steel piles with an impact hammer for anchoring barges.
- Installation of steel sheet piles with a vibratory driver for temporary cofferdams.
- Installation of steel piles for the piers with an impact hammer for the new bridge (although work would occur within dewatered cofferdams, underwater sound would propagate beyond the dewatered cofferdams).
- Installation of steel casings for the piers with a vibratory hammer or hydraulic oscillator/ rotator system for the new bridge.
- Installation of concrete piles with an impact hammer for the new bridge fender system.

Above-Water Construction Activities

After the temporary cofferdams are installed around the piers, forms would be constructed and concrete poured into the dewatered cofferdams to construct the pile caps. Work then would focus on the pier column construction. After the casings are installed, a rebar cage would be placed into the pile, and concrete would be poured into the steel shell. A cast-in-place concrete pier cap would be placed atop the columns to serve as the substructure.

Work then would focus on constructing the approach superstructure. The movable span superstructure likely would be constructed offsite, floated in, and erected when construction of the foundations is completed.

Bridge Construction Sequence

Figure 5 (Appendix A) shows the sequencing of construction activities. All in-water work would be conducted between May 1 and November 30.

Roadway Modifications

Proposed roadway modifications that would be part of all build alternatives are described below. Roadway modifications dependent on a specific alternative are described in Section 1.3.1.2, *Unique Features of Build Alternatives*.

City of West Sacramento

In West Sacramento, all build alternatives would include a new intersection for the bridge roadway at South River Road.

City of Sacramento

In Sacramento, common roadway modifications include repaving and reconstructing the sidewalk along Broadway from the new bridge east to 5th Street. Roadway modifications also would include a modified intersection at Marina View Drive and Broadway; widening of the northbound I-5 off-ramp at Broadway to two left-turn lanes and one right-turn lane; and improvements at intersections of Broadway and Front Street, 3rd Street (south), 3rd Street (north), and 5th Street to transition bridge traffic into the roadway network.

Class I Bikeway Improvements

City of West Sacramento

A future Class I River Walk trail extension is planned in West Sacramento. The trail is proposed within the levee setback. As part of the proposed project, the grade of the trail would be separated to allow it to pass under the proposed bridge structure. Cyclists and pedestrians approaching Broadway Bridge in either direction from the trail would have the option to continue along the trail under the new structure, avoiding the need to cross the roadway, or to connect to the structure and cross the river into Sacramento or travel westward in West Sacramento.

City of Sacramento

The existing Class I Sacramento River Bike Trail would be reconstructed approximately 1,000 feet north and 300 feet south of Broadway as part of the proposed project. In order to reconstruct the trail, permanent right-of-way acquisition from four adjacent private parcels would be necessary (acquisitions and easements are discussed in detail in Section 1.3.1.2, *Unique Features of Build Alternatives*). The trail would be grade-separated under the proposed bridge structure. Cyclists and pedestrians approaching Broadway in either direction would have the option to continue along the trail under the new structure, avoiding the need to cross the roadway, or to connect to the structure and cross the river into West Sacramento or travel westward on Broadway in Sacramento.

Bridge Communication Fiber Optic Line

A fiber optic cable is proposed to interconnect operational communications of the proposed project (the new Broadway Bridge), the Tower Bridge, and the I Street Replacement bridge. The fiber optic line would be placed in West Sacramento under Riverfront Street. From the proposed project, the fiber optic line would run north until Riverfront Street turns into 3rd Street and would end at the intersection of 3rd Street and C Street (see Appendix A, Figure 2). The fiber optic line would be installed within an existing City of West Sacramento-owned conduit along Riverfront Street to Tower Bridge Gateway. North of Tower Bridge Gateway, a new conduit

would be placed within the 3rd Street right-of-way north to the intersection of 3rd Street and C Street. To minimize ground disturbance, the construction method for the new fiber optic line would be jack and bore.

Stormwater Drainage Management

Stormwater and road runoff drainage for the proposed roadway would be conveyed in a new storm drain system installed approximately 5 feet below the finished road grade of South River Road, 15th Street, and Circle Street in West Sacramento and of Broadway in Sacramento. New storm drain outfalls into the Sacramento River would be constructed near each of the bridge abutments in West Sacramento and Sacramento.

Staging, Storage, and Proposed Access during Construction

Staging areas would be used to store materials and equipment during construction, such as pipe materials, precast manholes and drop inlets, steel girders, piles, and rebar, along with construction equipment when not in use. In West Sacramento, staging area options are the West Sacramento Corporation Yard (1951 South River Road) or the Shell property recently purchased by the Port of West Sacramento (1509 South River Road). Both staging areas in West Sacramento would be accessed via South River Road and are options on the condition that they are still available (have not been redeveloped) at the time the proposed project is constructed.

In Sacramento, one option for a staging area would be closing Broadway to traffic west of Front Street and using the road as a staging area with access via Broadway to the east. This option would require a traffic detour for continued access to Marina View Drive using Front Street and Miller Park Circle. Another staging area option in Sacramento is use of a vacant lot north of the California Automobile Museum with access via Front Street.

Staging areas would be in use throughout the construction duration; the areas would be returned to their pre-project conditions at completion of the project.

Utility Relocations

A number of public and private utilities would need to be relocated or adjusted to the new ground elevation as part of the project, including existing water, sewer, gas, overhead and underground electric, and communication facilities within Broadway, South River Road, 15th Street, and Jefferson Boulevard.

Two existing gas transmission lines, Kinder Morgan and Pacific Gas and Electric Company (PG&E), and a communication line run under the Sacramento River. The alternatives could conflict with the locations of the utility lines and require relocation of the utilities. Known conflict locations are discussed in Section 1.3.1.2, *Unique Features of the Build Alternatives*. Utility relocations and adjustments would be conducted prior to or during construction. As part of the final project design process, prior rights would be used to determine who is responsible for the utility relocations.

Traffic Management and Detours during Construction

While most of the project would be constructed outside of existing roadways, some project construction areas would require temporary detours or staged construction.

In West Sacramento, in order to construct the proposed project—including the new intersection at South River Road, a portion of South River Road would be closed to traffic. Closure of 15th Street also may be necessary. Travelers on South River Road south of the project area needing to get to South River Road north of the project area would be detoured around the project to the south and directed to travel over the Mike McGowan Bridge, turn right onto Locks Drive, right onto Jefferson Boulevard, right onto Tower Bridge Gateway, and then right onto 5th Street that becomes South River Road. The detour would be repeated in reverse for travelers on South River Road north of the project area wanting to travel south on South River Road.

In Sacramento, construction of street widening and sidewalk improvements under the I-5 viaduct structures would be phased to allow traffic access to Front Street for the duration of construction. Miller Park and Sacramento Marina traffic would travel on westbound Broadway, turn left onto southbound Front Street, right onto Miller Park Circle, and then left onto Marina View Drive. About 3,400 feet of the Sacramento River Bike Trail would be closed north and south of Broadway and detoured to the bike lane on Front Street between the Sacramento Marina and where the Sacramento River Bike Trail meets the R Street bicycle/pedestrian bridge.

Project Construction Sequence

The project may be constructed in two phases or in a single phase. The decision to construct in one or two phases will be driven by the extent of redevelopment and implementation of the approved mobility network in the Pioneer Bluff area of West Sacramento at the time project construction starts. If constructed in two phases, an interim (opening day) design phase for the proposed project would include constructing the new bridge and approach roadways with temporary pavement transitions along the existing alignment of South River Road. Construction of this first phase is expected to take approximately 36 months, with two seasons of in-water work. A subsequent phase, the design year phase, would take approximately 6 months and would complete the remaining project roadway construction consistent with full buildout of the approved mobility network. The roadway connection to the bridge and all other project improvements in Sacramento would be constructed during the first phase. If the project is built in a single phase, construction is expected to take 36 months. Information on the sequencing of construction activities is provided in Figure 5 (Appendix A).

Environmental Commitments

Each project build alternative includes environmental commitments that are part of the project description. The environmental commitments, such as implementing best management practices (BMPs), are to be considered in conducting the environmental analysis and determining effects and findings. The purpose of environmental commitments is to reflect and incorporate best practices into the project that avoid, minimize, or offset potential environmental effects. Note: The term *mitigation* is applied specifically in this Natural Environment Study (NES) only to designate measures required to reduce environmental effects triggering a finding of significance.

These best practices tend to be relatively standardized and compulsory; they represent sound and proven methods to reduce the potential effects of an action. The rationale behind including environmental commitments is that the project proponent commits to undertake and implement these measures in good faith as part of the project in advance of effect findings and determinations in order to improve the quality and integrity of the project, streamline the environmental analysis, and demonstrate responsiveness and sensitivity to environmental quality.

Runoff and Erosion Control Practices

As is standard with all construction projects that disturb soil, the construction contractor would be required to install temporary BMPs to control any runoff or erosion from the project site into the surrounding storm drain systems and waterways in order to comply with local, state and federal water quality regulations. Temporary BMPs would be installed prior to any construction operations and would be in place for the duration of the contract. Removal of the temporary BMPs would be the final operation, along with project site cleanup.

In-Water Sound and Shock Level Minimization

The following BMPs would be implemented during construction of pier columns for the bridge and placement and driving of piles and temporary sheet piles for cofferdams (if needed). The cofferdams would be removed when pier column construction is completed.

- Install bubble curtains around piles during impact driving and proofing operations to dampen underwater sound shockwaves.
- Conduct several dry or dead blows with the hammer initially to frighten fish away from the pile before the pile is driven or proofed with an impact pile driver. Implementation of several dry or dead blows with the hammer to initially frighten fish away is being proposed because the use of a cushioning block or similar feature would result in more strikes being needed to drive the piles, thereby resulting in a greater chance of exceeding the cumulative sound exposure levels (SELs) without significantly reducing peak SELs.

Transportation Management Plan

A Transportation Management Plan (TMP) would be developed for use during project construction. The TMP would implement strategies described in the *California Manual on Uniform Traffic Control Devices* (California Department of Transportation 2014) and Caltrans' *Transportation Management Plan Guidelines* (TMP Guidelines) (California Department of Transportation 2015), selected in accordance with the scale and scope of the project and the variety of transportation facility types and jurisdictions in the project area. The TMP would direct the process and procedures for dissemination of information to the public and motorists, provide guidance for implementation of incident management, describe construction strategies for traffic handling and guiding traffic through work zones, address traffic demand management during construction, and describe and direct the implementation of alternate routes or detours.

Environmental Stewardship

Construction and implementation of the proposed project would conform with applicable policies in the elements of the West Sacramento and Sacramento General Plans; requirements of the West Sacramento and Sacramento city codes; and Caltrans Standard Specification Section 14, Environmental Stewardship, (California Department of Transportation 2018:225–240). In addition to environmental protections established by state and federal law, City and Caltrans policies and standards address responsibilities for many environmental areas, such as air pollution; noise limits; protection of lakes, streams, and other water bodies; use of pesticides; safety; sanitation; convenience for the public; and damage or injury to any person or property as a result of construction.

1.2.1.2 Unique Features of Build Alternatives

Two combined bridge and roadway alignments are being considered (Appendix A, Figure 2). While each could be constructed in a single phase, the discussion of each alternative's unique features is separated into the components that would be constructed as part of an interim (opening day) phase and the remaining components that would be constructed as part of the design year phase. At the interim year, the new bridge across the Sacramento River would be constructed and open to traffic. By the design year, the remaining improvements and roadway connections proposed as part of the project would be constructed to allow the full, final design of the proposed project to be operational. See Section 1.1.3 *Existing Conditions* for interim and design year condition assumptions without the project. If the project is constructed in a single phase, the efforts needed to construct the new bridge and the ultimate (design year) roadway alignment configuration would be completed at the same time.

Appendix A includes preliminary plan view drawings for each alternative, by phase.

Deviations from the approved mobility network in West Sacramento that are part of the proposed project are noted by alternative in the subsections below.

Alternative B

The proposed project would realign 15th Street between Jefferson Boulevard and South River Road, consistent with the approved mobility network shown in Figure 3 (Appendix A), to connect the new bridge to the roadway network in West Sacramento. The bridge would connect to Broadway on the Sacramento side.

Interim Year Features of Alternative B

Project features that would be constructed and in operation by 2030 include the following.

- New bridge and roadway modifications, including a redesigned intersection connection for the bridge at 15th Street and new turn pockets on South River Road to facilitate traffic turning movements at the bridge connection in West Sacramento.
- Stormwater drainage management features.

- Utility relocations.
- Fiber optic cable installation for operational communications.

In West Sacramento, modifications to the approved mobility network would be necessary for construction of Alternative B. These modifications include the following.

- Constructing a northbound right-turn pocket on South River Road at 15th Street.
- Constructing a southbound right-turn pocket on South River Road at 15th Street.

In Sacramento, Alternative B requires the following modifications to the existing (or planned opening day) conditions.

- Reconstructing 350 feet of Marina View Drive to provide for a new connection to Broadway.
- Modifying property access along Broadway west of I-5.

The existing at-grade State Parks railroad crossing at Broadway would remain in the same location.

Construction of the interim year design of Alternative B would create 2.0 acres of new impervious surface.

RSP would be installed on the river side of the bridge abutments both above and below the OHWM to stabilize the shoreline on each side of the river. The estimated linear feet and area and volume above and below the OHWM are shown in Table 1-1.

Table 1-1. Estimated Rock Slope Protection Needed for Alternative B

Location	Linear Feet of Shoreline	Area (square feet)	Area below OHWM (square feet)	Volume below OHWM (cubic yards)	Volume above OHWM (cubic yards)
West Sacramento shoreline	426	31,033	12,833	1,569	2,224
Sacramento shoreline	398	27,589	11,293	1,380	1,992
Total	**824**	**58,622**	**24,126**	**2,949**	**4,216**

OHWM = ordinary high water mark.

Design Year Features of Alternative B

Project features that would be constructed by 2040 include the following.

- Roadway alignment modifications in West Sacramento necessary to shift the alignment of South River Road and connection of the new bridge to the east to conform with the approved mobility network alignment of South River Road.
- Roadway striping and turn pocket additions on Jefferson Boulevard, South River Road, and Alameda Boulevard.

In both West Sacramento and Sacramento, no additional modifications to the assumed design year conditions without the project would be needed.

Construction of the design year features of Alternative B would not increase impervious surface area from that created during the interim year phase.

Utility Relocations, Alternative B

The proposed location of the eastern bridge abutment conflicts with the location of the Kinder Morgan gas transmission line. The under-river portion of the line would remain in place; however, the proposed project would require relocation of a portion of gas line located under Broadway. The project's bridge alignment does not conflict with the location of the PG&E gas transmission line.

The proposed project also conflicts with the location of a communication line at the eastern bridge abutment. Similar to the Kinder Morgan gas line, the under-river portion of the communication line would remain in place, but the project would require relocation of a portion of the communication line under Broadway.

Property Acquisitions, Alternative B

Permanent property acquisitions or permanent easements would be necessary to construct the proposed project. Temporary construction easements (TCEs) also would be needed. The acquisitions described below assume that the project is constructed in two phases. The acquisitions that would be needed for the interim and ultimate design years are identified in Table 1-2.

Table 1-2. Property Acquisitions Needed for Alternative B

Assessor's Parcel Number	Total Parcel Size (acres)	Interim Year Permanent Acquisition (acres)	Design Year Permanent Acquisition (acres)	Interim Year TCE (acres)	Design Year TCE (acres)	Business Relocation Necessary? (yes, no)
West Sacramento						
058-027-006	2.579		0.023		0.013	No
058-027-014	7.568	0.120		0.015		No
058-028-003	3.530	1.005	0.056	0.089	0.012	No
058-028-005	6.010	2.920	0.200	0.325	0.065	No
058-028-006	0.473	0.056		0.055		Yes
058-028-007	0.911	0.177		0.027		Yes
843-57-5-7	6.477	0.064		0.019		No
Sacramento						
009-0012-008	1.598	0.220		0.074		Yes*
009-0012-038	0.033	0.033				No
009-0012-064	2.673	2.673				No
009-0012-065	0.793	0.793				No
009-0012-071	2.494	0.378		0.159		Yes*
009-0012-072	6.903	0.049		0.068		Yes*
009-0020-001	1.525	0.605		0.083		No
009-0030-054	5.616	0.657		0.274		Yes*

TCE = temporary construction easement.

* Assumes the fill slopes shown along realigned Broadway in Appendix A. No business relocation would be necessary if retaining walls were constructed instead of fill slopes to support the increase in elevation and widening of Broadway between the bridge and Front Street.

Alternative C

Alternative C (modified from the feasibility study) would connect to South River Road at a new intersection between 15th Street and Circle Street on the West Sacramento side and connect to Broadway on the Sacramento side (Appendix A, Figure 4).

Interim Year Features of Alternative C

Project features that would be constructed and in operation by 2030 include the following.

- New bridge and roadway modifications, including construction of a new "T" intersection on the existing alignment of South River Road.
- Stormwater drainage management features.
- Utility relocations.
- Fiber optic cable installation for operational communications.

In West Sacramento, modifications to the approved mobility network would be necessary for Alternative C. These modifications include the following.

- Creating a "T" intersection on South River Road between 15th Street and the future Circle Street location.
- Constructing an interim northbound right-turn pocket on the existing alignment of South River Road at Broadway.
- Constructing an interim southbound left-turn pocket on the existing alignment of South River Road at Broadway.

In Sacramento, Alternative C requires the following modifications to existing conditions.

- Reconstructing 350 feet of Marina View Drive to provide for a new connection to Broadway.
- Modifying property access along Broadway west of I-5.

The existing at-grade State Parks railroad crossing at Broadway would remain in the same location.

Construction of the interim year design of Alternative C would create 2.2 acres of new impervious surface.

RSP would be installed on the river side of the bridge abutments both above and below the OHWM to stabilize the shoreline on each side of the river. The estimated linear feet and area and volume above and below the OHWM are shown in Table 1-3.

Table 1-3. Estimated Rock Slope Protection Needed for Alternative C

Location	Linear Feet of Shoreline	Area (square feet)	Area below OHWM (square feet)	Volume below OHWM (cubic yards)	Volume above OHWM (cubic yards)
West Sacramento shoreline	466	29,455	10,779	1,317	2,283
Sacramento shoreline	395	19,363	8,652	1,058	1,309
Total	**861**	**48,818**	**19,431**	**2,375**	**3,592**

OHWM = ordinary high water mark.

Design Year Features of Alternative C

Project features that would be constructed by 2040 include the following.

- Roadway alignment modifications in West Sacramento necessary to shift the alignment of South River Road and the "T" intersection connection of the new bridge approximately 100 feet to the east to conform with the approved mobility network alignment of South River Road.
- Roadway striping and turn pocket additions on Jefferson Boulevard, South River Road, and Alameda Boulevard.

In West Sacramento, additional modifications to the approved mobility network would be necessary to construct the design year components of Alternative C. Leading up to the design year, development in Pioneer Bluff will occur following a new alignment of South River Road. After construction of the proposed project in the interim year, the new alignment of South River Road would require the proposed project to reconstruct the bridge's roadway connection to match. Modifications to the approved mobility network in West Sacramento include the following.

- Creating a new "T" intersection matching the new more eastern alignment of South River Road between 15th Street and Circle Street.
- Constructing the final northbound right-turn pocket on South River Road at Broadway.
- Constructing the final southbound left-turn pocket on South River Road at Broadway.

In Sacramento, no additional changes from the interim design would be needed.

Construction of the design year features of Alternative C would not increase impervious surface area from that created during the interim year phase.

Utility Relocations, Alternative C

The proposed location of the eastern bridge abutment conflicts with the location of the Kinder Morgan gas transmission line. The under-river portion of the line could remain in place; however, Alternative C would require relocation of a portion of gas line located under Broadway. This alternative does not conflict with the location of the PG&E gas transmission line or the under-river communication line.

Property Acquisitions, Alternative C

As with Alternative B, permanent property acquisitions or permanent easements would be necessary for Alternative C. TCEs also would be needed. The acquisitions described below assume that the project is constructed in two phases. The acquisitions that would be needed for the interim and ultimate design years are identified in Table 1-4.

Table 1-4. Property Acquisitions Needed for Alternative C

Assessor's Parcel Number	Total Parcel Size (acres)	Interim Year Permanent Acquisition (acres)	Design Year Permanent Acquisition (acres)	Interim Year TCE (acres)	Design Year TCE (acres)	Business Relocation Necessary? (yes, no)
West Sacramento						
058-027-006	2.579	0.777	0.810	0.080	0.058	Yes
058-027-007	0.450	–	0.104	–	0.025	No
058-027-014	7.568	2.762	–	0.102	–	Yes
058-028-005	6.010	0.680	0.136	0.137	0.071	No
Sacramento						
009-0012-008	1.598	0.223	0.223	0.074	0.074	Yes*
009-0012-038	0.033	0.033	0.033	0.000	0.000	No
009-0012-064	2.673	2.673	2.673	0.000	0.000	No
009-0012-065	0.793	0.793	0.793	0.000	0.000	No
009-0012-071	2.494	0.394	0.394	0.158	0.155	Yes*
009-0012-072	6.903	0.063	0.063	0.074	0.069	Yes*
009-0020-001	1.525	0.682	0.682	0.082	0.081	No
009-0030-054	5.616	0.672	0.672	0.428	0.270	Yes*

TCE = temporary construction easement.

* Assumes the fill slopes shown along realigned Broadway in Appendix A. No business relocation would be necessary if retaining walls are constructed instead of fill slopes to support the increase in elevation and widening of Broadway between the bridge and Front Street.

Chapter 2 Study Methods

This chapter describes the regulatory requirements that are relevant to biological resources and the methods used to identify special-status species and their habitats, sensitive natural communities, and waters of the United States and State (including wetlands) in the biological study area (BSA). The BSA includes all areas of proposed permanent and temporary impacts, as well as areas adjacent to the proposed road improvements in the City of West Sacramento and the City of Sacramento.

2.1 Regulatory Requirements

This section summarizes the federal and state regulations that protect special-status species; waters of the United States (which also are considered waters of the State), including wetlands; and sensitive habitats. This section also discusses pertinent local general plan policies and ordinances related to the protection and preservation of biological resources.

2.1.1 Federal Regulations

2.1.1.1 Federal Endangered Species Act

The federal Endangered Species Act (ESA) of 1973, and subsequent amendments, provides regulations for the conservation of endangered and threatened species and the ecosystems on which they depend. The U.S. Fish and Wildlife Service (USFWS) (with jurisdiction over plants, wildlife, and resident fish) and the National Marine Fisheries Service (NMFS) (with jurisdiction over anadromous fish and marine fish and mammals) oversee the ESA. Section 7 of the ESA mandates all federal agencies to consult with USFWS and NMFS if they determine that a proposed project may affect a listed species or destroy or adversely modify designated critical habitat. Section 7 requirements do not apply to nonfederal actions. A Clean Water Act (CWA) Section 404 permit from the U.S. Army Corps of Engineers (USACE) will be required for project construction. Consequently, consultation under Section 7 for effects on federally listed species will be required. Under Section 7, the federal lead agency must obtain incidental take authorization or a letter of concurrence stating that the proposed project is not likely to adversely affect federally listed species.

Section 9 of the ESA prohibits the take of any fish or wildlife species listed as endangered, including destruction of habitat that prevents the species' recovery. *Take* is defined as any action or attempt to hunt, harm, harass, pursue, shoot, wound, capture, kill, trap, or collect a species. Section 9 prohibitions also apply to threatened species unless a special rule has been defined with regard to take at the time of listing. Under Section 9, the take prohibition applies only to wildlife and fish species. However, Section 9 does prohibit the unlawful removal and possession, or malicious damage or destruction, of any endangered plant from federal land. Section 9 prohibits acts to remove, cut, dig up, damage, or destroy an endangered plant species in nonfederal areas in knowing violation of any state law or in the course of criminal trespass. Candidate species and species that are proposed for or under petition for listing receive no protection under Section 9.

Federally listed species identified with the potential to occur in the BSA for the proposed project include valley elderberry longhorn beetle (VELB) (*Desmocerus californicus dimorphus*), Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawytscha*), Central Valley (CV) spring-run Chinook salmon (*O. tshawytscha*), California Central Valley (CCV) steelhead (*O. mykiss*), North American green sturgeon (*Acipenser medirostris*), and delta smelt (*Hypomesus transpacificus*). In addition, designated critical habitat for Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, North American green sturgeon, and delta smelt occurs in the BSA. These species and designated critical habitat are discussed in Chapter 4.

2.1.1.2 Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Management and Conservation Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), requires federal agencies to consult with NMFS on activities that may adversely affect essential fish habitat (EFH). The purpose of the MSA is to conserve and manage the fishery resources of the United States and to promote protection of EFH. *EFH* is the aquatic habitat necessary for fish to spawn, breed, feed, or grow to maturity that will allow a level of production needed to support a long-term, sustainable commercial fishery and contribute to a healthy ecosystem (Pacific Fishery Management Council 2003). Important components of EFH include substrate, water quality, water quantity, depth, velocity, channel gradient and stability, food, cover, habitat complexity, space, access and passage, and habitat connectivity. EFH is described for Pacific salmon fisheries (specifically Chinook salmon) in Chapter 4. The MSA requires the following.

- Federal agencies undertaking, permitting, or funding an activity that may adversely affect EFH are required to consult with NMFS.
- NMFS is required to provide conservation recommendations for any federal or state activity that may adversely affect EFH.
- Within 30 days of receiving conservation recommendations from NMFS, federal agencies must provide a detailed response in writing to NMFS regarding the conservation recommendations (the response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH, or reasons for not following the recommendations).

An EFH assessment will be prepared for NMFS jointly with a Biological Assessment (BA) to address potential effects on Pacific salmon fisheries (specifically, Chinook salmon).

2.1.1.3 Executive Order 12962: Recreational Fisheries

Executive Order (EO) 12962, signed June 7, 1995, and amended by EO 13474 on September 26, 2008, directs all federal agencies to improve the quantity, function, sustainable productivity, and distribution of U.S. aquatic resources for increased recreational fishing opportunities—to the extent permitted by law and where practicable. This EO requires evaluation and documentation in NEPA analyses of the effects caused by federally funded, permitted, or authorized actions on aquatic systems, fishing access, and recreational fisheries.

The proposed project may reduce the abundance of fish in the BSA; therefore, federal agencies are required to consider this EO prior to issuing permits. Measures identified in Chapter 4 will avoid, minimize, or compensate for project effects on fish and fish habitat.

2.1.1.4 Executive Order 13112: Prevention and Control of Invasive Species

EO 13112, signed February 3, 1999, directs all federal agencies to prevent and control the introduction of invasive species in a cost-effective and environmentally sound manner. The EO established the National Invasive Species Council, which is composed of federal agencies and departments, and a supporting Invasive Species Advisory Committee composed of state, local, and private entities. In 2008, the Council released an updated national invasive species management plan (National Invasive Species Council 2008) that recommends objectives and measures to implement the EO and to prevent the introduction and spread of invasive species. The EO requires consideration of invasive species in NEPA analyses, including their identification and distribution, their potential impacts, and measures to prevent or eradicate them.

The proposed project may introduce or spread invasive species into the BSA; therefore, federal agencies are required to consider this EO prior to issuing permits. Measures identified in Chapter 4 will avoid or minimize the introduction and spread of invasive species as a result of project activities.

2.1.1.5 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) protects migratory bird species from take. Under the MBTA, *take* is defined as to (or attempt to) pursue, hunt, shoot, capture, collect, or kill (50 Code of Federal Regulations [CFR] 10.12). The definition differentiates between intentional take (take that is the purpose of the activity in question) and unintentional take (take that results from, but is not the purpose of, the activity in question). EO 13186, signed January 10, 2001, directs each federal agency taking actions that would, or likely would, negatively affect migratory bird populations to work with USFWS to develop an MOU to promote the conservation of migratory bird populations. Protocols developed under the MOU must include the following agency responsibilities.

- Avoid and minimize, to the extent practicable, adverse impacts on migratory bird resources when conducting agency actions.
- Restore and enhance habitat of migratory birds, as practicable.
- Prevent or abate the pollution or detrimental alteration of the environment for the benefit of migratory birds, as practicable.

The EO is designed to assist federal agencies in their efforts to comply with the MBTA; it does not constitute any legal authorization to take migratory birds. Migratory birds could nest in the BSA. The discussion of nesting migratory birds in Chapter 4 describes potential project impacts on migratory birds and measures to avoid or minimize impacts on those species.

2.1.1.6 Clean Water Act

The CWA was passed by Congress in 1972 with a broad mandate "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." The chief purpose of the CWA is to establish the basic structure for regulating discharges of pollutants into waters of the United States. The CWA authorizes the U.S. Environmental Protection Agency (EPA) to set national water quality standards and effluent limitations, and includes programs addressing both point-source and nonpoint-source pollution. *Point-source pollution* is pollution that originates or enters surface waters at a single, discrete location, such as an outfall structure or an excavation or construction site. *Nonpoint-source pollution* originates over a broader area and includes urban contaminants in storm water runoff and sediment loading from upstream areas. The CWA operates on the principle that all discharges into the nation's waters are unlawful unless specifically authorized by a permit; permit review is the CWA's primary regulatory tool. One aquatic resource, the Sacramento River, is present in the BSA and will be regulated under CWA Section 404 (described below).

Section 401: Water Quality Certification

Under CWA Section 401, applicants for a federal license or permit to conduct activities that may result in the discharge of a pollutant into waters of the United States must apply for water quality certification from the State. Therefore, all projects with a federal component that may affect state water quality (including projects that require federal agency approval, such as a Section 404 permit) must comply with CWA Section 401. The Sacramento River, a water of the United States, is present in the BSA.

As currently designed, roadway and bridge construction associated with the proposed project is expected to result in a discharge of pollutants into the Sacramento River, which is a water of the United States; therefore, a Section 401 water quality certification from the Central Valley Regional Water Control Board (RWQCB) will be required for the proposed project.

Section 402: Permits for Stormwater Discharge

CWA Section 402 regulates construction-related storm water discharges to surface waters through the National Pollutant Discharge Elimination System (NPDES) program, administered by EPA. In California, the State Water Resources Control Board (State Water Board) is authorized by EPA to oversee the NPDES program through the RWQCB.

NPDES permits are required for projects that disturb more than 1 acre of land. The NPDES permitting process requires the applicant to file a public notice of intent to discharge storm water and to prepare and implement a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP must include a site map, a description of proposed construction activities, and the BMPs that will be implemented to prevent soil erosion and discharge of other construction-related pollutants (e.g., petroleum products, solvents, paints, and cement) that could contaminate nearby water resources. Permittees are required to conduct annual monitoring and reporting to ensure that BMPs are correctly implemented and effective in controlling the discharge of storm water-related pollutants. Because the proposed project would disturb more than 1 acre of land, the project proponent will prepare a SWPPP and apply for an NPDES permit.

Section 404: Permits for Fill Placement in Waters of the United States (Including Wetlands)

Waters of the United States (including wetlands) are protected under Section 404 of the CWA. Any activity that involves a discharge of dredged or fill material into waters of the United States, including wetlands, is subject to regulation by the USACE. *Waters of the United States* is defined to encompass navigable waters of the United States; interstate waters; all other waters where their use, degradation, or destruction could affect interstate or foreign commerce; tributaries of any of these waters; and wetlands that meet any of these criteria or are adjacent to any of these waters or their tributaries. *Wetlands* are defined under Section 404 as those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Jurisdictional wetlands must meet three wetland delineation criteria: (1)support hydrophytic vegetation (i.e., plants that grow in saturated soil); (2) have hydric soil types (i.e., soils that are wet or moist enough to develop anaerobic conditions); and (3) have wetland hydrology.

No wetlands were identified in the BSA, but roadway and bridge construction associated with the proposed project will result in a discharge of fill material into the Sacramento River, a non-wetland water of the United States. Therefore, a Section 404 CWA permit will be required for the proposed project. A delineation of waters of the United States (aquatic resources delineation) has been completed for the project and is contained in Appendix D. The aquatic resources delineation report will be submitted to the USACE to support a preliminary jurisdictional determination for the project.

Rivers and Harbors Appropriation Act of 1899

The River and Harbors Appropriation Act of 1899 (RHA) addresses activities that involve construction of dams, bridges, dikes, and other structures across any navigable water. Placing obstructions to navigation outside established federal lines and excavating from or depositing material in such waters require permits from the USACE. The Sacramento River is a navigable water subject to the requirements of the RHA.

Section 9 and the General Bridge Act of 1946

Section 9 (33 USC 403) of the RHA and the General Bridge Act of 1946 require that the location and plans of bridges and causeways across navigable waters be submitted to and approved by the Secretary of Homeland Security prior to their construction. Under the authority of these acts, the USCG regulates the placement of bridges across navigable waters, such as the Sacramento River. Construction of the proposed bridge will require a bridge permit from the USCG District 11.

Section 10

Section 10 (33 USC 403) of the RHA prohibits the unauthorized obstruction or alteration of any navigable water of the United States. Under Section 10, a permit is required for work or structures in, over, or under navigable waters of the United States. Construction of the proposed bridge will require a Section 10 permit from the USACE.

2.1.2 State Regulations

2.1.2.1 California Endangered Species Act

The California Endangered Species Act (CESA) (California Fish and Game Code [CFGC] Section 2050 et seq.) establishes state policy to conserve, protect, restore, and enhance threatened or endangered species and their habitats. CESA mandates that state agencies should not approve projects that jeopardize the continued existence of threatened or endangered species if reasonable and prudent alternatives are available that would avoid jeopardy. For projects that would affect a species on the federal and state lists, compliance with ESA satisfies CESA if the California Department of Fish and Wildlife (CDFW) determines that the federal incidental take authorization is consistent with CESA under CFGC Section 2080.1 (a *consistency determination*). Consistency determinations allow an applicant who has obtained a federal incidental take statement (Section 7 consultation) or a federal Section 10(a) incidental take permit to submit the federal incidental take statement or permit to the CDFW Director for a determination whether the federal document is consistent with CESA. However, consistency determinations can be used only for species that are listed under both the federal ESA and CESA, and cannot be applied to species that are listed by the state but are not federally listed. For projects that would result in take of a species that is only state listed, the project proponent must apply for a take permit under Section 2081(b). Five state-listed species—Swainson's hawk (*Buteo swainsoni*), Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, delta smelt, and longfin smelt (*Spirinchus thaleichthys*)—are known or have the potential to occur in the BSA and be affected by the proposed project (Swainson's hawk and longfin smelt are only state listed). Chapter 4 describes potential project-related impacts and identifies avoidance and minimization measures that will avoid direct impacts and minimize indirect impacts on these species. Because CDFW's Bay Delta Region is no longer issuing consistency determinations and two species (Swainson's hawk and longfin smelt) are only state listed, a Section 2081 Incidental Take Permit Application may be required to address the potential for take of Swainson's hawk, Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, delta smelt, and longfin smelt.

2.1.2.2 California Environmental Quality Act

CEQA is the regulatory framework by which California public agencies identify and mitigate significant environmental impacts. A project normally is considered to cause a significant environmental impact on biological resources if it would substantially affect a rare or endangered species or the habitat of that species; substantially interfere with the movement of resident or migratory fish or wildlife; or substantially diminish habitat for fish, wildlife, or plants. The State CEQA Guidelines define *rare, threatened, and endangered species* as those listed under the ESA and CESA and any other species that meets the criteria of the resource agencies or local agencies (e.g., CDFW-designated species of special concern). The State CEQA Guidelines state that the lead agency preparing an Environmental Impact Report (EIR) must consult with and receive written findings from CDFW concerning project impacts on species listed as endangered or threatened. The impacts of a proposed project on these resources are important in determining whether the project would result in significant environmental impacts under CEQA. The project proponent will be preparing an EIR to comply with the State CEQA Guidelines.

2.1.2.3 California Native Plant Protection Act

The California Native Plant Protection Act of 1977 (CNPPA) prohibits importation of rare and endangered plants into California, take of rare and endangered plants, and sale of rare and endangered plants. CESA defers to the CNPPA, which ensures that state-listed plant species are protected when state agencies are involved in projects subject to CEQA. In this case, plants listed as rare under the CNPPA are not protected under CESA but rather under CEQA. One special-status plant species (Mason's lilaeopsis [*Lilaeopsis masonii*]) is listed as rare under the CNPPA, has suitable habitat in the BSA, and is known to occur in the project region (i.e., within a 10-mile radius of the BSA). This species was not observed in the BSA during the field surveys. Chapters 3 and 4 discuss the potential for special-status plants to occur in the BSA.

2.1.2.4 California Fish and Game Code

Several sections of the CFGC apply to the proposed project, as described below.

Lake or Streambed Alteration (Section 1602)

CDFW regulates activities that would interfere with the natural flow of—or substantially alter the channel, bed, or bank of—a lake, river, or stream, including disturbance of riparian vegetation, under CFGC Sections 1600–1616. CDFW requires a Lake or Streambed Alteration Agreement (LSAA) permit for these activities. Requirements to protect the integrity of biological resources and water quality often are conditions of LSAAs. CDFW may establish conditions that include avoiding or minimizing vegetation removal, using standard erosion control measures, limiting the use of heavy equipment, limiting work periods to avoid impacts on fisheries and wildlife resources, and restoring degraded sites or compensating for permanent habitat losses. The Sacramento River and the adjacent riparian forest are regulated by CDFW. The proposed project is expected to result in modification of the bed, bank, or channel of the river and removal of adjacent riparian vegetation; therefore, an LSAA will be required.

Protection of Birds and Raptors (Sections 3503 and 3503.5)

Section 3503 of the CFGC prohibits killing of birds and destruction of bird nests. Section 3503.5 prohibits killing of raptor species and destruction of raptor nests. Typical violations include destruction of active bird and raptor nests as a result of tree removal, and failure of nesting attempts (loss of eggs or young) as a result of disturbance of nesting pairs caused by nearby human activity.

The proposed project has the potential to adversely affect birds and raptors protected under Sections 3503 and 3503.5 of the CFGC. The project proponent will avoid violation of CFGC Sections 3503 and 3503.5 by implementing measures identified for nesting birds in Chapter 4.

Fully Protected Species (Sections 3511, 3513, 4700, and 5050)

CFGC Sections 3511, 3513, 4700, and 5050 pertain to fully protected wildlife species (birds in Sections 3511 and 3513, mammals in Section 4700, and reptiles and amphibians in Section 5050) and strictly prohibit take of these species. CDFW cannot issue a take permit for

fully protected species, except under narrow conditions for scientific research or the protection of livestock, or if a Natural Community Conservation Plan (NCCP) has been adopted. Specifically, Section 3513 prohibits any take or possession of birds designated by the MBTA as migratory nongame birds except as allowed by federal rules and regulations pursuant to the MBTA.

One fully protected bird species, white-tailed kite (*Elanus leucurus*), has the potential to nest in the BSA and be affected by the proposed project. The project proponent would avoid take of white-tailed kite by implementing measures identified for nesting birds in Chapter 4.

2.1.2.5 Porter-Cologne Water Quality Control Act

The California Water Code addresses the full range of water issues in the state and includes Division 7, known as the Porter-Cologne Water Quality Control Act (Porter-Cologne Act) (California Water Code Sections 13000–16104). Section 13260 requires "any person discharging waste, or proposing to discharge waste, within any region that could affect the quality of the waters of the state" to file a report of discharge (an application for waste discharge requirements [WDRs]). Section 13050 of the Porter-Cologne Act authorizes the State Water Board and the relevant RWQCB to regulate biological pollutants. The California Water Code generally regulates more substances contained in discharges and defines discharges to receiving waters more broadly than does the CWA.

Pursuant to CWA Section 401, an applicant for a Section 404 permit to conduct any activity that may result in discharge into navigable waters must provide a certification from the RWQCB that such discharge will comply with state water quality standards. Each Basin Plan sets forth water quality standards for surface water and groundwater, as well as actions to control nonpoint and point sources of pollution. Projects that affect waters of the State must meet the WDRs of the applicable RWQCB. As part of the permitting process under Section 404, the project proponent will be required to apply for water quality certification from the Central Valley RWQCB.

As currently designed, roadway and bridge construction associated with the proposed project is expected to result in a discharge of fill material into the Sacramento River, which is both a water of the State and a water of the United States. Because the project would obtain Section 401 certification for discharge into a water of the United States, the RWQCB would not need to additionally issue WDRs under the Porter-Cologne Act for discharge into a water of the State.

2.1.2.6 Central Valley Flood Protection Plan: Levee Vegetation Management Strategy

Under the Central Valley Flood Protection Act of 2008, the California Department of Water Resources (DWR) developed the 2012 Central Valley Flood Protection Plan (CVFPP) as the foundation for the statewide FloodSAFE California initiative (California Department of Water Resources 2012a). Part of the CVFPP is a strategy for managing levee vegetation. Based on this strategy, existing trees on levees will be allowed to live out their normal life cycles unless they pose an unacceptable threat to levee integrity.

2.1.2.7 Urban Levee Design Criteria

The Urban Levee Design Criteria (ULDC) are intended to supply engineering guidance and criteria for levees required to provide an urban level of flood protection (200-year flood) (California Department of Water Resources 2012b). The ULDC also correspond to the CVFPP Levee Vegetation Management Strategy. With regard to levee improvements, the ULDC state the following.

> In cases of levee repair or improvement, vegetation shall be removed as required to meet objectives of the specific project. Vegetation removed as part of direct construction activities may not be replaced in the vegetation management zone. However, vegetation on other sections of the levee, not affected by the construction activity may remain in place, natural revegetation may be allowed outside of the vegetation management zone, and replanting may be allowed… Trees and other woody vegetation may be: (1) planted, and (2) allowed to naturally revegetate on a landside planting berm. Only the portion of the landside planting berm that is both 15 feet or more from the landside levee slope and 15 feet or more from the landward top of the planting berm may be planted and allowed to naturally revegetate.

2.1.3 Local Regulations

2.1.3.1 Yolo Habitat Conservation Plan/Natural Communities Conservation Plan

The Yolo Habitat Conservation Plan/Natural Communities Conservation Plan (HCP/NCCP) covers 12 sensitive species and the natural communities and agricultural land on which they depend. The HCP/NCCP covers Yolo County and the cities of Davis, Woodland, Winters, and West Sacramento through the Yolo Habitat Conservancy. Resources in the BSA that would be covered by the HCP/NCCP include riparian habitat, VELB, and Swainson's hawk.

2.1.3.2 City of West Sacramento General Plan

Goals and policies in the City of West Sacramento General Plan 2035 Policy Document (City of West Sacramento 2016) apply to biological resources in the BSA that would be affected by implementation of the project. These policies include preservation, enhancement, and creation of connected open space; development setbacks from significant habitat; mitigation of adverse impacts on rare, threatened, and endangered species; preservation and enhancement of riparian and wetland habitats; no net loss of wetlands and other waters; requirements for site-specific wildlife habitat and vegetation surveys; avoidance of adverse effects on fish in the Sacramento River; minimization of recreational use effects on riparian habitat; and promotion of using native plants for landscaping near the Sacramento River.

2.1.3.3 City of Sacramento General Plan

Goals and policies in the City of Sacramento General Plan (Part 2, Environmental Resources section) (City of Sacramento 2015) apply to biological resources in the BSA that would be affected by implementation of the project. These policies include conservation of open space areas to protect creeks and the Sacramento River; preservation of natural habitats; retention of sensitive habitats and species; preservation of riparian habitats or mitigation by preservation and/or restoration at a 1:1 ratio; preservation of wetlands or mitigation for no-net-loss of value

and/or function; preservation of wildlife corridors or replacement with habitat of equivalent value; performance of sensitive species surveys and/or habitat assessments and, if suitable habitat is present for a species, performance of either protocol-level or industry-recognized species surveys or assumption of species presence and consultation with appropriate resource agencies and mitigation in compliance with state and federal laws; and retention of heritage trees.

2.1.3.4 City of West Sacramento Tree Preservation Ordinance

The City's Tree Preservation Ordinance is found in the West Sacramento Municipal Code, Title 8 (Health and Safety), Chapter 24 (Tree Preservation). The City protects heritage and landmark trees, as defined in the ordinance, and requires tree permits for activities that would affect such trees.

A *heritage* tree is defined as follows.

- Any living tree with a trunk circumference of 75 inches (diameter of 24 inches) or more, or
- Any living native oak (any species of the genus *Quercus*) with a trunk circumference of 50 inches (diameter of 16 inches) or more, both measured 4.5 feet above ground level. The circumference of multi-trunk trees is based on the sum of the circumference of each trunk.

A *landmark* tree is defined as a tree or stand of trees that is especially prominent, stately, or of historical significance as designated by the City Council. Trees that are too small in diameter to meet the size threshold of a heritage or landmark tree but are located within the public right-of-way (typically 12.5 feet from the curb) (referred to as *street trees*) also are protected by the ordinance.

It is unlawful in West Sacramento to perform any of the following acts with respect to a heritage or landmark tree without a tree permit issued by the City's tree administrator.

- Move, remove, cut down, poison, set fire to or permit fire to burn in proximity to, or perform or fail to perform any act that results in the unnatural death or destruction of a landmark or heritage tree.
- Perform any activity that will interfere with or retard the natural growth of any landmark or heritage tree.
- Perform any work or permit any work to be performed within the dripline area of a landmark or heritage tree.
- Trim or prune any branch of a landmark or heritage tree that is 5 inches or more in diameter.
- Change the appropriate amount of irrigation or drainage water provided to any landmark, heritage, or street tree. Trench, grade, pave, or otherwise damage or disturb any exposed roots within 1 foot outside the dripline area of any landmark, heritage, or street tree.
- Park or operate any motor vehicle within 1 foot outside the dripline area of any landmark, heritage, or street tree.

- Place or store any equipment or construction materials within 1 foot outside the dripline area of any landmark, heritage, or street tree.
- Place, apply, or attach any signs, ropes, cables, or other items to any landmark, heritage, or street tree.
- Place or allow to flow any oil, fuel, concrete mix, or other deleterious substance into or over within 1 foot outside the dripline area of any landmark, heritage, or street tree.

Tree permits require the applicant to replace a removed tree with a living tree on the property or within West Sacramento in a location approved by the tree administrator. The applicant also must replace the replacement tree if it dies any time within 3 years of the initial planting. Replacement is not required if a tree is removed because it poses a risk or hosts a plant parasite.

Replacement trees are required at a ratio of 1:1 (i.e., 1-inch diameter of replacement plant for every 1-inch diameter of tree removed). Replacement trees may be a combination of 15-gallon trees, which are the equivalent of a 1-inch-diameter tree, or 24-inch box trees, which are the equivalent of a 3-inch-diameter tree. If a property owner is unable to replace the tree on his or her property, or within an area approved by the tree administrator, the tree administrator will require the property owner to pay an in-lieu fee to the city. An in-lieu fee payment is not required if the tree needs to be removed solely because it poses a risk to persons or property, or if the tree acts as a host for a plant that is parasitic. In-lieu fees are set by City Council resolution and are used to purchase and plant trees elsewhere in West Sacramento.

The BSA supports heritage trees in West Sacramento that would be affected by implementation of the project and would be subject to the City of West Sacramento Tree Preservation Ordinance.

2.1.3.5 City of Sacramento Tree Conservation

The City of Sacramento protects trees on city property and private property (Sacramento Municipal Code, Title 12, Chapter 12.56). All city street trees and trees on city property are protected. On private property, protected trees include the following.

- A valley oak (*Quercus lobata*), blue oak (*Q. douglasii*), interior live oak (*Q. wislizenii*), coast live oak (*Q. agrifolia*), California buckeye (*Aesculus californica*), or California sycamore (*Platanus racemosa*) tree with a diameter at standard height (dsh) of 12 inches or more.
- A tree of any species with a dsh of 24 inches or more on an undeveloped lot or a lot that does not have a single unit or duplex dwelling.
- A tree of any species with a dsh of 32 inches or more on a lot that has a single unit or duplex dwelling.

The code regulates all activities that could adversely affect the health of a protected tree, including the following.

- Tree removal.
- Tree pruning.
- Attaching any signs, lights, or hardware to a city tree.

- Grading, clearing, excavating, adding fill, trenching, boring, compacting, or paving within the tree protection zone (the outermost edge of the canopy).
- Placing or storing construction equipment or material within the tree protection zone.
- Application of any harmful substance within the tree protection zone.
- Topping a tree.

The City requires that public projects avoid removal of or damage to city trees to the extent feasible and requires a tree protection plan for retained trees. For projects that require City Council approval and that will remove city trees with a dsh of 4 inches or more, written justification to the Department of Public Works Director and subsequent City Council approval is required. The City requires a tree permit from the Director and a tree replacement plan to provide for replacement at a ratio of 1:1 (1 inch dsh of tree replaced for each 1 inch of dsh removed).

The BSA supports protected city trees in the City of Sacramento that would be affected by implementation of the project and would be subject to the required permitting and replacement standards.

2.2 Studies Required

Potential biological resource issues associated with the proposed project were identified through review of existing information and field surveys. It was determined that the following studies and surveys would be required to document natural resources in the BSA.

- General habitat evaluation to determine whether suitable habitat exists for special-status plant and animal species.
- Botanical field surveys to map land cover types, including natural communities, and survey for special-status plant species.
- Delineation of aquatic resources (waters of the United States) and waters of the State.
- General river habitat survey to evaluate the occurrence and extent of shaded riverine aquatic (SRA) cover that exists for special-status fish species in the BSA.

To prepare for the field surveys, biologists reviewed existing resource information related to the project to evaluate whether special-status species or other sensitive biological resources (e.g., waters of the United States) could occur in the BSA. As this document was prepared and revised, updated versions of the resources were obtained, reviewed, and incorporated. The sources listed below were reviewed.

- California Native Plant Society's (CNPS's) online Inventory of Rare and Endangered Plants of California records search of the Sacramento West, Clarksburg, Saxon, Rio Linda, Sacramento East, Florin, Taylor Monument, Grays Bend, and Davis U.S. Geological Survey (USGS) 7.5-minute quadrangles (California Native Plant Society 2019) (Appendix B).

- California Natural Diversity Database (CNDDB) records search of the Sacramento West, Clarksburg, Saxon, Rio Linda, Sacramento East, Florin, Taylor Monument, Grays Bend, and Davis USGS 7.5-minute quadrangles (California Department of Fish and Wildlife 2019) (Appendix B).
- A list of endangered and threatened species that may occur in or be affected by projects within the Sacramento West USGS 7.5-minute quadrangle and Yolo and Sacramento Counties (National Marine Fisheries Service 2019; U.S. Fish and Wildlife Service 2019) (Appendix B).
- Lists of plants identified as noxious weeds or invasive plants by the U.S. Department of Agriculture (USDA) (Natural Resources Conservation Service 2010), the California Department of Food and Agriculture (CDFA) (Natural Resources Conservation Service 2003) and the California Invasive Plant Council (Cal-IPC) (2018).
- Soil map unit descriptions for the BSA (Natural Resources Conservation Service 2019).

This information was used to develop lists of special-status species and other sensitive biological resources that could be present in the project region. Species from the lists were considered if they were known to occur in the project region or had potential habitat in the BSA and the BSA was within the species' range.

2.3 Personnel and Survey Dates

ICF biologists conducted biological surveys in the accessible parcels in the BSA in 2017 and 2018 (Table 2-1). Methods and personnel involved in documenting wetlands and other waters of the United States and conducting botanical, wildlife, and SRA cover habitat surveys are described below. Representative photographs taken during field surveys are provided in Appendix C.

2.3.1 Wetlands and Non-Wetland Waters of the United States

ICF botanist/wetland ecologist Lisa Webber conducted the delineation field work in the BSA on August 24, 2017, and on February 6 and 9, 2018. The delineation was conducted using the routine onsite determination method described in the *U.S. Army Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987); the supplemental procedures and wetland indicators provided in the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (U.S. Army Corps of Engineers 2008); *Ordinary High Water Mark Identification*, USACE Regulatory Guidance Letter No. 05-05, dated December 7, 2005 (U.S. Army Corps of Engineers 2005), and *A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region* (Lichvar and McColley 2008). The aquatic resources delineation letter report is included as Appendix D.

Table 2-1. Biological Survey Personnel and Dates

Survey Type	Survey Date	Surveyor
Natural communities and habitat-based assessment for special-status species	August 24, 2017; February 6 and 9, 2018	Lisa Webber, ICF Botanist/Wetland Ecologist, 25 years experience
Botanical surveys	August 24, 2017; February 6 and 9, 2018	Lisa Webber
Tree survey	February 6 and 9, 2018	Kristin Lantz, ICF Certified Arborist, 14 years experience
Delineation of waters of the United States and waters of the State	August 24, 2017; February 6 and 9, 2018	Lisa Webber
Shaded riverine aquatic cover habitat survey, fish passage reconnaissance assessment, riparian tree assessment, and general river habitat survey	August 24, 2017	Lisa Webber Jeff Kozlowski, ICF Fish Biologist, 31 years experience
Reconnaissance-level survey and elderberry shrub survey	October 29, 2019; November 5, 2019	John Howe, ICF Wildlife Biologist, 23 years experience

2.3.2 Botanical Resources

ICF botanist Lisa Webber conducted botanical surveys in the BSA on August 24, 2017, and on February 6 and 9, 2018. The 2017 summer survey coincided with the identification periods of special-status plants with potential to occur in the project region. No spring survey was conducted, but no spring-blooming special-status plants have suitable habitat in the BSA. During February 2018 surveys, the botanist walked all accessible parts of the BSA and compiled lists of plants species observed. For the August 24, 2017 survey, the banks of the Sacramento River were surveyed via boat and onshore to assess potential special-status plant habitat and riparian trees. The species, approximate diameters at breast height (dbh), and approximate locations were recorded for riparian trees. ICF certified arborist Kristin Lantz recorded species and approximate dbh of trees outside of the riparian habitat in accessible parts of the BSA on February 6 and 9, 2018. Street trees in Sacramento were not included in the tree survey.

A list of plant species observed in the BSA is included as Appendix E, and a list of the riparian trees is included as Appendix F. Natural communities in the BSA also were identified and mapped during the botanical field surveys. The results of these surveys are presented in Chapters 3 and 4.

2.3.3 Wildlife Resources

ICF wildlife biologist John Howe conducted a reconnaissance-level wildlife survey on October 29, 2019, that focused on identifying areas of suitable habitat for special-status wildlife. On November 5, 2019, an elderberry shrub (host plant of the federally threatened VELB) survey was conducted in the BSA. The results of the wildlife surveys are presented in Chapters 3 and 4.

2.3.4 Fisheries Resources

On August 24, 2017, ICF fish biologist Jeff Kozlowski, accompanied by Lisa Webber, mapped SRA cover habitat and conducted a fish passage reconnaissance assessment and a general reconnaissance-level field survey of the Sacramento River within the BSA via boat. The reconnaissance-level field survey focused on evaluating existing habitat conditions within the

BSA relative to the needs of special-status fish species. No special-status fish surveys were conducted for the proposed project.

2.4 Agency Coordination and Professional Contacts

The following agency coordination has been conducted for the project.

2.4.1 National Marine Fisheries Service

On November 4, 2019, Caltrans obtained from the NMFS California Species List Tools website a list of all federally proposed and listed endangered and threatened species, designated critical habitat, and EFH that could occur in the vicinity of, and be affected by, the project (National Marine Fisheries Service 2019).

2.4.2 U.S. Fish and Wildlife Service

On September 17, 2019, ICF obtained a list of federally endangered and threatened species with a potential to occur in the BSA from USFW's Information for Planning and Conservation (IPaC) (U.S. Fish and Wildlife Service 2019).

2.4.3 U.S. Army Corp of Engineers

A delineation of aquatic resources letter report and request for a preliminary jurisdictional determination (PJD) was submitted to the USACE on November 5, 2019, and was confirmed as received by USACE Senior Project Manager Mary Pakenham-Walsh on November 12, 2019. Ms. Pakenham-Walsh assigned the request an existing file number (SPK-2015-00634), which was used during the feasibility stage of the Broadway Bridge Project. Ms. Pakenham-Walsh requested and received additional contact information on November 19, 2019, and clarification of acreage information on January 6, 2020. The PJD is pending as of this writing.

2.4.4 California Department of Fish and Wildlife

There has been no consultation with CDFW to date, but at the very least, an LSAA will be required for the project.

2.4.5 California State Lands Commission

There has been no consultation with the California State Lands Commission to date, but a Land Use Lease will be required for bridge construction in the Sacramento River.

2.5 Limitations That May Influence Results

The botanical surveys were conducted during the reported blooming periods for all of the special-status plants identified with potential habitat in the BSA. Although not all parcels in the BSA were accessible for botanical surveys, the potential for occurrence of special-status plants in

the BSA is generally low, due to historical and ongoing disturbance of the area for development, agriculture, and flood control. The tree survey was not complete, and there is potential for protected non-riparian trees on parcels that were not accessible for surveys.

At the time of the delineation fieldwork, indicators of hydrophytic vegetation, hydric soils, wetland hydrology, and the mean high water line were evident and identifiable. Inaccessible parcels in the BSA were reviewed on aerial photographs and had no evidence of supporting wetland or non-wetland waters. Therefore, there were no limitations on the survey for wetlands and non-wetland waters in the BSA.

Focused nesting bird surveys (including surveys for Swainson's hawk) were not conducted as part of the wildlife surveys. Based on the large population of nesting Swainson's hawk along the Sacramento River and their historical use of riparian habitat in the project vicinity, there is a high likelihood that Swainson's hawks could nest in or adjacent to the BSA during construction. In addition, the presence of an active nest in one particular year is not a clear indication of where Swainson's hawks may nest in the year of construction. Therefore, for purposes of assessing impacts on Swainson's hawk, it was assumed that they are present in the BSA.

Focused fish surveys were not conducted as part of the river habitat survey. The potential for occurrence of special-status fish in the BSA is high, and the assumed presence of, and the impact assessment on, special-status fish species relied heavily on previously collected data; literature reviews; and current information on fish species distribution, habitat requirements, and life history accounts.

Chapter 3 Results: Environmental Setting

This chapter defines the BSA for the proposed project and describes the existing physical and biological conditions within the BSA.

3.1 Existing Biological and Physical Conditions

3.1.1 Biological Study Area

The extent of the BSA, which includes all permanent and temporary project impact areas, is shown in Figures 6 and 7 (Appendix A). The BSA consists of the Sacramento River, riparian forest along the Sacramento River, local roads, and commercial development. The BSA has a relatively high level of historical and ongoing disturbance.

3.1.2 Physical Conditions

The BSA is located in the Sacramento Valley subregion of the California Floristic Province (Baldwin et al. 2012:43). The topography in the BSA varies from relatively level to moderate slopes on the Sacramento River levees, and elevations range from approximately 0 to 35 feet above mean sea level.

According to soil data from the Natural Resources Conservation Service, the BSA contains the following five soil map units and water (Natural Resources Conservation Service 2019).

- Lang sandy loam (Yolo County).
- Lang sandy loam, deep (Yolo County).
- Sycamore silt loam, 0 to 1 percent slopes, MLRA 17 (Yolo County).
- Columbia sandy loam, drained, 0 to 2 percent slopes, occasionally flooded (Sacramento County).
- Urban land (Sacramento County).

The soil profile has been disturbed by development in the BSA.

The BSA is within the Lower Sacramento watershed hydrologic unit (hydrologic unit code [HUC] 18020109) (U.S. Environmental Protection Agency 2018). The primary river in the delineation area is the Sacramento River, a traditional navigable water (TNW) that qualifies as another water of the United States (which also is considered a water of the State). The specific characteristics of waters of the United States (including wetlands) in the BSA are further described in Section 3.1.3.1, *Natural Communities* and in the wetland delineation report (Appendix D).

3.1.3 Biological Conditions

3.1.3.1 Natural Communities

The natural communities in the BSA are interspersed with roadways, railroad tracks, and commercial and industrial areas. The term *land cover type* is used in this NES to refer to vegetation communities, open water, and unvegetated developed or disturbed areas. The five land cover types mapped during field surveys (cottonwood riparian forest, ruderal, perennial stream, landscaped, and developed/graded) are described below and shown in Figures 6 and 7 (Appendix A). Representative photographs of land cover types within the BSA are provided in Appendix C.

The BSA supports both common vegetation communities and natural communities of special concern. Common vegetation communities are habitats with low species diversity that are widespread, reestablish naturally after disturbance, or support primarily non-native species. These communities generally are not protected by agencies unless the specific site is habitat for or supports special-status species (e.g., raptor foraging or nesting habitat, upland habitat in a wetland watershed). Common vegetation communities in the BSA are ruderal and landscaped areas.

Natural communities of special concern are habitats considered sensitive because of their high species diversity, high productivity, unusual nature, limited distribution, or declining status. Local, state, and federal agencies consider these habitats important. The CNDDB contains a current list of rare natural communities throughout the state. USFWS considers certain habitats, such as wetlands and riparian communities, important to wildlife; and the USACE and EPA consider wetland habitats important for water quality and wildlife. The only habitat in the BSA that meets the criteria for natural communities of special concern is cottonwood riparian forest. Perennial stream, although not a vegetation community, is included as a natural community of special concern because it is important wildlife and fish habitat and is regulated by resource agencies.

The distribution, representative vegetation, and typical wildlife species found in land cover types within the BSA are described below. Lists of plant species observed in the BSA are included in Appendix E, and a list of wildlife species observed in the BSA is presented in Section 3.1.3.2, *Common Animal Species*.

Cottonwood Riparian Forest

Cottonwood riparian forest in the BSA occurs along the banks of the Sacramento River (Appendix A, Figures 6 and 7). The overstory of riparian forest is predominantly mature Fremont's cottonwood (*Populus fremontii*) and Goodding's black willow (*Salix gooddingii*) trees associated with valley oak and black locust (*Robinia pseudoacacia*). Other riparian tree species observed include boxelder (*Acer negundo* var. *californicum*), white alder (*Alnus rhombifolia*), Oregon ash (*Fraxinus latifolia*), northern California black walnut (*Juglans californica* var. *hindsii*), and western sycamore. The riparian understory on the waterside of the levee is primarily rip-rap with non-native annual grasses and forbs; however, there are also patches of more typical riparian species, such as narrow-leaf willow (*Salix exigua*) and Himalayan blackberry (*Rubus*

armeniacus). The invasive red sesbania (*Sesbania punicea*) shrub was observed in the riparian forest on both sides of the river. Riparian forest associated with the Sacramento River in the BSA is depicted in Photos 1–4 in Appendix C.

Riparian habitats are sensitive natural communities that provide important habitat for wildlife and shaded riverine habitat for fish. Local, state, and federal agencies recognize riparian habitats as sensitive natural communities.

Riparian habitats provide cover, provide foraging and nesting habitat, and serve as migration and dispersal corridors for several bird and mammal species in the region. Common wildlife species that may occur in these habitats include black phoebe (*Sayornis nigricans*), yellow-rumped warbler (*Dendroica coronata*), house finch (*Carpodacus mexicanus*), American goldfinch (*Carduelis tristis*), yellow-billed magpie (*Pica nuttalli*), pocket gopher (*Thomomys bottae*), fox squirrel (*Sciurus niger*), common muskrat (*Ondatra zibethicus*), and raccoon (*Procyon lotor*).

Ruderal

Both the West Sacramento and Sacramento sides of the BSA include areas of naturalized vegetation on undeveloped parcels or parts of parcels with ruderal species. Dominant species observed in ruderal habitats at the time of the field surveys include non-native annual grasses and forbs, such as ripgut brome (*Bromus diandrus*), soft chess (*Bromus hordeaceus*), shepherd's purse (*Capsella bursa-pastoris*), mouse ear chickweed (*Cerastium fontanum*), fringed willowherb (*Epilobium ciliatum*), white stemmed filaree (*Erodium moschatum*), telegraph weed (*Heterotheca grandiflora*), foxtail barley (*Hordeum murinum* subsp. *leporinum*), and milk thistle (*Silybum marianum*). One blue elderberry shrub (*Sambucus nigra* subsp. *caerulea*), habitat for the federally threatened VELB, was found in ruderal habitat on the Sacramento side of the river near the bike path (Appendix A, Figures 6 and 7). Representative photographs of ruderal habitat in the BSA are provided as Photos 5–7 in Appendix C.

The ruderal vegetation provides nesting habitat for common birds, including northern mockingbird (*Mimus polyglottos*), western meadowlark (*Sturnella neglecta*), and killdeer (*Charadrius vociferous*) (in more open areas). Mallards from the adjacent river could use the denser areas of ruderal grassland for nesting. This ruderal area also provides foraging habitat for bird species.

Perennial Stream (Sacramento River)

The Sacramento River is the only perennial stream in the BSA (Appendix A, Figures 6 and 7). All perennial stream is unvegetated open water. The river averages 720 feet wide at the OHWM in the BSA. The riverbanks are levees that are mostly steeply sloped and support riparian forest vegetation, as described above, with rip-rap near the bottom of the slope. Additional information about the perennial stream is provided in the wetland delineation report (Appendix D). Representative photographs of the Sacramento River in the BSA are provided as Photos 1–4 in Appendix C.

The Sacramento River is a TNW and a water of the United States subject to regulation under CWA Section 404 and Section 10 of the RHA, and under the jurisdiction of the USACE. The river is considered a sensitive natural community. The RWQCB protects all waters of the State under the Porter-Cologne Act.

Riverine habitats like the Sacramento River provide habitat for amphibians, birds, and mammals. Common wildlife species that could be found in the river and along the shore of the river include American bullfrog (*Lithobates catesbeianus*), mallard (*Anas platyrhynchos*), great egret (*Ardea alba*), and river otter (*Lutra canadensis*). Numerous species of fish also are known to occur in the Sacramento River and are described below.

Landscaped

The vegetation in landscaped areas typically comprises ornamental species planted as street trees and landscaping, including deodar cedar (*Cedrus deodara*), camphortree (*Cinnamomum camphora*), Italian cypress (*Cupressus sempervirens*), oleander (*Nerium oleander*), pines (*Pinus* spp.), London plane tree (*Platanus* x *hispanica*), and California fan palm (*Washingtonia filifera*) (Appendix A, Figures 6 and 7). Areas shown as landscaped on Figures 6 and 7 include some paved areas located within surrounding landscaping. Landscaping is depicted in Photos 8–10 in Appendix C.

Common bird species may forage and nest in some of the landscaped areas, including mourning dove, American robin (*Turdus migratorius*), cliff swallow (*Petrochelidon pyrrhonota*) (nests on buildings and bridges), and western scrub jay (*Aphelocoma californica*).

Developed/Graded

Developed portions of the BSA consist of commercial/industrial areas, and paved roadways and parking lots. Graded portions of the BSA include unpaved areas adjacent to roadways and unpaved parking areas. These areas generally are unvegetated. Disturbed/graded areas are depicted in Photos 8–10 in Appendix C.

Common wildlife species that would occur in developed areas would be the same as those described above in the landscaped areas.

3.1.3.2 Common Animal Species

Wildlife

The BSA supports common birds and mammals typical of both riverine, riparian, and urban areas. Wildlife species with a potential to occur in the BSA include western fence lizard (*Sceloporus occidentalis*), Canada goose (*Branta canadensis*), white-throated swift (*Aeronautes saxatalis*), western scrub jay, northern mockingbird, European starling (*Sturnus vulgaris*), rock dove (*Columbia livia*), yellow-billed magpie, feral house cat (*Felis catus*), black-tailed jackrabbit (*Lepus californicus*), fox squirrel, raccoon, and skunk (*Mephitis mephitis*).

Wildlife Migration Corridors

The BSA consists of predominantly disturbed and developed areas along both sides of the Sacramento River, with a narrow band of riparian habitat along the river. Despite these existing conditions, the open water portion of the river serves as a migration corridor for aquatic species; and, even though limited, the riparian habitat can be used by birds and other wildlife for dispersing along the Sacramento River corridor. Fish passage and migration within the Sacramento River are discussed below.

Fish

The Sacramento River in the BSA falls within the Sacramento-San Joaquin Province (Central Valley Subprovince), one of six aquatic zoogeographic provinces in California, as defined by Moyle (2002). The Sacramento-San Joaquin Province is drained by the Sacramento and San Joaquin Rivers. Generally, four native fish assemblages can be recognized in Central Valley streams: rainbow trout assemblage, California roach assemblage, pikeminnow-hardhead-sucker assemblage, and deep-bodied fish assemblage (Moyle 2002). Based on its geographic location, the BSA lies at the interface between the zone characterized by the deep-bodied fish assemblage and the Sacramento-San Joaquin Estuary (i.e., the Delta).

Native fish species that occur where the Sacramento River meets the Delta include Sacramento sucker (*Catostomus occidentalis*), Sacramento pikeminnow (*Ptychocheilus grandis*), Sacramento splittail (*Pogonichthys macrolepidotus*), Sacramento blackfish (*Orthodon microlepidotus*), Sacramento hitch (*Lavinia exilicauda*), hardhead (*Mylopharodon conocephalus*), Chinook salmon (winter-, spring-, fall-, and late fall–run), steelhead, green sturgeon, white sturgeon (*Acipenser transmontanus*), Pacific lamprey (*Entosphenus tridentata*), western river lamprey (*Lampetra ayresi*), delta smelt, longfin smelt, tule perch (*Hysterocarpus traski*), and prickly sculpin (*Cottus asper*) (Moyle 2002). The dominant fishes, however, are all non-native (alien) species: largemouth, smallmouth, and spotted bass (*Micropterus* spp.); white and black crappie (*Pomoxis* spp.); bluegill (*Lepomis macrochirus*); American shad (*Alosa sapidissima*); threadfin shad (*Dorosoma petenense*); striped bass (*Morone saxatilis*); bigscale logperch (*Percina macrolepida*); red shiner (*Cyprinella lutrensis*); inland silverside (*Menidia beryllina*); white catfish (*Ameiurus catus*); black and brown bullhead (*Ameiurus* spp.); and common carp (*Cyprinus carpio*) (Moyle 2002).

The Sacramento River is wide and deep and provides unimpeded passage for adult and juvenile migratory and resident fish species in the BSA.

3.2 Regional Special-Status Species

Regional species and habitats of concern were identified using the CNDDB records search (California Department of Fish and Wildlife 2019) (Appendix B), CNPS's online Inventory of Rare and Endangered Plants of California (2019) (Appendix B), the species lists obtained from the USFWS (2019) and NMFS (2019) websites (Appendix B); and species distribution and habitat requirements data. Based on a review of this information, 31 special-status plant species, 26 special-status wildlife species, and 13 special-status fish species (Tables 3-1 and 3-2 [at the

end of the chapter]) were identified with the potential to occur or are known to occur in the project region (i.e., within 10 miles of the BSA).

For the purpose of this NES, *special-status species* are plants, wildlife, and fish that are legally protected under ESA, CESA, or other regulations, and species that are considered sufficiently rare by the scientific community to qualify for such listing. Special-status plants, animals, and fish are those species in any of the categories listed below.

- Species listed or proposed for listing as threatened or endangered under ESA (50 CFR 17.11 [listed animals], 50 CFR 17.12 [listed plants], and various notices in the Federal Register [FR] [proposed species]).
- Species that are candidates for possible future listing as threatened or endangered under ESA (84 FR 54732 October 10, 2019).
- Species listed or proposed for listing by the State of California as threatened or endangered under CESA (14 California Code of Regulations 670.5).
- Species that meet the definitions of rare or endangered under CEQA (State CEQA Guidelines Section 15380).
- Plants listed as rare under the CNPPA (CFGC 1900 et seq.).
- Plants considered by CDFW and CNPS to be "rare, threatened, or endangered in California" (Rare Plant Ranks 1B and 2; California Department of Fish and Wildlife 2019).
- Plants identified by CDFW and CNPS about which more information is needed to determine their status, and plants of limited distribution (Rare Plant Ranks 3 and 4, California Department of Fish and Wildlife 2019), which may be included as sensitive species on the basis of local significance or recent biological information.
- Animal species of special concern to CDFW.
- Animals fully protected in California (CFGC Section 3511 [birds], 4700 [mammals], 5050 [amphibians and reptiles], and 5515 [fish]).

3.2.1 Special-Status Plants

Based on the searches of the CNDDB, the CNPS rare plant inventory, and the USFWS website, 32 special-status plant species were identified as occurring in the project region (Table 3-1 [at the end of the chapter]). The natural communities in the BSA contain potential habitat for 4 of these 32 species. The other 28 species have habitat or microhabitat requirements (e.g., playas, vernal pools, perennial marsh; alkaline, saline, clay, or serpentine soils) that are not present in the BSA or have very marginal, disturbed habitat similar to the species' habitat (e.g., patchy ruderal vegetation rather than annual grassland). The high level of historical and ongoing disturbance that is present in most of the BSA detracts from the quality of potential habitat for special-status plant species. No special-status plants were observed during the August 2017 or February 2018 field surveys, and no occurrences of special-status plants have been reported previously in the BSA (California Department of Fish and Wildlife 2019; California Native Plant Society 2019).

Plant surveys were conducted in the BSA during the appropriate identification period for the four special-status plant species with suitable habitat in the BSA (rose-mallow [*Hibiscus lasiocarpus* var. *occidentalis*], northern California black walnut [*Juglans hindsii*], Mason's lilaeopsis [*Lilaeopsis masonii*], and Suisun Marsh aster [*Symphotrichum lentum*]). Only one of these species, a single northern California black walnut tree, was found in the BSA. This species, however, has special status only as a native stand of walnut trees; and a single tree in the riparian forest is not considered a special-status plant.

Based on the field survey results and the lack of recorded occurrences in the BSA, this NES concludes that no special-status plant species occur in the BSA.

3.2.2 Special-Status Wildlife

Based on a review of the CNDDB search results; the USFWS list of endangered, threatened, and proposed species within the project region; and species' distribution and habitat data, 26 special-status wildlife species were determined to have the potential to occur in the project region (Table 3-2 [at the end of the chapter]). After completion of the field survey, the biologists determined that 20 of the 26 species would not occur in the BSA because the area lacks suitable habitat or is outside the species' known range. An explanation for the absence of each of these species from the BSA is provided in Table 3-2. Suitable habitat is present in the BSA for the remaining six species listed below. These species are discussed in Chapter 4.

- Valley elderberry longhorn beetle
- Western pond turtle (*Emys marmorata*)
- Swainson's hawk
- White-tailed kite
- Pallid bat (*Antrozous pallidus*)
- Western red bat (*Lasiurus blossevillii*)

3.2.3 Special-Status Fish

Based on a review of the CNDDB search results; the USFWS and NMFS lists of endangered, threatened, and proposed species within the project region; CDFW's list of fish species of special concern (Moyle et al. 2015); and species' distribution, life history, and habitat data (e.g., Moyle 2002; U.S. Fish and Wildlife Service 2019), 13 special-status fish species were identified as occurring, or having the potential to occur, in the project region (Table 3- 2 [at the end of the chapter]). These 13 species are listed below and are discussed further in Chapter 4.

- Sacramento River winter-run Chinook salmon
- CV spring-run Chinook salmon
- CV fall- and late fall–run Chinook salmon
- CCV steelhead
- Southern Distinct Population Segment (DPS) green sturgeon

- Delta smelt
- Longfin smelt
- White sturgeon
- Sacramento splittail
- Sacramento hitch
- Hardhead
- Pacific lamprey
- Western river lamprey

In addition, the Sacramento River in the BSA is designated as critical habitat for Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, North American green sturgeon, and delta smelt. The Sacramento River in the BSA also is considered EFH for Pacific salmon (i.e., Chinook salmon).

3.2.4 Other Protected and Managed Biological Resources

3.2.4.1 Migratory Birds

Non-special-status migratory birds, including raptors, have the potential to nest in trees, in shrubs, and on the ground in the BSA. Although common migratory bird species are not considered special-status wildlife species, their occupied nests and eggs are protected by CFGC Sections 3503 and 3503.5 and the MBTA.

3.2.4.2 Bats

Several bat species could roost in trees and buildings within the BSA, including special-status bats. Bats play important roles in California ecosystems and offer important benefits to humans, including the control of mosquitos and crop-damaging insects and the deposition of nitrogen rich guano under roosts that serves as a natural fertilizer (Western Bat Working Group 2004; Erickson et al. 2002:2). A total of 18 species of bats use bridges in one way or another in California (Erickson et al. 2002:14). Bridges provide important habitat for roosting bats in California considering the amount of riparian habitat lost and the loss of rock outcrops and caves from reservoir development (Erickson et al. 2002:2).

3.2.4.3 Protected Trees

A list of riparian and non-riparian trees, by species, with a diameter at 4.5 feet above ground of 6 inches or greater was recorded for the accessible parcels in the BSA (Appendix F). The City of West Sacramento Tree Preservation Ordinance protects all trees with a dbh of 24 inches or greater and native oaks with a dbh of 16 inches or greater. On private property, the City of Sacramento protects all trees with a dsh of 24 inches or greater on undeveloped land or commercial or industrial property; native oaks, California buckeye, and western sycamore with a dsh of 12 inches or greater; and all trees in a riparian zone with a dsh of 12 inches or greater.

Within the proposed project footprint alternatives, approximately 33 trees meet the tree ordinance criteria for the city in which they occur—approximately 13 trees in West Sacramento and 20 trees in Sacramento (Appendix F). Not all street trees in the BSA were included in the tree survey, and additional protected street trees likely are not accounted for in these estimates. The tree species included are boxelder, white alder, Oregon ash, California black walnut, western sycamore, Fremont's cottonwood, valley oak, black locust, and Goodding's black willow. Black locust is an invasive species, but several black locust trees in the riparian forest on the City of Sacramento side of the river meet the protected tree size criterion.

3.2.4.4 Invasive Species

Invasive plant species include species designated as federal noxious weeds by the USDA, species listed by the CDFA, and invasive plants identified by Cal-IPC. Invasive plants displace native species, change ecosystem processes, alter plant community structure, and lower wildlife habitat quality. Road, highway, and related construction projects are potential dispersal pathways for invasive plants and their propagules (California Invasive Plant Council 2012). FHWA requires that state departments of transportation use the state's noxious weed list to identify invasive plant species that could be spread by construction of transportation projects. Accordingly, Table 3-3 lists the invasive plant species identified by the CDFA and Cal-IPC that are known to occur in the BSA (Natural Resources Conservation Service 2003; California Invasive Plant Council 2018). No plant species designated as federal noxious weeds have been identified in the BSA (Natural Resources Conservation Service 2010). Invasive plant species occur in riparian forest, ruderal, and disturbed/graded areas in the BSA. Infestation of the BSA by these species is generally limited; they occur primarily as scattered individuals.

Table 3-1. Special-Status Plants Known or with Potential to Occur in the Project Region, or That May Be Affected by the Proposed Project

Common Name *Scientific Name*	Status[a] Federal/ State/CRPR	General Habitat Description	Blooming Period	Habitat Present/Absent	Rationale
Depauperate milk-vetch (*Astragalus pauperculus*)	–/–/4.3	Seasonally wet areas on volcanic soils in chaparral, cismontane woodland, valley and foothill grassland in seasonally wet areas or on volcanic soils; 196–3,986 feet	March–June	Habitat absent	Marginal grassland habitat only in ruderal areas. No volcanic soils present. Nearest recorded occurrence is more than 10 miles from the BSA.
Ferris' milk-vetch (*Astragalus tener* var. *ferrisiae*)	–/–/1B.1	Seasonally wet areas in meadows and seeps, subalkaline flats in valley and foothill grassland; 6–246 feet	April–May	Habitat absent	Marginal grassland habitat only in ruderal areas. No subalkaline flats present. Nearest recorded occurrence is ~3 miles west of the BSA.
Alkali milk-vetch (*Astragalus tener* var. *tener*)	–/–/1B.2	Playas, on adobe clay in valley and foothill grassland, vernal pools on alkali soils; below 197 feet	March–June	Habitat absent	Marginal grassland habitat only in ruderal areas. No playas, adobe clay, or alkali soils present. Nearest recorded occurrence is ~10 miles southwest of the BSA.
Heartscale (*Atriplex cordulata* var. *cordulata*)	–/–/1B.2	Saline or alkaline soils in chenopod scrub, meadows and seeps, sandy areas in valley and foothill grassland; below 1,230 feet	April–October	Habitat absent	Marginal grassland habitat only in ruderal areas. No saline or alkaline soils present. Nearest recorded occurrence is more than 10 miles from the BSA. Not observed during August 2017 surveys.
Brittlescale (*Atriplex depressa*)	–/–/1B.2	Alkaline or clay soils in chenopod scrub, meadows and seeps, playas, valley and foothill grassland, vernal pools; below 1,050 feet	April–October	Habitat absent	Marginal grassland habitat only in ruderal areas. No alkaline or clay soils present. Nearest recorded occurrence is more than 10 miles from the BSA. Not observed during August 2017 surveys.
Valley brodiaea (*Brodiaea rosea* subsp. *vallicola*)	–/–/4.2	Serpentine soils in closed-cone coniferous forest, chaparral, cismontane woodland, valley and foothill grassland; 1,100–4,757 feet	May–June	Habitat absent	Marginal grassland habitat only in ruderal areas. No coniferous forest, chaparral, or suitable woodland habitat present. No serpentine soils present. Nearest recorded occurrence is ~4 miles east of the BSA.
Bristly sedge (*Carex comosa*)	–/–/2.1	Coastal prairie, marshes and swamps at lake margins, valley and foothill grassland; below 2,050 feet	May–September	Habitat absent	Marginal grassland habitat only in ruderal areas. No alkaline soils present. Nearest recorded occurrence is more than 10 miles from the BSA. Not observed during August 2017 surveys.

Common Name *Scientific Name*	Status[a] Federal/ State/CRPR	General Habitat Description	Blooming Period	Habitat Present/Absent	Rationale
Pappose tarplant (*Centromadia parryi* subsp. *parryi*)	–/–/1B.2	Coastal prairie, meadows and seeps, coastal salt marshes and swamps, alkaline soils in vernally mesic valley and foothill grassland; 0–1,378 feet	May–November	Habitat absent	Marginal grassland habitat only in ruderal areas. No alkaline soils present. Nearest recorded occurrence is more than 10 miles from the BSA. Not observed during August 2017 surveys.
Parry's rough tarplant (*Centromadia parryi* subsp. *rudis)*	–/–/4.2	Alkaline, vernally mesic seeps, sometimes roadsides, in valley and foothill grassland, vernal pools; 0–328 feet	May–October	Habitat absent	No mesic grassland or vernal pools present. No alkaline soils present. Nearest recorded occurrence is ~7.5 miles north of the BSA. Not observed during August 2017 surveys.
Palmate-bracted bird's-beak (*Chloropyron palmatum*)	E/E/1B.1	Alkaline grassland, alkali meadow, chenopod scrub; 50–1,670 feet	May–October	Habitat absent	Marginal grassland habitat only in ruderal areas. No alkaline grassland habitat or chenopod scrub present. Nearest recorded occurrence is more than 10 miles from the BSA. Not observed during August 2017 surveys. *No effect.*
Peruvian dodder (*Cuscuta obtusiflora* var. *glandulosa*)	–/–/2.2	Freshwater marshes and swamps; 50–920 feet	July–October	Habitat absent	No freshwater marsh habitat present. Nearest recorded occurrence is more than 10 miles from the BSA. Not observed during August 2017 surveys.
Dwarf downingia (*Downingia pusilla*)	–/–/2.2	Vernal pools and mesic valley and foothill grasslands; below 1,459 feet	March–May	Habitat absent	No vernal pool habitat present. Nearest recorded occurrence is ~9 miles north of the BSA.
Jepson's coyote thistle (*Eryngium jepsonii*)	–/–/1B.2	Vernal pools and mesic valley and foothill grassland; 33–330 feet	April–August	Habitat absent	No vernal pool habitat present. Nearest recorded occurrence is more than 10 miles from the BSA. Not observed during August 2017 surveys.
San Joaquin saltscale (*Extriplex* [*Atriplex*] *joaquiniana*)	–/–/1B.2	Alkaline soils in chenopod scrub, meadows and seeps, playas, valley and foothill grassland; below 2,739 feet	April–October	Habitat absent	Marginal grassland habitat only in ruderal areas. No alkaline soils present. Nearest recorded occurrence is ~10 miles southwest of the BSA. Not observed during August 2017 surveys.
Stinkbells (*Fritillaria agrestis*)	–/–/4.2	Chaparral, cismontane woodland, pinyon-juniper woodland, valley and foothill grassland, on clay, sometimes serpentinite substrate; 33–5,101 feet	March–June	Habitat absent	Marginal grassland habitat only in ruderal areas. No chaparral or suitable woodland habitat present. No clay or serpentine soils present. Nearest recorded occurrence is ~7.5 miles northeast of the BSA.

Common Name *Scientific Name*	Status[a] Federal/ State/CRPR	General Habitat Description	Blooming Period	Habitat Present/Absent	Rationale
Boggs Lake hedge-hyssop (*Gratiola heterosepala*)	–/E/1B.2	Clay soils in areas of shallow water, lake margins of swamps and marshes, vernal pool margins; 33–7,791 feet	April–August	Habitat absent	No vernal pool habitat or clay soils present. Nearest recorded occurrence is ~9 miles northeast of the BSA. Not observed during August 2017 surveys.
Hogwallow starfish (*Hesperevax caulescens*)	–/–/4.2	Mesic clay in valley and foothill grassland; below 1,657 feet	March–June	Habitat absent	Marginal grassland habitat only in ruderal areas. No mesic areas present. Nearest recorded occurrence is ~9 miles southeast of the BSA.
Rose-mallow (*Hibiscus lasiocarpus* var. *occidentalis*)	–/–/2.2	Freshwater marsh along rivers and sloughs; often in rip-rap on sides of levees; below 394 feet	June–September	Habitat present	Low potential for presence in rip-rap along the Sacramento River. Nearest recorded occurrence is ~3 miles northwest of the BSA. Not observed during August 2017 surveys.
Northern California black walnut (*Juglans hindsii*)	–/–/1B.1	Last two native stands in Napa and Contra Costa Counties; riparian scrub and riparian woodland; below 1,443 feet	April–May	Habitat present	Species is special status only as a native stand of trees. Riparian habitat present with one black walnut tree in BSA, but no native stands present. Nearest recorded occurrence along the Sacramento River ~7 miles south of the BSA is extirpated.
Legenere (*Legenere limosa*)	–/–/1B.1	Deep, seasonally wet habitats such as vernal pools, ditches, marsh edges, and river banks; below 2,887 feet	April–June	Habitat absent	No vernal pool habitat present. Nearest recorded occurrence is ~7.5 miles northeast of the BSA.
Heckard's pepper-grass (*Lepidium latipes* var. *heckardii*)	–/–/1B.2	Alkaline flats in valley and foothill grassland; 32–656 feet	March–May	Habitat absent	Marginal grassland habitat only in ruderal areas. No alkaline soils present. Nearest recorded occurrence is ~10 miles west of the BSA.
Mason's lilaeopsis (*Lilaeopsis masonii*)	–/R/1B.1	Freshwater or brackish marsh, riparian scrub; in tidal zone	April–November	Habitat present	Low potential for presence in degraded habitat present on the Sacramento River bank but not known to occur in this area; flow and boat wakes are likely too great for establishment of this species, and most levee banks have rip-rap to below the water level or trampled sand flats Nearest recorded occurrence is ~6 miles southwest of the BSA along the Deep Water Ship Channel. Not observed during August 2017 surveys.

Common Name *Scientific Name*	Status[a] Federal/ State/CRPR	General Habitat Description	Blooming Period	Habitat Present/Absent	Rationale
Little mousetail (*Myosurus minimus* subsp. *apus*)	–/–/3.1	Alkaline soils in valley and foothill grassland and vernal pools; 66–2,100 feet	March–June	Habitat absent	BSA is lower than species' known elevation range. No alkaline soils or vernal pool habitat present. Nearest recorded occurrence is more than 10 miles from the BSA.
Baker's navarretia (*Navarretia leucocephala* subsp. *bakeri*)	–/–/1B.1	Mesic areas in cismontane woodland, lower montane coniferous forest, meadows and seeps, valley and foothill grassland, vernal pools;16–5,709 feet	April–July	Habitat absent	No suitable mesic grassland or vernal pool habitat present. Nearest recorded occurrence is more than 10 miles from the BSA.
Colusa grass (*Neostapfia colusana*)	T/E/1B.1	Adobe soils of vernal pools; 16–656 feet	May–August	Habitat absent	No vernal pool habitat or adobe soils present. Nearest recorded occurrence is ~9.5 miles southwest of the BSA. Not observed during August 2017 surveys. *No effect.*
Bearded popcorn flower (*Plagiobothrys hystriculus*)	–/–/1B.1	Mesic grassland, vernal pools; 33–900 feet	April–May	Habitat absent	No mesic grassland or vernal pool habitat present. Nearest recorded occurrence is more than 10 miles from the BSA.
California alkali grass (*Puccinellia simplex*)	–/–/1B.2	Alkaline soils, vernally mesic; sinks, flats, lake margins, chenopod scrub, meadows and seeps, valley and foothill grassland, vernal pools; 7–3,050 feet	March–May	Habitat absent	No suitable mesic habitat present. No alkaline soils present. Nearest recorded occurrence is ~8 miles northwest of the BSA.
Sanford's arrowhead (*Sagittaria sanfordii*)	–/–/1B.2	Freshwater marshes, sloughs, canals, and other slow-moving water habitats; below 2,132 feet	May–October	Habitat absent	No freshwater marsh or slow-moving water habitat present. Nearest recorded occurrence is ~3 miles northeast of the BSA. Not observed during August 2017 surveys.
Keck's checkerbloom (*Sidalcea keckii*)	E/–/1B.1	Known from only three occurrences; serpentine clay soils in cismontane woodland, valley and foothill grassland; 246–2,132 feet	April–May (June)	Habitat absent	Marginal grassland habitat only in ruderal areas. No serpentine clay soils present. Nearest recorded occurrence is more than 10 miles from the BSA. *No effect.*

Common Name *Scientific Name*	Status[a] Federal/ State/CRPR	General Habitat Description	Blooming Period	Habitat Present/Absent	Rationale
Suisun Marsh aster (*Symphotrichum lentum*)	–/–/1B.2	Brackish and freshwater marshes and swamps; below 10 feet	May–November	Habitat present	Low potential for presence in rip-rap along the Sacramento River. Nearest recorded occurrence is ~4 miles southwest of the BSA. Not observed during August 2017 surveys.
Saline clover (*Trifolium hydrophilum*)	–/–/1B.2	Salt marsh, mesic alkaline areas in valley and foothill grasslands, vernal pools, marshes and swamps; below 980 feet	April–June	Habitat absent	No salt marsh, mesic grassland, vernal pool, or marsh habitat present. No alkaline soils present. Nearest recorded occurrence is more than 10 miles from the BSA.
Crampton's tuctoria (*Tuctoria mucronata*)	E/E/1B.1	Mesic areas in valley and foothill grassland, vernal pools; 16–33 feet	April–August	Habitat absent	No mesic grassland or vernal pool habitat present. Nearest recorded occurrence is ~10 miles southwest of the BSA. Not observed during August 2017 surveys. *No effect.*

Sources: California Native Plant Society 2019; California Department of Fish and Wildlife 2019.

BSA = biological study area.

[a] Status explanations:

Federal

E = Listed as endangered under the federal Endangered Species Act (ESA).
T = Listed as threatened under the federal ESA.
– = No listing status.

State

E = Listed as endangered under the California Endangered Species Act (CESA).
R = Listed as rare under CESA. This category is no longer used for newly listed plants, but some plants previously listed as rare retain this designation.
– = No listing status.

CRPR (California Rare Plant Rank)

1B = List 1B species: rare, threatened, or endangered in California and elsewhere.
2 = List 2 species: rare, threatened, or endangered in California but more common elsewhere.
3 = List 3 species: more information is needed about this plant.
4 = List 4 species: limited distribution; species on a watch list.
.1 = Seriously endangered in California (over 80% of occurrences threatened—high degree and immediacy of threat).
.2 = Fairly endangered in California (20–80% occurrences threatened).

Table 3-2. Special-Status Wildlife and Fish Known or with Potential to Occur in the Project Region, or That May Be Affected by the Proposed Project

Common Name *Scientific Name*	Legal Status (Federal/State)	General Habitat Description	Habitat Present/Absent	Rationale
Invertebrates				
Conservancy fairy shrimp *Branchinecta conservatio*	E/–	Typically found in large, turbid vernal pools but known to occur in other types of pools; occurs in scattered locations from Butte and Tehama Counties to Ventura County.	Habitat absent	No suitable vernal pool habitat is present in the BSA. *No Effect*
Vernal pool fairy shrimp *Branchinecta lynchi*	T/–	Found in Central Valley, central and south Coast Ranges from Tehama to Santa Barbara County; isolated populations also in Riverside County; common in vernal pools; also found in sandstone rock outcrop pools.	Habitat absent	No suitable vernal pool habitat is present in the BSA. *No Effect*
Vernal pool tadpole shrimp *Lepidurus packardi*	E/–	Found from Shasta County south to Merced County; occurs in vernal pools and ephemeral stock ponds.	Habitat absent	No suitable vernal pool habitat is present in the BSA. *No Effect*
Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	T/–	Streamside habitats below 3,000 feet throughout the Central Valley; occurs in riparian and oak savanna habitats with elderberry shrubs; elderberries are the host plant.	Habitat present	One elderberry shrub was observed in the BSA in an area of ruderal vegetation. There were no exit holes on the shrub. The shrub is within160 feet of riparian habitat along the Sacramento River. The shrub occurs within the general location of a 1949 CNDDB record for the species. Riparian habitat also is within the BSA. According to the USFWS 2017 Framework, this shrub represents potential habitat for valley elderberry longhorn beetle. *Not Likely to Adversely Affect*

Common Name *Scientific Name*	Legal Status (Federal/State)	General Habitat Description	Habitat Present/Absent	Rationale
Amphibians				
California tiger salamander *Ambystoma californiense*	T/T	Breeds during the wet season in vernal pools and ponds, with a minimum 10-week inundation period; adults spend most of the year in grassland oak woodland habitat, primarily in small mammal burrows; occurs from Yolo to Kern County in the Central Valley and in the Sierra Nevada foothills from Amador to Tulare County, and from Sonoma to Santa Barbara County on the coast.	Habitat absent	No suitable habitat for the species is present in the BSA, and the BSA is outside the known distribution of the species. *No Effect*
California red-legged frog *Rana draytonii*	T/SSC	Found along the coast and coastal mountain ranges of California from Mendocino to San Diego County and in the Sierra Nevada from Butte to Tuolumne County; occurs in permanent and semipermanent aquatic habitats, such as creeks and ponds, with emergent and submergent vegetation; uses upland areas for cover (burrows, logs, rocks, and crevices) and dispersal.	Habitat absent	No suitable habitat for the species is present in the BSA, and the BSA is outside the known distribution of the species. *No Effect*
Reptiles				
Western pond turtle *Emys marmorata*	–/SSC	Occurs throughout California west of the Sierra-Cascade crest; found from sea level to 6,000 feet; does not occur in desert regions except along the Mojave River and its tributaries; occupies ponds, marshes, rivers, streams, and irrigation canals with muddy or rocky bottoms.	Habitat present	In the BSA, suitable aquatic habitat is present in the Sacramento River, and potential upland habitat is present in riparian woodland habitat adjacent to the river.
Giant garter snake *Thamnophis gigas*	T/T	Sloughs, canals, low-gradient streams, and freshwater marsh habitats with a prey base of small fish and amphibians; also found in irrigation ditches and rice fields; requires grassy banks and emergent vegetation for basking and areas of high ground protected from flooding during winter.	Habitat absent	The Sacramento River is not considered suitable aquatic habitat for the species. No other suitable habitat is present in the BSA. *No Effect*

Common Name *Scientific Name*	Legal Status (Federal/State)	General Habitat Description	Habitat Present/Absent	Rationale
Birds				
Swainson's hawk *Buteo swainsoni*	–/T	Lower Sacramento and San Joaquin Valleys, the Klamath Basin, and Butte Valley; highest nesting densities occur near Davis and Woodland in Yolo County; nests in oaks or cottonwoods in or near riparian habitats; forages in grasslands, irrigated pastures, and grain fields.	Habitat present	Suitable nest trees occur within and adjacent to the BSA. Species has been documented nesting north and south of the BSA along the Sacramento River.
White-tailed kite *Elanus leucurus*	–/FP	Lowland areas west of Sierra Nevada from the head of the Sacramento Valley south, including coastal valleys and foothills to western San Diego County at the Mexico border; low foothills or valley areas with valley or live oaks, riparian areas, and marshes near open grasslands for foraging.	Habitat present	Suitable nest trees occur within and adjacent to the BSA.
Western snowy plover *Charadrius alexandrines nivosus*	T/SSC	Barren to sparsely vegetated ground at alkaline or saline lakes, reservoirs, ponds, and riverine sand bars; also along sewage, salt-evaporation, and agricultural wastewater ponds.	Habitat absent	The BSA lacks suitable habitat for the species. *No Effect*
Mountain plover *Charadrius montanus*	-/SSC	Occupies open plains or rolling hills with short grasses or very sparse vegetation; nearby bodies of water are not needed; may use newly plowed or sprouting grainfields.	Habitat absent	The BSA lacks suitable habitat for the species.
Western yellow-billed cuckoo *Coccyzus americanus occidentalis*	T/E	In the west, breeding populations are limited primarily to the Sacramento Valley; nests in large blocks of riparian habitat with dense understory foliage.	Habitat absent	The riparian habitat in the BSA is not typical nesting habitat used by the species because it consists of mostly thin rows of trees along the river with very little understory. *No Effect*
Burrowing owl *Athene cunicularia*	–/SSC	Lowlands throughout California, including the Central Valley, northeastern plateau, southeastern deserts, and coastal areas; rare along south coast; level, open, dry, heavily grazed or low-stature grassland or desert vegetation with available burrows.	Habitat absent	The BSA lacks ground squirrel burrows or other structures that could be used by burrowing owl for nesting.

Common Name *Scientific Name*	Legal Status (Federal/State)	General Habitat Description	Habitat Present/Absent	Rationale
Least Bell's vireo *Vireo bellii pusillus*	E/E	Historically nested in riparian habitat throughout the Central Valley, but the majority of the population now occurs in southern California; recently documented nesting on the San Joaquin River west of Modesto; requires dense riparian vegetation for nesting and a dense, stratified canopy for foraging.	Habitat absent	The BSA lacks dense riparian vegetation with a stratified canopy. *No Effect*
Purple martin *Progne subis*	–/SSC	Nests in abandoned woodpecker holes in oaks, cottonwoods, and other deciduous trees in a variety of wooded and riparian habitats; also nests in vertical drainage holes under elevated freeways and highway bridges.	Habitat absent	In the Sacramento Valley, the species is only known to use overpasses with hollow-box girders for nesting.
Bank swallow *Riparia riparia*	–/T	Nests in bluffs or banks, usually adjacent to water, where the soil consists of sand or sandy loam.	Habitat absent	The Sacramento River within the BSA lacks suitable bank habitat with sandy open soil for nesting. The banks are all covered with rip-rap.
Grasshopper sparrow *Ammodramus svannarum*	–/SSC	Occurs in dry, dense grasslands, especially those with a variety of grasses and tall forbs and scattered shrubs for singing perches; nests in slight depressions in dense grasslands.	Habitat absent	The BSA lacks dense grasslands.
Song sparrow ("Modesto populations") *Melospiza melodia*	–/SSC	Endemic to the north-central portion of the Central Valley and the Bay-Delta; breeds in emergent marsh and riparian scrub, and in valley oak riparian forests with dense blackberry understory, vegetated irrigation canals, and levees.	Habitat absent	The BSA lacks riparian habitat with a dense understory and lacks emergent marsh.
Tricolored blackbird *Agelaius tricolor*	–/E	Permanent resident in the Central Valley from Butte to Kern County; breeds at scattered coastal locations from Marin County south to San Diego County; and at scattered locations in Lake, Sonoma, and Solano Counties; rare nester in Siskiyou, Modoc, and Lassen Counties; nests in dense colonies in emergent marsh vegetation, such as tules and cattails, or upland sites with blackberries, nettles, thistles, and grainfields; habitat must be large enough to support 50 pairs; probably requires water at or near the nesting colony.	Habitat absent	The BSA lacks suitable nesting and foraging habitat for the species.

Common Name *Scientific Name*	Legal Status (Federal/State)	General Habitat Description	Habitat Present/Absent	Rationale
Yellow-headed blackbird *Xanthocephalus xanthocephalus*	–/SSC	Nests in freshwater emergent wetlands with dense vegetation and deep water, often along borders of lakes or ponds; forages along moist shorelines and in grasslands and agricultural areas; breeding range includes primarily the Central Valley, northeastern California, and portions of southern California; most individuals migrate south of California in winter.	Habitat absent	The BSA lacks suitable nesting and foraging habitat for the species.
Mammals				
Pallid bat *Antrozous pallidus*	–/SSC	Occurs throughout California, primarily at lower and mid-level elevations in a variety of habitats from desert to coniferous forest; most closely associated with oak, yellow pine, redwood, and giant sequoia habitats in northern California and oak woodland, grassland, and desert scrub in southern California. Daytime roosts include rock outcrops, mines, caves, hollow trees, buildings, and bridges.	Habitat present	Trees on both sides of the river within the BSA provide potential habitat for bats. Buildings adjacent to the BSA also provide potential roosting habitat for pallid bats.
Townsend's big-eared bat *Corynorhinus townsendii townsendii*	–/T	Roosts in caves, tunnels, mines, and dark attics of abandoned buildings; very sensitive to disturbances and may abandon a roost after one onsite visit; also reported to use bridges and hollow trees as roost sites; in bridges, typically uses cavernous spaces under bridges; in California, occurs in inland deserts, moist cool redwood forests, oak woodlands of the inner Coast Ranges and Sierra Nevada foothills, and lower to mid-elevation mixed coniferous forests.	Habitat absent	The species is not known to occur on the floor of the Sacramento Valley.
Western red bat *Lasiurus blossevillii*	–/SSC	Found throughout much of California at lower elevations; found primarily in riparian and wooded habitats; occurs at least seasonally in urban areas; day roosts in trees within the foliage; found in fruit orchards and sycamore riparian habitats in the Central Valley.	Habitat present	Trees within the BSA represent potential roosting habitat for the species.

Common Name *Scientific Name*	Legal Status (Federal/State)	General Habitat Description	Habitat Present/Absent	Rationale
Western mastiff bat *Eumops perotis californicus*	–/SSC	Typically roosts in crevices in cliffs and rocky outcrops, in colonies of fewer than 100 individuals; may also roost in caves and buildings that allow sufficient height and clearance for dropping into flight; forages in a variety of grassland, shrub, and wooded habitats, including riparian and urban areas, although most commonly in open, arid lands; year-round range spans most of California, with records absent from the northwest and northeast portions of the state and is not known to occur on the floor of the Sacramento Valley.	Habitat absent	Although areas that could be used for roosting are present in the BSA (buildings), the species is not known to roost on the floor of the Sacramento Valley.
American badger *Taxidea taxus*	–/SSC	Drier open shrub, forest, and herbaceous habitats with friable soils; typically does not occupy cultivated lands; a single individual's home range can range between 300 and 1,500 acres; year-round range spans all of California except the Humboldt and Del Norte County coasts.	Habitat absent	No suitable habitat in the BSA for this species.
Fish				
Sacramento River winter-run Chinook salmon *Oncorhynchus tshawytscha*	E/E	Mainstem Sacramento River below Keswick Dam (Moyle 2002); occurs in well-oxygenated, cool, riverine habitat with water temperatures from 8.0 to 12.5 °Celsius (°C); habitat types are riffles, runs, and pools (Moyle 2002); adults and juveniles migrate in the lower Sacramento River and through the Delta.	Habitat present	Sacramento River within the BSA provides migration and seasonal rearing habitat, is designated as critical habitat for the species, and is considered essential fish habitat (EFH) for Chinook salmon. *Likely to adversely affect.*
Central Valley spring-run Chinook salmon *Oncorhynchus tshawytscha*	T/T	Upper Sacramento River, Feather River, and Yuba River and several perennial tributaries of the Sacramento River (Battle, Butte, Clear, Deer, and Mill Creeks); has the same general habitat requirements as winter-run Chinook salmon; coldwater pools are needed for holding adults (Moyle 2002); adults and juveniles migrate in the lower Sacramento River and through the Delta.	Habitat present	Sacramento River within the BSA provides migration and seasonal rearing habitat, is designated as critical habitat for the species, and is considered EFH for Chinook salmon. *Likely to adversely affect.*

Common Name *Scientific Name*	Legal Status (Federal/State)	General Habitat Description	Habitat Present/Absent	Rationale
Central Valley fall-/late fall–run Chinook salmon *Oncorhynchus tshawytscha*	FSC/SSC	Sacramento and San Joaquin Rivers and tributary Central Valley streams and rivers below impassable barriers; occurs in well-oxygenated, cool, riverine habitat with water temperatures from 8.0 to 12.5 °C; habitat types are riffles, runs, and pools; adults spawn at head of riffles/tails of pools; young rear for several months and emigrate to the ocean before summer (Moyle 2002).	Habitat present	Sacramento River within the BSA provides migration and seasonal rearing habitat and is considered EFH for Chinook salmon. *Likely to adversely affect.*
California Central Valley steelhead *Oncorhynchus mykiss*	T/–	Sacramento and San Joaquin Rivers and tributary Central Valley streams and rivers below impassable barriers; occurs in well-oxygenated, cool, riverine habitat with water temperatures from 7.8 to 18 °C; habitat types are riffles, runs, and pools; adults spawn at head of riffles/tails of pools; young rear year-round for 1–4 years before emigrating to the ocean (Moyle 2002).	Habitat present	Sacramento River within the BSA provides migration and seasonal rearing habitat and is designated as critical habitat for the species. *Likely to adversely affect.*
North American Green sturgeon (southern Distinct Population Segment) *Acipenser medirostris*	T/SSC	Occurs in Sacramento, Klamath, and Trinity Rivers (Moyle 2002); spawns in large river systems with well-oxygenated water, with temperatures from 8.0 to 14 °C, including the upper Sacramento River.	Habitat present	Sacramento River within the BSA provides migration and rearing habitat and is designated as critical habitat for the species. *Likely to adversely affect.*
Delta smelt *Hypomesus transpacificus*	T/E	Found primarily in the Sacramento-San Joaquin Estuary but has been found as far upstream as the mouth of the American River on the Sacramento River and Mossdale on the San Joaquin River; range extends downstream to San Pablo Bay; occurs in estuary habitat in the Delta where fresh and brackish water mix in the salinity range of 2–7 parts per thousand (Moyle 2002).	Habitat present	Sacramento River within the BSA provides migration, spawning, and seasonal rearing habitat and is designated as critical habitat for the species. *Likely to adversely affect.*
Longfin smelt *Spirinchus thaleichthys*	FC/T	San Francisco estuary, Humboldt Bay, Eel River estuary, and Klamath River estuary; occurs in open waters of estuaries and seasonally migrates to spawn in freshwater habitats of upper estuary; spawns over sand, rocks, and aquatic plants.	Habitat present	Sacramento River within the BSA provides migration, spawning, and seasonal rearing habitat.

Common Name *Scientific Name*	Legal Status (Federal/State)	General Habitat Description	Habitat Present/Absent	Rationale
White sturgeon *Acipenser transmontanus*	–/SSC	Occurs in larger rivers from the Sacramento-San Joaquin River system northward into British Columbia; spawns in upper Sacramento River and possibly Feather and San Joaquin Rivers; spawns from late February to early June at temperatures from 8.0 to 19.0 °C. (Moyle et al. 2015.)	Habitat present	Sacramento River within the BSA provides migration and rearing habitat.
Sacramento splittail *Pogonichthys macrolepidotus*	–/SSC	Occurs throughout the year in low-salinity waters and freshwater areas of the Sacramento-San Joaquin Delta, Yolo and Sutter Bypasses, Suisun Marsh, Napa River, and Petaluma River (Moyle 2002); spawning takes place among submerged and flooded vegetation in sloughs and the lower reaches of rivers and flood bypasses.	Habitat present	Sacramento River within the BSA provides migration, spawning, and seasonal rearing habitat.
Sacramento hitch *Lavinia exilicauda exilicauda*	–/SSC	Occurs in warm, low elevation waters including clear streams, turbid sloughs, lakes, and reservoirs; found in pools or runs among aquatic vegetation; may occur in riffles; can survive temperatures as high as 38 °C and salinities up to 9 parts per thousand (Moyle 2202.)	Habitat present	Sacramento River within the BSA provides migration and rearing habitat.
Hardhead *Mylopharodon conocoephalus*	–/SSC	Tributary streams in the San Joaquin River drainage; large tributary streams in the Sacramento River and the mainstem; resides in low to mid-elevation streams and prefers clear, deep pools and runs with slow velocities; also occurs in reservoirs.	Habitat Present	Sacramento River within the BSA provides migration and rearing habitat.
Pacific lamprey *Entosphenus tridentata*	FSC/SSC	Occurs in streams and rivers below impassable barriers throughout coastal California and in rivers in the Central Valley—including the Sacramento River; habitat requirements are similar to those of Pacific salmonids. Adults live in the ocean and migrate into fresh water to spawn in gravel streams with cold, clear water; ammocoetes (larvae) live in freshwater 5–7 years and require suitable conditions year-round for rearing, including backwater habitats with soft substrates (Moyle 2002; Moyle et al. 2015).	Habitat Present	Sacramento River within the BSA provides migration and rearing habitat.

Common Name *Scientific Name*	Legal Status (Federal/State)	General Habitat Description	Habitat Present/Absent	Rationale
Western river lamprey *Lampetra ayresi*	–/SSC	Sacramento, San Joaquin, and Napa Rivers; tributaries of San Francisco Bay (Moyle 2002; Moyle et al. 1995); adults live in the ocean and migrate into fresh water to spawn.	Habitat present	Sacramento River within the BSA provides migration and rearing habitat.

Notes: Habitat absent—no habitat present and no further work needed. Habitat present—habitat is, or may be, present. The species may be present.

[a] Status explanations:

Federal

E = Listed as endangered under the federal Endangered Species Act (ESA).
T = Listed as threatened under the federal ESA.
FC = Federal candidate for listing under the federal ESA.
D = Delisted from the federal ESA.
FSC = Species of concern.
– = No listing.

State

E = Listed as endangered under the California Endangered Species Act (CESA).
T = Listed as threatened under CESA.
P = Proposed for listing as threatened or endangered under CESA.
FP = Fully protected under the California Fish and Game Code.
SSC = Species of special concern in California.
– = No listing.

Table 3-3. Invasive Plant Species Identified in the Biological Study Area

Species	CDFA	Cal-IPC
Tree of heaven (*Ailanthus altissima*)	–	Moderate
Black mustard (*Brassica nigra*)	–	Moderate
Ripgut brome (*Bromus diandrus*)	–	Moderate
Soft chess (*Bromus hordeaceus*)	–	Limited
Bull thistle (*Cirsium vulgare*)	B	Moderate
Bermuda grass (*Cynodon dactylon*)	C	Moderate
Rattail fescue (*Festuca myuros*)	–	Moderate
English ivy (*Hedera helix*)	–	High
Foxtail barley (*Hordeum murinum* subsp. *leporinum*)	–	Moderate
Wild radish (*Raphanus sativus*)	–	Limited
Black locust (*Robinia pseudoacacia*)	–	Limited
Himalayan blackberry (*Rubus armeniacus*)	–	High
Russian thistle (*Salsola tragus*)	C	Limited
Red sesbania (*Sesbania punicea*)	B	High
Milk thistle (*Silybum marianum*)	–	Limited
Johnson grass (*Sorghum halepense*)	C	–
Smilo grass (*Stipa miliacea*)	–	Limited
Field hedge parsley (*Torilis arvensis*)	–	Moderate

Notes: The California Department of Agriculture (CDFA) and California Invasive Plant Council (Cal-IPC) lists assign ratings that reflect the CDFA and Cal-IPC views of the statewide importance of the pest, likelihood that eradication or control efforts would be successful, and present distribution of the pest in the state. These ratings are guidelines that indicate the most appropriate action to take against a pest under general circumstances. The Cal-IPC species list is more inclusive than the CDFA list.

The CDFA categories indicated in the table are defined as follows:

B: Eradication, containment, control or other holding action at the discretion of the county agricultural commissioner.

C: State-endorsed holding action and eradication only when found in a nursery; action to retard spread outside nurseries at the discretion of the county agricultural commissioner.

The Cal-IPC categories indicated in the table are defined as follows:

High: Species with severe ecological impacts, high rates of dispersal and establishment, and usually widely distributed.

Moderate: Species with substantial and apparent ecological impacts, moderate to high rates of dispersal, establishment dependent on disturbance, and limited to widespread distribution.

Limited: Species with minor ecological impacts, low to moderate rates of invasion, limited distribution, and locally persistent and problematic.

Chapter 4 Results: Biological Resources, Discussion of Impacts and Mitigation

The impact analysis for biological resources was conducted by evaluating the potential changes to existing biological communities based on the anticipated project construction activities and permanent project elements listed below that could cause impacts of varying degrees on sensitive biological resources present in the BSA.

- Vegetation removal.
- Grading, excavating, compacting, and fill placement during construction.
- In-water work during construction of bridge abutments and piers in the Sacramento River.
- Temporary dewatering within the Sacramento River during construction.
- Temporary stockpiling and side-casting of soil, construction materials, or other construction wastes.
- Introduction or spread of invasive plant species into adjacent natural habitats.
- Runoff of herbicides, fertilizers, diesel fuel, gasoline, oil, raw concrete, or other toxic materials used for project construction and maintenance into sensitive biological resource areas (e.g., riparian habitats and Sacramento River).

The following assumptions were used in assessing the magnitude of possible impacts on biological resources.

- Under the No-Build Alternative, the project would not be constructed and there would be no impacts on biological resources in the BSA.
- The two build alternatives (Alternatives B and C) and the interim and design year conditions have varying permanent and temporary impact footprints (as shown in Appendix A, Figures 6 and 7). Impacts for the design year conditions vary for ruderal and landscaped land cover types. Impacts on cottonwood riparian forest and perennial stream would already have occurred in the interim phase, and no additional impacts would occur in the design year phase.
- For protected native trees that would be removed as part of the proposed project and that occur within riparian habitat, impacts are included within the cottonwood riparian woodland discussion.
- Impacts on land cover types and associated wildlife habitat were determined by overlaying preliminary footprints for permanent project features and temporary work areas (e.g., access roads, equipment staging) on an aerial photograph base map with mapped habitats (Appendix A, Figures 6 and 7). Impact acreages presented in this chapter are intended to provide worst-case scenarios; actual impacts are expected to be less based on avoidance of trees and other vegetation within temporary work areas.

- Construction BMPs would be implemented to ensure that indirect effects on adjacent habitats are avoided or minimized.
- Installation of the fiber optic cable would occur entirely within existing roads and an existing conduit using jack and bore construction, and, therefore, would cause only minimal impacts on adjacent landscaped areas.

The impacts of both build alternatives and the interim and design year configurations of each are discussed separately in this chapter. Table 4-1 lists the acreages of each land cover type within the portions of the BSA that would be permanently or temporarily affected by each of the proposed interim and ultimate design year configurations of the build alternatives.

Table 4-1. Permanent and Temporary Impacts on Land Cover Types in the Biological Study Area

Impacts by Alternative	Land Cover Type				
	Cottonwood Riparian Forest[a]	Perennial Stream[a]	Ruderal	Landscaped	Total
Alternative B, Interim Year					
Permanent impact (acres)	1.273	0.948	3.063	4.484	**9.768**
Temporary impact (acres)	0.625	4.211	1.030	1.286	**7.152**
Alternative B, Design Year					
Permanent impact (acres)	1.273	0.948	3.069	4.484	**9.774**
Temporary impact (acres)	0.625	4.211	1.030	1.260	**7.126**
Alternative C, Interim Year					
Permanent impact (acres)	1.290	1.196	2.248	4.819	**9.553**
Temporary impact (acres)	1.035	4.254	0.871	1.325	**7.485**
Alternative C, Design Year					
Permanent impact (acres)	1.290	1.196	2.253	4.819	**9.558**
Temporary impact (acres)	1.035	4.254	0.871	1.299	**7.459**

[a] These are sensitive natural communities.

4.1 Sensitive Natural Communities

The BSA supports two sensitive natural communities: cottonwood riparian forest and perennial stream.

4.1.1 Cottonwood Riparian Forest

4.1.1.1 Survey Results

Riparian forest in the BSA occurs along the banks of the Sacramento River. The overstory of riparian forest is predominantly mature Fremont's cottonwood and black willow trees associated with valley oak and black locust. Other riparian tree species observed include boxelder, white alder, Oregon ash, and northern California black walnut. The riparian understory on the waterside of the levee is primarily rip-rap with non-native annual grasses and forbs; however, there are also patches of more typical riparian species, such as narrow-leaf willow and Himalayan blackberry. The invasive shrub red sesbania was observed in the riparian forest on

both sides of the river. Local, state, and federal agencies recognize riparian habitats as sensitive natural communities.

4.1.1.2 Project Impacts

Implementation of the proposed project would result in a loss of cottonwood riparian habitat. Clearing of the existing cottonwood riparian forest vegetation within the proposed project footprint would result from construction activities related to the abutments for the fixed-span approach structures on both the City of West Sacramento and City of Sacramento sides, placement of RSP to stabilize the bridge abutments on each side of the river, and temporary access roads (Appendix A, Figures 6 and 7). Impacts on cottonwood riparian forest in the BSA differ between the two alternatives (Table 4-1).

Construction during the ultimate design year phase would include completion of roads for the full buildout of the approved mobility network (Appendix A, Figures 6 and 7). Because none of these roads occur in riparian habitat, this phase of construction would not affect cottonwood riparian forest. Additionally, impacts on cottonwood riparian forest would be the same with any of the proposed bridge designs (bascule, vertical lift, swing). The impact discussions below therefore are focused on the interim design year phases of each of the two alternative alignments.

Under either of the build alternatives, state and federal agencies would require avoidance, minimization, and compensatory mitigation for the loss of riparian habitat. CDFW would require an LSAA for construction within riparian habitat and compensation for the loss of riparian trees and habitat. The City of West Sacramento and City of Sacramento would require compensation for loss of protected riparian trees.

Alternative B

Permanent and Temporary Direct Impacts

Construction of the proposed project under interim Alternative B would result in the permanent loss of up to 1.273 acres of cottonwood riparian forest within the area designated as the limits of disturbance. Clearing of the existing cottonwood riparian forest vegetation within the proposed project footprint would result from activities related to construction of two fixed-span bridge approach structures (Appendix A, Figures 6 and 7). Riparian vegetation would be removed between the permanent footprint of the bikeways and the river on both sides during construction of the abutment structures and overhead bridge. The area beneath the bridge approach structures on both the City of West Sacramento and City of Sacramento sides would be unlikely to revegetate after construction due to low clearance under the bridge and shading from the bridge.

Temporary impacts under interim Alternative B would occur from trimming riparian vegetation and removing additional trees and understory vegetation to provide equipment access. Up to 0.625 acre of riparian forest temporarily would be disturbed during construction of interim Alternative B.

Indirect Impacts

The proposed project could result in indirect impacts on riparian habitat from shading by the new bridge approach structures on both riverbanks. The extent of potential shading effects on areas north and south of the bridge depends on the width and height of the new approach structures above the existing vegetation and the orientation of the structures relative to the sun's path. During part of the year, the north side of the new structures would be more shaded than the south side. The height of the proposed structures would allow adequate light to penetrate most of the adjacent vegetation during much of the year and would be unlikely to cause a loss of, or a shift in, the species composition of riparian vegetation adjacent to the new structures. Discussion of potential indirect impacts from shading and loss of shaded riverine aquatic (SRA) cover habitat is provided in Section 4.4.16, *Chinook Salmon and Steelhead.*

Alternative C

Permanent and Temporary Direct Impacts

Construction of the proposed project under interim Alternative C would result in the permanent loss of up to 1.290 acres of cottonwood riparian forest within the area designated as the limits of disturbance. Clearing of the existing cottonwood riparian forest vegetation within the proposed project footprint would result from activities related to construction of two fixed-span bridge approach structures (Appendix A, Figures 6 and 7). As described for Alternative B, the riparian area between the permanent footprint of the bikeway and the river on both ends of the bridge also would be considered permanently removed.

Temporary impacts under interim Alternative C would occur from trimming riparian vegetation and removing additional trees and understory vegetation to provide equipment access. Up to 1.035 acres of riparian forest temporarily would be disturbed during construction of interim Alternative C.

Indirect Impacts

Indirect impacts from shading created by the constructed bridge under Alternative C would be the same as discussed above for Alternative B. Discussion of potential indirect impacts from shading and loss of shaded riverine aquatic (SRA) cover habitat is provided in Section 4.4.16, *Chinook Salmon and Steelhead.*

4.1.1.3 Avoidance and Minimization Efforts

Implementation of Measures 1–3 would ensure that the proposed project minimizes effects on cottonwood riparian forest adjacent to the project construction area.

Measure 1: Install Orange Construction Fencing between the Construction Area and Adjacent Sensitive Biological Resources

The project proponent or their contractor will install orange construction fencing between the construction area and adjacent sensitive biological resource areas. Sensitive biological resources that occur adjacent to the construction area that could be directly affected by

the project include sensitive natural communities; special-status wildlife habitats, such as nest sites of Swainson's hawk and migratory birds; and protected trees.

Barrier fencing around sensitive biological resource areas will be installed as one of the first orders of work and prior to equipment staging. Before construction begins, the construction contractor will work with the project engineer and a resource specialist to identify the locations for the orange construction fencing and will place stakes around the sensitive resource sites to indicate these locations. The protected areas will be designated as environmentally sensitive areas and clearly identified on the construction plans and described in the specifications. To minimize the potential for snakes and other ground-dwelling animals from being caught in the orange construction fencing, the fencing will be placed with at least a 1-foot gap between the ground and the bottom of the fencing. The exception to this condition is where construction barrier fencing overlaps with erosion control fencing and must be secured to prevent sediment runoff. Barrier fencing will be installed before construction activities are initiated, maintained throughout the construction period, and removed after completion of construction.

Measure 2: Conduct Environmental Awareness Training for Construction Employees

The project proponent will retain a qualified biologist to conduct environmental awareness training for construction crews before project implementation. The awareness training will be provided to all construction personnel and will brief them on the need to avoid effects on sensitive biological resources (e.g., native trees, sensitive natural communities, and special-status species habitats in and adjacent to the construction area). The education program will include a brief review of the special-status species with the potential to occur in the BSA (including their life history, habitat requirements, and photographs of the species). The training will identify the portions of the BSA in which the species may occur, as well as their legal status and protection. The program also will cover the restrictions and guidelines that must be followed by all construction personnel to reduce or avoid effects on these species during project implementation. This will include the steps to be taken if a sensitive species is found within the construction area (i.e., notifying the crew foreman, who will call a designated biologist). In addition, construction employees will be educated about the importance of controlling and preventing the spread of invasive plant infestations. An environmental awareness handout that describes and illustrates sensitive resources to be avoided during project construction and identifies all relevant permit conditions will be provided to each crew member. The crew foreman will be responsible for ensuring that crew members adhere to the guidelines and restrictions. Education programs will be conducted for appropriate new personnel as they are brought on the job during the construction period.

Measure 3: Conduct Periodic Biological Monitoring

The project proponent will retain a qualified biological monitor for the project who will visit the site a minimum of once per week to ensure that fencing around environmentally sensitive areas is intact and that activities are being conducted in accordance with the

agreed upon project schedule and agency conditions of approval. The monitor will provide the project proponent with a monitoring log for each site visit.

Certain activities will require the presence of a biological monitor for the duration of the activity or during the initial disturbance of an area to ensure that impacts on special-status species are avoided. The activities that require specific monitoring are identified below in Measures 10, 12, and 16.

4.1.1.4 Compensatory Mitigation

Implementation of Measure 4 would compensate for temporary effects on and permanent loss of riparian forest habitat.

Measure 4: Compensate for Temporary Effects on and Permanent Loss of Cottonwood Riparian Forest (Including SRA Cover)

The project proponent will compensate for the permanent loss of up to 1.273 acres of riparian forest under Alternative B or up to 1.290 acres of riparian forest under Alternative C. In addition, any unavoidable temporary loss of riparian forest will be mitigated. The project proponent will implement onsite and, if necessary, offsite compensation measures and/or purchase mitigation bank credits to compensate for losses of cottonwood riparian forest on the waterside slope of the existing levees, including riparian forest supporting SRA cover habitat (as described in Section 4.4.1.5, *Survey Results*, portions of the cottonwood riparian forest in the BSA also provide SRA cover habitat for fish). Onsite compensation will be used to the maximum extent practicable. Compliance with the USACE levee vegetation policy (U.S. Army Corps of Engineers 2014), the ULDC (California Department of Water Resources 2012b), or other engineering constraints may limit the ability to achieve full onsite compensation. Therefore, offsite compensation and/or purchase of mitigation bank credits may be needed to achieve no net loss of existing in-kind riparian and SRA cover habitat values. Each of these options is discussed below.

1. **Onsite and/or Offsite Restoration and/or Enhancement along the Sacramento River.** Riparian habitat restoration and/or enhancement onsite or offsite should occur in the same year construction is completed. For onsite or offsite replacement plantings, the project proponent will prepare a mitigation planting plan, including a species list and number of each species, planting locations, and maintenance requirements. Plantings will consist of cuttings taken from local plants or plants grown from local material. Planted species for the mitigation plantings will be similar to those removed from the project area and will include native species, such as Fremont's cottonwood, valley oak, black willow, boxelder, Oregon ash, and black walnut. The final planting plan will be developed based on results of the arborist survey for species to be removed (see additional discussion below). All plantings will be fitted with exclusion cages or other suitable protection from herbivory. Plantings will be irrigated for up to 3 years or until established. Plantings will be monitored annually for 3 years or as required in the project permits. If 75% of the plants survive at the end of the monitoring period, the revegetation will be considered successful. If

the survival criterion is not met at the end of the monitoring period, planting and monitoring will be repeated after mortality causes have been identified and corrected.

2. **Mitigation Bank Credit Purchase.** If this option is chosen, the project proponent will provide written evidence to the resource agencies that compensation has been established through the purchase of mitigation credits. The amount to be paid will be the fee that is in effect at the time the fee is paid. The mitigation will be approved by CDFW and may be modified during the permitting process. Mitigation can be in the form of creation and/or preservation credits. If mitigation is in the form of restoration/creation credits, the mitigation will be at a minimum ratio of 1:1 (1 acre of restored or created riparian habitat for each acre of riparian habitat removed). If mitigation is in the form of preservation credits, the mitigation will be at a minimum ratio of 2:1 (2 acres of preserved riparian habitat for each acre of riparian habitat removed). The final compensation ratio will be approved by CDFW in order to result in no net loss of riparian habitat. The project proponent will purchase riparian habitat credits from an approved mitigation bank near the project, such as the Liberty Island Conservation Bank, Cosumnes Floodplain Mitigation Bank, Fremont Landing Conservation Bank, Elsie Gridley Mitigation Bank, River Ranch Wetland Mitigation Bank, or other approved bank with available riparian forest credits at the time of project permitting. Replacement riparian forest habitat will include tree species that would support nesting Swainson's hawk (i.e., oak, cottonwood) and will occur within the range of nesting Swainson's hawk within the Sacramento Valley.

   To provide a current and accurate estimate of tree loss, an arborist survey will be conducted upon completion of 90% design plans for the project and no more than 2 years prior to project construction. In addition to a description of the tree, the arborist survey report will include the precise location of the trunk and size of the dripline for all trees whose trunk or canopy overlap with the project footprint. Riparian forest compensation will be consistent with the requirements of the City of West Sacramento and City of Sacramento tree ordinances to ensure compensation for losses of individual protected trees.

   In addition to mitigating the loss of riparian forest habitat, specific measures will be included to satisfy NMFS requirements and compensate for the loss of SRA cover (area and linear feet). The acreage will not be duplicated, such that the acreage of riparian forest habitat restored for SRA cover mitigation will apply toward riparian forest habitat mitigation requirements. SRA cover mitigation will include the following riparian replacement requirements:

- Replace the permanent loss of 302 linear feet and up to 0.368 acre of affected SRA cover vegetation (see Section 4.4.1.2, *Temporary and Permanent Loss of Riparian Vegetation [Including SRA Cover*]) at a 3:1 replacement ratio (i.e., 3 linear feet replaced for every 1 foot affected and 3 acres replaced for every 1 acre affected) by planting native riparian trees in temporary impact areas and along existing onsite or offsite unshaded banks along the Sacramento River.

- Plant native riparian trees onsite to the maximum extent practicable, followed by planting on adjacent reaches of the Sacramento River to minimize the need for purchasing offsite mitigation bank credits.
- Plant riparian trees that are intended to provide SRA cover along the water's edge at summer low flows up to the OHWM and at sufficient densities to provide shade along at least 85% of the bank's length when the trees reach maturity. This will ensure that riparian plantings intended for SRA cover mitigation will contribute to instream SRA cover when they are inundated during winter/spring flows and overhead cover (shade) during summer flows when they approach maturity.
- Monitor and evaluate the revegetation success of riparian plantings intended for SRA cover mitigation as described above.

  If mitigation for SRA cover is in the form of offsite mitigation bank credits, credits will need to be purchased from an approved mitigation bank within the approved service area for the project that provides riparian forest floodplain conservation credits as offsite compensation for impacts on state- and federally listed fish species, designated critical habitat, and EFH for Pacific salmon.

4.1.1.5 Cumulative Impacts

Cumulative impacts on riparian forest would result from construction of other general development and levee projects in Sacramento and Yolo Counties. Although implementation of the avoidance and minimization efforts and compensatory mitigation would replace the lost habitat, the compensation would occur offsite and not on the Sacramento River, in compliance with the ULDC regarding woody vegetation on flood protection levees (California Department of Water Resources 2012b). The loss of riparian forest on the Sacramento River, therefore, would be permanent and would contribute to the ongoing loss of riparian habitat along the river. Consequently, construction of the proposed project would make a considerable contribution to the cumulative loss of riparian forest.

4.1.2 Perennial Stream

4.1.2.1 Survey Results

The Sacramento River is the only perennial stream in the BSA (see Appendix A, Figures 6 and 7). All perennial stream is unvegetated open water. The river averages 720 feet wide at the OHWM in the BSA. The riverbanks are levees that are mostly steeply sloped and support riparian forest vegetation, as described above, with rip-rap near the bottom of the slope. The Sacramento River is a TNW and a water of the United States subject to regulation under CWA Section 404 and Section 10 of the RHA, and under the jurisdiction of the USACE. The river is considered a sensitive natural community. The RWQCB protects all waters of the State under the Porter-Cologne Act.

4.1.2.2 Project Impacts

Construction during the ultimate design year phase would include completion of roads for the full buildout of the approved mobility network (Appendix A, Figures 6 and 7). Because none of this road work would occur in the Sacramento River, this phase of construction would not affect perennial stream. The extent of impacts on perennial stream would vary depending on the selected bridge type but would be the same under both interim Alternative B and interim Alternative C, as described below.

Permanent and Temporary Direct Impacts

Implementation of the proposed project would result in permanent and temporary impacts (placement of fill) on the Sacramento River in the BSA, including construction of bridge piers 2 through 5 and installation of RSP around these piers, RSP along the shoreline adjacent to the bridge, a bridge fender system, and temporary construction components (cofferdams, trestle piles, and barge piles) (Appendix A, Figures 6 and 7). Abutments 1 and 6 at the ends of the two fixed-span approach structures would be constructed on the levees above the OHWM and, therefore, would not directly affect perennial stream. In addition to direct fill impacts, project activities could indirectly affect water quality within the stream by causing increased erosion and sedimentation downstream of the work area.

A total of up to 0.87 acre of permanent impacts on perennial stream in the Sacramento River would result from the following bridge components and RSP to be placed below the OHWM (see Table 4-15 "Amount of Temporarily and Permanently Affected Aquatic Habitat in the Sacramento River Resulting from the Proposed Project" in Section 4.4.1.2). Permanent impacts on perennial stream would vary between the proposed bridge designs (bascule, vertical lift, swing). These differences are described below.

- The two fixed-spans for the new bridge would be constructed on piers 2 and 3, and the movable span section of the bridge would be constructed on piers 4 and 5. Two pile types are proposed for the in-water piers for each of the three bridge designs: 60-inch-diameter cast-in-steel-shell (CISS) piles for the movable span (i.e., piers 2 and 3) and 16-inch-diameter steel pipe piles for the in-water piers (i.e., piers 4 and 5). The difference between the bridge design types would be the number of piles needed.

  This assessment assumes that the bascule bridge would require 12 60-inch CISS piles and 40 steel pipe piles, the vertical lift bridge would require from 6 to 8 60-inch CISS piles and 40 steel pipe piles, and the swing bridge would require 18 60-inch CISS piles and 20 steel pipe piles.

  The CISS piles, consisting of hollow steel shells, would be driven into the channel bottom using drivers and cranes on the temporary trestle or mounted on barges to temporarily place the steel shells at the desired location for each pile. Once the steel shells are in place, the soil inside the shell would be drilled out, and concrete would be poured into the dewatered hollow shells.

  Both the CISS and steel pipe piles would be covered by pile caps and RSP. The footprints for piers 2 and 3 on the river bottom would total up to 13,500 square feet (0.31 acre) for the

bascule bridge and less for the vertical lift and swing bridge designs. The footprints for piers 4 and 5 would total 360 square feet (0.01 acre).

- A bridge fender system would be constructed around the movable span piers that would include 60 driven piles around each pier. Piles would be placed on the riverbed to support the bridge fender system. Piles would be 14-inch-square concrete piles or 16-inch-diameter steel pipe piles. The footprint of the bridge fender system on the river bottom would total approximately 0.004 acre for the square piles and 0.002 acre for the pipe piles.
- RSP (assumed 1/4-ton stone weight, machine positioned [Method B]) would be installed along up to 824 linear feet of shoreline (398 linear feet on City of Sacramento shoreline and 426 linear feet on City of West Sacramento shoreline), covering up to 24,126 square feet (0.55 acre) of the bank below the OHWM.

A total of up to 0.008 acre of temporary impacts on perennial stream in the Sacramento River would result from the following construction components to be placed below the OHWM (see Table 4-15 "Amount of Temporarily and Permanently Affected Aquatic Habitat in the Sacramento River Resulting from the Proposed Project" in Section 4.4.1.2). Temporary impacts on perennial stream would be the same for all three proposed bridge designs (bascule, vertical lift, swing).

- Temporary impacts of up to 0.0003 acre would occur from installation of cofferdams and temporary piles for construction. Two cofferdams constructed of sheet piles would be installed for construction of piers 4 and 5 of the new bridge. When installed, each cofferdam would be approximately 35 feet wide and 95 feet long; however, the area of fill would include only the footprint of the up to 0.6-inch-thick sheet piles (totaling approximately 13 square feet [0.0003 acre]). The area inside the cofferdams would be dewatered by pumping to the river, with implementation of sediment control measures if necessary.
- Approximately 234 trestle piles would be installed below the OHWM of the river to support the temporary construction trestles, resulting in the placement of 327 square feet (0.007 acre) of fill in the riverbed. Two trestle pile types are being considered: 16-inch-diameter steel pipe piles and 16-inch-diameter steel H-piles.
- A total of 16 spud piles would be installed for the temporary barges that would be used during construction, resulting in the placement of 22 square feet (0.0005 acre) of fill in the riverbed. The barge spud piles would be 16-inch-diameter steel pipe piles.

State and federal agencies would require avoidance, minimization, and compensatory mitigation for the loss of perennial stream. The loss of perennial stream is considered adverse because it provides a variety of important ecological functions and values.

Indirect Impacts

Additional indirect impacts from project construction on water quality, such as increased turbidity and chemical runoff, could occur in perennial drainage habitat outside the project footprint.

4.1.2.3 Avoidance and Minimization Efforts

Implementation of Measures 1–3 and 5 would ensure that the proposed project minimizes effects on perennial stream adjacent to the project construction area.

Measure 5: Protect Water Quality and Prevent Erosion and Sedimentation in Drainages and Wetlands

The project proponent or their construction contractor will comply with all construction site BMPs specified in the final SWPPP that will be developed for the project, as well as any other permit conditions to minimize introduction of construction-related contaminants and mobilization of sediment in the Sacramento River. Broadly, these BMPs will address soil stabilization, sediment control, wind erosion control, vehicle tracking control, non-storm water management, and waste management practices. The BMPs will be based on the best conventional and best available technology.

The proposed project is subject to storm water quality regulations established under the NPDES, described in Section 402 of the federal CWA. In California, the NPDES program requires that any construction activity disturbing 1 or more acres comply with the statewide General Permit, as authorized by the State Water Board. The General Permit requires elimination or minimization of non-storm water discharges from construction sites and development and implementation of a SWPPP for the site. The primary elements of the SWPPP include the following.

- Description of site characteristics—including runoff and streamflow characteristics and soil erosion hazard—and construction procedures.
- Guidelines for proper application of erosion and sediment control BMPs.
- Description of measures to prevent and control toxic materials spills.
- Description of construction site housekeeping practices.

In addition to these primary elements, the SWPPP specifies that the extent of soil and vegetative disturbance would be minimized by control fencing or other means, and that the extent of soil disturbed at any given time would be minimized. The SWPPP must be retained at the construction site.

The BMPs will be selected to achieve maximum sediment removal and represent the best available technology that is economically achievable; they are subject to review and approval by the project proponent. The project proponent will perform routine inspections of the construction area to verify that the BMPs are properly implemented and maintained. The project proponent will notify contractors immediately of a noncompliance issue and will require compliance.

The BMPs will include, but are not limited to, the following.

- Conduct all in-water work within the Sacramento River between May 1 and November 30 to minimize or avoid potential impacts on sensitive life stages

(migration, spawning, egg and embryo incubation, and rearing) of special-status fish species.

- Use equipment in and around the Sacramento River that is in good working order and free of dripping or leaking engine fluids. All vehicle maintenance will be performed at least 300 feet from all streams. Any necessary equipment washing will be carried out where the water cannot flow into drainages or wetlands.
- Develop a hazardous material spill prevention control and countermeasure plan before construction begins. The plan will include strict onsite handling rules to keep construction and maintenance materials from entering the river, including procedures related to refueling, operating, storing, and staging construction equipment and procedures for preventing and responding to spills. The plan also will identify the parties responsible for monitoring a spill response. During construction, any spills will be cleaned up immediately according to the spill prevention control and countermeasure plan. The project proponent will review and approve the contractors' spill prevention control and countermeasure plan before allowing construction to begin.
- Prohibit the following types of materials from being rinsed or washed into the streets, shoulder areas, or gutters: concrete, solvents and adhesives, thinners, paints, fuels, sawdust, dirt, gasoline, asphalt and concrete saw slurry, and heavily chlorinated water.
- Take any surplus concrete rubble, asphalt, or other rubble from construction to a local landfill.
- Prepare and implement an erosion and sediment control plan for the proposed project that will include the following provisions and protocols. The SWPPP for the project will detail the applications and type of measures and the allowable exposure of unprotected soils.
  - Discharge from dewatering operations, if needed, and runoff from disturbed areas will be made to conform to the water quality requirements of the waste discharge permit issued by the RWQCB.
  - Apply temporary erosion control measures, such as sandbagged silt fences, throughout construction of the proposed project and remove them after the working area is stabilized or as directed by the engineer. Soil exposure will be minimized through use of temporary BMPs, groundcover, and stabilization measures. Exposed dust-producing surfaces will be sprinkled daily, if necessary, until wet; this measure will be controlled to avoid producing runoff. Paved roads will be swept daily following construction activities.
  - The contractor will conduct periodic maintenance of erosion and sediment control measures.
  - Plant an appropriate seed mix of native species on disturbed areas upon completion of construction.

- Cover or apply nontoxic soil stabilizers to inactive construction areas (previously graded areas inactive for 10 days or more) that could contribute sediment to waterways.
- Enclose and cover exposed stockpiles of dirt or other loose, granular construction materials that could contribute sediment to waterways. Material stockpiles will be located in non-traffic areas only. Side slopes will not be steeper than 2:1. All stockpile areas will be surrounded by a filter fabric fence and interceptor dike.
- Contain soil and filter runoff from disturbed areas by berms, vegetated filters, silt fencing, straw wattle, plastic sheeting, catch basins, or other means necessary to prevent the escape of sediment from the disturbed area.
- Use other temporary erosion control measures (e.g., silt fences, staked straw bales/wattles, silt/sediment basins and traps, check dams, geofabric, sandbag dikes, and temporary revegetation or other ground cover) to control erosion from disturbed areas as necessary.
- Avoid earth or organic material from being deposited or placed where it may be directly carried into the Sacramento River.

The project proponent also will obtain a 401 Water Quality Certification from the Central Valley RWQCB, which may contain additional BMPs and water quality measures to ensure the protection of water quality.

4.1.2.4 Compensatory Mitigation

Implementation of Measure 6 would compensate for the permanent loss of perennial stream.

Measure 6: Compensate for Loss of Perennial Stream

The project proponent will comply with any regulatory requirements determined as part of the state (Section 401 Water Quality Certification or WDRs, LSAA) and federal (Section 404 and Section 10 permits) processes for the work that would occur in the Sacramento River. The project proponent will compensate for the permanent fill of up to 0.87 acre of non-wetland waters of the United States in the Sacramento River by purchasing mitigation bank credits, which can be in the form of preservation and/or creation credits using the following minimum ratios.

- A minimum of 2:1 (2 acres of mitigation for each acre filled), for a total of up to 1.74 acres, if credits are for preservation of habitat; or,
- A minimum of 1:1 (1 acre of mitigation for each acre filled), for a total of up to 0.87 acre, if credits are for creation of habitat.

The actual compensation ratios will be determined through coordination with the Central Valley RWQCB and USACE as part of the permitting process. The project proponent will compensate for permanent loss of perennial stream by implementing one or a combination of the following options.

- Purchase credits for created riparian stream channel at a USACE-approved mitigation bank with a service area that encompasses the project area, such as the Liberty Island Conservation Bank, Cosumnes Floodplain Mitigation Bank, Fremont Landing Conservation Bank, Elsie Gridley Mitigation Bank, River Ranch Wetland Mitigation Bank, or other approved bank with available riparian stream credits. The project proponent will provide written evidence to the resource agencies that compensation has been established through the purchase of mitigation credits.
- Compensate out-of-kind for loss of perennial stream by implementing compensatory mitigation for cottonwood riparian forest impacts described in Measure 4. The acreage restored or created to compensate for loss of perennial stream will be added to the acreage restored or created for loss of riparian habitat.

4.1.2.5 Cumulative Impacts

Cumulative impacts on perennial stream would result from construction of other general development projects in Sacramento and Yolo Counties. The proposed project would contribute to cumulative impacts through the placement of fill in the Sacramento River. With implementation of the avoidance and minimization efforts and compensatory mitigation, construction of the proposed project would result in a less than cumulatively considerable contribution to the loss of perennial stream and would not result in a cumulatively adverse effect on perennial stream.

4.2 Special-Status Plant Species

4.2.1.1 Survey Results

Based on the searches of the CNDDB, the CNPS rare plant inventory, and the USFWS website, 32 special-status plant species were identified as occurring in the vicinity of the BSA (Table 3-1). The natural communities in the BSA contain potential habitat for 4 of these 32 species. The other 28 species have habitat or microhabitat requirements (e.g., playas, vernal pools, or perennial marsh; alkaline, saline, clay, or serpentine soils) that are not present in the BSA; or very marginal, disturbed habitat similar to the species' habitat (e.g., patchy ruderal vegetation rather than annual grassland) is present in the BSA. The high level of historical and ongoing disturbance that is present in most of the BSA detracts from the quality of potential habitat for special-status plant species. Only one special-status species, northern California black walnut tree, was found in the BSA. This species has special status only as a native stand of walnut trees; therefore, the individual tree observed in the riparian forest is not considered a special-status plant. No other special-status plants were observed during the August 2017 and February 2018 field surveys, and no occurrences of special-status plants have been reported previously in the BSA (California Department of Fish and Wildlife 2019; California Native Plant Society 2019). Based on the field survey results, the level of disturbance in potential habitat, and the lack of recorded occurrences in the BSA, this NES concludes that no special-status plant species occur in the BSA.

4.2.1.2 Project Impacts

No special-status plants were found during botanical surveys of the BSA; therefore, construction of the project is not expected to cause any direct or indirect impacts on special-status plants.

4.2.1.3 Avoidance and Minimization Efforts

No avoidance or minimization efforts for impacts on special-status plants are required.

4.2.1.4 Compensatory Mitigation

No compensatory mitigation for impacts on special-status plants is required.

4.2.1.5 Cumulative Impacts

No direct impacts on special-status plants would result from construction of the project; therefore, the project would not contribute to cumulative impacts on special-status plants.

4.3 Special-Status Wildlife Species

Seven special-status wildlife species were identified with the potential to occur in the BSA based on the known range of these species and the suitability of the habitat in the BSA. None of these species, or signs of their presence, were observed in the BSA during surveys.

4.3.1 Valley Elderberry Longhorn Beetle

VELB is federally listed as threatened. The range extends approximately from Shasta County south to Fresno County, including the valley floor and associated lower foothills (U.S. Fish and Wildlife Service 2017:4). The majority of VELB have been documented below 500 feet (152 meters) in elevation (U.S. Fish and Wildlife Service 2017:4). VELB is dependent on its host plant, elderberry shrubs, which is a common component of riparian corridors and adjacent upland areas (non-riparian vegetative communities) in the Central Valley (Barr 1991:5). Elderberry shrubs can be found on historical floodplain terraces above the river, on levees, and areas where subsurface flow provides water to elderberry roots (U.S. Fish Wildlife Service 2017:5). In non-riparian settings, elderberry shrubs can occur singly or in clumps in valley oak and blue oak woodlands and annual grasslands (U.S. Fish Wildlife Service 2017:5).

4.3.1.1 Survey Results

The BSA was surveyed for elderberry shrubs on October 29, 2019. One elderberry shrub was identified within the BSA, in an area of ruderal vegetation on the Sacramento side of the BSA (Appendix A, Figures 6 and 7). The shrub was approximately 7 feet tall with five stems just over 1 inch in diameter, and no exit holes were observed on the shrub (Appendix C, Photo 11). The shrub is located within 160 feet of riparian habitat along the Sacramento River. The shrub occurs within the general location of a 1949 CNDDB record for the species (California Department of Fish and Wildlife 2019). According to the USFWS *Framework for Assessing Impacts to the*

Valley Elderberry Longhorn Beetle (U.S. Fish and Wildlife Service 2017), this shrub represents potential habitat for VELB.

Riparian habitat along both sides of the Sacramento River in the BSA also represents linkages between occupied habitat upstream and downstream of the BSA.

4.3.1.2 Project Impacts

Alternative B

Permanent and Temporary Direct Impacts

Alternative B (interim and ultimate) would not directly affect the elderberry shrub in the BSA but would result in the permanent loss and temporary loss of cottonwood riparian along the Sacramento River (see Table 4-1). This loss of riparian habitat could create permanent and temporary barriers to the dispersal of VELB along this riparian corridor and contribute to the already fragmented habitat and the isolation of existing populations.

If construction takes place during the flight season (March–July), it could disrupt VELB ability to disperse between the elderberry shrub in the BSA and the nearby riparian habitat, as well as within the riparian habitat itself, and result in the potential for injury and/or mortality from construction equipment.

Indirect Impacts

No indirect impacts on VELB from Alternative B are anticipated.

Alternative C

Alternative C (interim and ultimate) would similarly affect VELB but would result in greater permanent and temporary impacts on cottonwood riparian habitat along the Sacramento River. Table 4-1 lists the permanent and temporary impacts on cottonwood riparian forest that provides potential habitat for VELB

Under the federal ESA, both alternatives would result in a *may affect, not likely to adversely affect* determination with implementation of the avoidance and minimization measures provided below.

4.3.1.3 Avoidance and Minimization Efforts

Implementation of Measures 1–3, 5, and 7 would ensure that construction activities avoid or minimize impacts on VELB within and adjacent to the limits of disturbance associated with construction.

Measure 7: Avoid and Minimize Effects on Valley Elderberry Longhorn Beetle

The following measures from the *Framework for Assessing Impacts to the Valley Elderberry Longhorn Beetle* (U.S. Fish and Wildlife Service 2017) have been slightly modified for this project.

- Fencing. The elderberry shrub will be fenced and/or flagged as close to construction limits as feasible.
- Avoidance area. Activities that may damage or kill an elderberry shrub (e.g., trenching, paving) may need an avoidance area of at least 6 meters (20 feet) from the dripline, depending on the type of activity.
- Worker education. A qualified biologist will provide training for all contractors, work crews, and any onsite personnel on the status of the VELB, its host plant and habitat, the need to avoid damaging the elderberry shrubs, and the possible penalties for noncompliance.
- Construction monitoring. At a minimum, a qualified biologist will monitor the work area on a weekly basis to ensure that all avoidance and minimization measures are implemented.
- Timing. As much as feasible, all activities that could occur within 50 meters (165 feet) of the elderberry shrub, will be conducted outside of the flight season of the VELB (March–July).

4.3.1.4 Compensatory Mitigation

Measure 4 would compensate for the loss of riparian habitat. No additional compensatory mitigation is proposed.

4.3.1.5 Cumulative Impacts

Cumulative impacts on VELB and VELB habitat would result from construction of other general development and levee projects in Sacramento and Yolo Counties. The permanent and temporary loss of cottonwood riparian habitat along the Sacramento River as a result of the proposed project would contribute to cumulative effects on already fragmented VELB habitat and the isolation of existing populations. Alternative C would have a greater contribution than Alternative B. With implementation of Measures 1–3, 5, and 7 to avoid and minimize effects on the species, and Measure 4 to compensate for the loss of riparian habitat, the incremental contribution of either alternative to cumulative impacts on VELB would be reduced to a less than cumulatively considerable level.

4.3.2 Western Pond Turtle

Western pond turtle is a California species of special concern. Western pond turtle occurs throughout much of California, except east of the Sierra-Cascade crest and desert regions (with the exception of the Mojave River and its tributaries) (Zeiner et al. 1988:100). Aquatic habitats used by pond turtles include ponds, lakes, marshes, rivers, streams, and irrigation ditches with a

muddy or rocky bottom in grassland, woodland, and open forest areas (Stebbins 2003:250). Pond turtles spend a considerable amount of time basking on rocks, logs, emergent vegetation, mud or sand banks, or human-generated debris (Jennings et al. 1992:11). Pond turtles move to upland areas adjacent to watercourses to deposit eggs and overwinter (Jennings and Hayes 1994:98). Turtles have been observed overwintering several hundred meters from aquatic habitat. In the southern portion of their range and along the central coast, pond turtles are active year-round. In the remainder of their range, these turtles typically become active in March and return to overwintering sites by October or November. (Jennings et al.1992:11.)

4.3.2.1 Survey Results

No pond turtles were observed in the BSA during the reconnaissance-level surveys. The Sacramento River provides suitable aquatic habitat for the species, and the banks on the Sacramento River and adjacent uplands may be used for basking and nesting. Although there is a high amount of disturbance within uplands in the BSA, including domestic dogs and cats that may prey on pond turtles or pond turtle eggs, pond turtles may still attempt to nest in these areas if they are present in the adjacent aquatic habitat. The species has been recorded within 10 miles of the BSA (California Department of Fish and Wildlife 2019).

4.3.2.2 Project Impacts

Alternative B

Permanent and Temporary Direct Impacts

Alternative B (interim) would affect potential western pond turtle aquatic habitat (Sacramento River) and nesting habitat (cottonwood riparian forest and ruderal) on both sides of the Sacramento River. Table 4-1 lists the permanent and temporary impacts on perennial stream, cottonwood riparian, and ruderal areas that could be used by western pond turtle for nesting. Alternative B also would reduce the amount of basking habitat on the margins of the river by shading out the banks and removing natural areas (exposed banks and woody debris) that may be used for basking substrates.

The proposed project would require two seasons of temporary in-channel work that could result in injury and mortality to pond turtles. Injury or mortality could result from placement of equipment and materials into the river channel and on the riverbanks. In addition, underwater vibrations from pile driving could result in injury to pond turtles if they are in the vicinity. Construction activities, including noise and visual disturbance, also could temporarily discourage pond turtles from foraging and basking near the project site.

Indirect Impacts

No indirect impacts on western pond turtle from Alternative B are anticipated.

Alternative C

Alternative C (interim) would similarly affect western pond turtle but would result in greater permanent and temporary impacts on habitat for the species than Alternative B. See Table 4-1 for

a list of the permanent and temporary impacts on perennial stream, cottonwood riparian, and ruderal areas that could be used by western pond turtle for nesting.

4.3.2.3 Avoidance and Minimization Efforts

Implementation of Measures 1–3, 5, and 8 would ensure that construction activities avoid or minimize impacts on western pond turtle within and adjacent to the limits of disturbance associated with construction.

> **Measure 8: Conduct Preconstruction Surveys for Western Pond Turtle and Allow Turtles to Leave Work Area Unharmed**
>
> To avoid potential injury to or mortality of western pond turtles, the project proponent will retain a qualified biologist to conduct a preconstruction survey for western pond turtles immediately prior to construction activities (including vegetation removal) along the banks of the Sacramento River. The biologist will survey the aquatic habitat, riverbanks, and adjacent riparian and ruderal habitat within the construction area immediately prior to disturbance.
>
> If a western pond turtle is found within the immediate work area during the preconstruction survey or during project activities, work shall cease in the area until the turtle is able to move out of the work area on its own. Information about the location of turtles seen during the preconstruction survey will be included in the environmental awareness training (Measure 2) and provided directly to the construction crew working in that area to ensure that areas where turtles were observed are inspected each day prior to the start of work to verify that no turtles are present.
>
> If a western pond turtle nest is discovered during the preconstruction survey or during project construction, the project proponent will coordinate with CDFW to determine whether additional avoidance measures (e.g., no-disturbance buffer or monitoring) is prudent.

4.3.2.4 Compensatory Mitigation

No compensatory mitigation is required.

4.3.2.5 Cumulative Impacts

Cumulative impacts on western pond turtle would result from construction of other general development and levee projects in Sacramento and Yolo Counties. The direct effects of the proposed project on western pond turtle habitat and the project's potential to cause injury or mortality to pond turtles would contribute to cumulative impacts on western pond turtle. Alternative C would have a greater contribution than Alternative B. For both alternatives, implementation of Measures 1–3, 5, and 8 to avoid and minimize potential impacts on western pond turtle would reduce the project's contribution to cumulative impacts on western pond turtle to a less than cumulatively considerable level.

4.3.3 Swainson's Hawk

Swainson's hawk is state listed as threatened. Swainson's hawks forage in grasslands, grazed pastures, alfalfa and other hay crops, and certain grain and row croplands. Vineyards, orchards, rice, and cotton crops are generally unsuitable for foraging because of the density of the vegetation (California Department of Fish and Game 1992:41). The majority of Swainson's hawks winter in South America, although some winter in the United States. Swainson's hawk arrives in California in early March to establish nesting territories and breed (California Department of Fish and Game 1994:5). They usually nest in large, mature trees. Most nest sites (87%) in the Central Valley are found in riparian habitats (Estep 1989:35), primarily because trees are more available there. Swainson's hawks also nest in mature roadside trees and in isolated trees in agricultural fields or pastures. The breeding season is from March through August (Estep 1989:12, 35).

4.3.3.1 Survey Results

No Swainson's hawks were observed during the reconnaissance-level surveys. The CNDDB contains several records for Swainson's hawk both upstream and downstream of the BSA, with the nearest record approximately 0.3 mile southwest of the BSA (California Department of Fish and Wildlife 2019).

Trees within the cottonwood riparian forest and within ruderal and landscaped areas represent potential nesting habitat for Swainson's hawk.

4.3.3.2 Project Impacts

Alternative B

Permanent and Temporary Direct Impacts

Alternative B (interim) would affect potential Swainson's hawk nesting habitat on both sides of the Sacramento River. Table 4-1 lists the permanent and temporary impacts on cottonwood riparian that could be used by Swainson's hawk for nesting. The alternative also would result in removal of several individual trees within ruderal and landscaped areas.

Noise and visual disturbances associated with project construction (interim and ultimate) during the nesting season may disrupt Swainson's hawk nesting behavior to the point of nest abandonment or forced fledging that results in young mortality. Nests that are located within or adjacent to the BSA could be affected by typical construction noise and visual disturbances. Because the BSA has high levels of pedestrian, bike, vehicle, and boat traffic and associated noise, most construction activities may not substantially increase noise and visual disturbance above baseline conditions. However, pile driving and the use of cranes in proximity to an active nest are expected to exceed existing levels of noise disturbance. Bridge construction will require impact pile driving to be spread out over two summer construction seasons. These loud noises could startle Swainson's hawk beyond the BSA and disrupt normal behaviors, including nesting. CDFW typically considers intensive new disturbances in developed areas to have potential

impacts on active Swainson's hawk nests located in urban areas that are within 0.25 mile of the activity (California Department of Fish and Game 1994:10).

Indirect Impacts

Vehicle traffic on the new bridge could result in some amount of increased disturbance to Swainson's hawk nesting and roosting along the Sacramento River; however, considering the existing conditions along both sides of the river, this increase would not be substantial.

Alternative C

Alternative C (interim and ultimate) would similarly affect Swainson's hawk but would result in greater permanent and temporary impacts on habitat for the species than Alternative B. See Table 4-1 for a list of the permanent and temporary impacts on cottonwood riparian that could be used by Swainson's hawk for nesting.

4.3.3.3 Avoidance and Minimization Efforts

Implementation of Measures 1–3 and 9–11 would ensure that construction activities avoid or minimize potential impacts on Swainson's hawk within and adjacent to the limits of disturbance associated with project construction.

Measure 9: Conduct Focused Surveys for Nesting Swainson's Hawk prior to Construction

The project proponent will retain a wildlife biologist experienced in surveying for Swainson's hawk to conduct surveys for the species in the spring/summer prior to construction. The surveys will be conducted within the limits of disturbance and in a buffer area up to 0.25 mile from the limits of disturbance. The size of the buffer area surveyed will be based on the type of habitat present and the line-of-sight from the construction area to surrounding suitable breeding habitat. Surveys will follow the methods in *Recommended Timing and Methodology for Swainson's Hawk Nesting Surveys in California's Central Valley* (Swainson's Hawk Technical Advisory Committee 2000). A minimum of six surveys will be conducted according to these methods. If a variance of the survey distance or number of surveys is necessary, the project proponent will coordinate with CDFW regarding appropriate survey methods based on proposed construction activities. Surveys generally will be conducted from February to July. Survey methods and results will be reported to the project proponent and CDFW.

Measure 10: Conduct Tree Removal during Non-Sensitive Periods for Wildlife

The project proponent will remove or trim trees during the non-breeding season for tree-nesting migratory birds and raptors, and prior to periods when bats would be hibernating (generally between September 15 and October 31). If tree removal cannot be confined to this period, the project proponent will retain a qualified wildlife biologist with knowledge of the wildlife species that could occur in the project area to conduct the appropriate

preconstruction surveys and establish no-disturbance buffers for sensitive wildlife species, as described under Measure 8 (Swainson's hawk), Measure 11 (nesting birds), and Measure 12 (roosting bats).

Measure 11: Monitor Active Swainson's Hawk Nests during Pile Driving and Other Construction Activities

Active Swainson's hawk and white-tailed kite nests within 600 feet of the BSA will be monitored during pile driving and other construction activities. Monitoring will be conducted by a wildlife biologist with experience in monitoring Swainson's hawk and white-tailed kite nests. The monitor will document the location of active nests, coordinate with the project proponent and CDFW, and record all observations in a daily monitoring log. The monitor will have the authority to temporarily stop work if activities are disrupting nesting behavior to the point of resulting in potential take (i.e., eggs and young chicks still in nests and adults appear agitated and potentially could abandon the nest). The monitor will work closely with the contractor, the project proponent, and CDFW to develop plans for minimizing disturbance, such as modifying or delaying certain construction activities.

A minimum non-disturbance buffer of 600 feet (radius) will be established around all active Swainson's hawk and white-tailed kite nests. No entry of any kind related to construction will be allowed within this buffer while the nest is active, unless approved by CDFW through issuance of an Incidental Take Permit or through consultation during project construction. The buffer size may be modified based on site-specific conditions, including line-of-sight, topography, type of disturbance, existing ambient noise and disturbance levels, and other relevant factors. Entry into the buffer for construction activities will be granted when the biological monitor determines that the young have fledged and are capable of independent survival or that the nest has failed and the nest site is no longer active. All buffer adjustments will be approved by CDFW.

4.3.3.4 Compensatory Mitigation

The mitigation for riparian impacts (Measure 4) and replacement of protected trees (Measure 23) would offset the loss of potential Swainson's hawk nesting habitat within the BSA. Replacement habitat will occur within the Sacramento Valley population of Swainson's hawk and will include tree species suitable for Swainson's hawk nesting.

4.3.3.5 Cumulative Impacts

Cumulative impacts on Swainson's hawk would result from removal of suitable nesting and foraging habitat through construction of other general development and levee projects in Sacramento and Yolo Counties. The loss of nesting habitat on both sides of the Sacramento River that would result from implementation of the proposed project would contribute to cumulative impacts on Swainson's hawk. Alternative C would have a greater contribution than Alternative B. For both alternatives, implementation of Measures 1–3 and 9–11 to avoid or minimize construction-related effects and compensatory Measures 4 and 23 would reduce the project's contribution to a less than cumulatively considerable level.

4.3.4 White-Tailed Kite

White-tailed kite is fully protected by the CFGC. White-tailed kite occurs in coastal and valley lowlands in California (Zeiner et al. 1990:120). White-tailed kites generally inhabit low-elevation grassland, savannah, oak woodland, wetland, agricultural, and riparian habitats. Some large shrubs or trees are required for nesting and for communal roosting sites. Nest trees range from small, isolated shrubs and trees to trees in relatively large stands (Dunk 1995:6, 8). White-tailed kites make nests of loosely piled sticks and twigs lined with grass and straw, near the top of dense oaks, willows, and other tree stands. The breeding season lasts from February through October and peaks from May to August. They forage in undisturbed, open grassland, meadows, farmland, and emergent wetlands. (Zeiner et al. 1990:120.)

4.3.4.1 Survey Results

No white-tailed kites were observed during the reconnaissance-level surveys. The CNDDB contains several records for white-tailed kite in the region, with the nearest record approximately 0.75 mile west of the BSA (California Department of Fish and Wildlife 2019).

Trees within the cottonwood riparian forest and within landscaped areas represent potential nesting habitat for white-tailed kite.

4.3.4.2 Project Impacts

Alternative B

Permanent and Temporary Direct Impacts

Alternative B (interim) would affect potential white-tailed kite habitat on both sides of the Sacramento River. Table 4-1 lists the permanent and temporary impacts on cottonwood riparian habitat that could be used by white-tailed kite for nesting. The alternative also would result in the removal of several individual trees within landscaped areas.

Noise and visual disturbances associated with project construction (interim and ultimate) during the nesting season may disrupt white-tailed kite nesting behavior to the point of nest abandonment or forced fledging that results in young mortality. Nest that are located within or adjacent to the BSA could be affected by typical construction noise and visual disturbances. Because the BSA has high levels of pedestrian, bike, vehicle, and boat traffic and associated noise, most construction activities may not substantially increase noise and visual disturbance above baseline conditions. However, pile driving and the use of cranes in proximity to an active nest are expected to exceed existing levels of noise disturbance. Bridge construction will require impact pile driving to be spread out over two summer construction seasons. These loud noises could startle white-tailed kite beyond the BSA and disrupt normal behaviors, including nesting.

Indirect Impacts

Vehicle traffic on the new bridge could result in some amount of increased disturbance to white-tailed kite nesting and roosting along the Sacramento River; however, considering the existing conditions along both sides of the river this increase would not be substantial.

Alternative C

Alternative C (interim and ultimate) would similarly affect white-tailed kite but would result in greater permanent and temporary impacts on habitat for the species than Alternative B. See Table 4-1 for a list of the permanent and temporary impacts on cottonwood riparian habitat that could be used by white-tailed kite for nesting.

4.3.4.3 Avoidance and Minimization Efforts

Implementation of Measures 1–3 and 10–12 would ensure that construction activities avoid or minimize potential impacts on white-tailed kite within and adjacent to the limits of disturbance associated with project construction.

Measure 12: Conduct Preconstruction Surveys for Nesting Migratory Birds, Including Special-Status Birds, and Establish Protective Buffers

The project proponent will retain a qualified wildlife biologist to conduct nesting surveys before the start of construction. These nesting surveys will be conducted in conjunction with the Swainson's' hawk nesting surveys under Measure 8 and will include a minimum of three separate surveys to look for active nests of migratory birds, including raptors. Surveys will include a search of all trees and shrubs, ruderal areas, and grassland vegetation that provide suitable nesting habitat within 50 feet of disturbance. In addition, a 0.25-mile area from the river will be surveyed for nesting raptors in order to identify raptors that might be affected by pile driving. Surveys should occur during the height of the breeding season (March 1 to June 1), with one survey occurring in each of the 2 consecutive months within this peak period and the final survey occurring within 1 week of the start of construction. If no active nests are detected during these surveys, no additional measures are required.

If an active nest is found in the survey area, a no-disturbance buffer will be established to avoid disturbance or destruction of the nest site until the end of the breeding season (September 15) or until after a qualified wildlife biologist determines that the young have fledged and moved out of the construction area (this date varies by species). The extent of these buffers will be determined by the biologist in coordination with CDFW and will depend on the level of noise or construction disturbance taking place, line-of-sight between the nest and the disturbance, ambient levels of noise and other non-project disturbances, and other topographical or artificial barriers. Suitable buffer distances may vary between species.

4.3.4.4 Compensatory Mitigation

The mitigation for riparian impacts (Measure 4) and replacement of protected trees (Measure 32) would offset the loss of potential white-tailed kite nesting habitat within the BSA.

4.3.4.5 Cumulative Impacts

Cumulative impacts on white-tailed kite would result from removal of suitable nesting habitat, including cottonwood riparian forest, through construction of other general development and levee projects in Sacramento and Yolo Counties. The permanent and temporary impacts on cottonwood riparian habitat that would result from implementation of the proposed project would contribute to cumulative impacts. Alternative C would have a greater contribution than Alternative B. For both alternatives, implementation of Measures 1–3 and 10–12 to ensure that construction activities avoid or minimize potential impacts on white-tailed kite, and compensatory Measures 4 and 32, would reduce the project's contribution to a less than cumulatively considerable level.

4.3.5 Special-Status Bats

Pallid bat is designated as a California species of special concern. Pallid bat occurs at low elevations throughout California (Zeiner et al. 1990:70). They occur in a variety of habitat, including grasslands, shrublands, and woodlands, and are most common in open, dry habitats with rocky areas for roosting (Zeiner et al. 1990:70). Pallid bats roost alone, in small groups, or gregariously in crevices in rocky outcrops and cliffs, caves, mines, trees hollows, exfoliating tree bark, and various human structures such as bridges and buildings (Western Bat Working Group 2005a).

Western red bat is designated as a California species of special concern. Western red bat occurs along the California coast from Mendocino County south to San Diego and into the Sierra Nevada, but the most significant distribution in the state is within the Central Valley (Pierson et al. 2006:12). Western red bats typically roost alone, primarily in the foliage of trees or shrubs (Western Bat Working Group 2005b). Day roosts are commonly in edge habitats adjacent to streams or open fields (Western Bat Working Group 2005b). In the Central Valley, western red bats are more common in areas with wide strips of mature cottonwoods and sycamores (Pierson et al. 2006:12). They are also known to roost in orchard trees, in particular, walnut orchards (Pierson et al. 2006:13).

4.3.5.1 Survey Results

Suitable tree roosting habitat occurs within the cottonwood riparian habitat and in individual trees within the BSA that may be used by both pallid bat (those with cavities) and western red bat. Manmade structures in the BSA also may be used by pallid bat for roosting. No directed surveys for bats were conducted due to limited access in the BSA.

No records for pallid bat or western red bat are within 5 miles of the BSA (California Department of Fish and Wildlife 2019).

4.3.5.2 Project Impacts

Alternative B

Permanent and Temporary Direct Impacts

Cottonwood riparian forest, individual trees in landscaped areas, and buildings, which represent potential roosting habitat for special-status bats in the BSA, would be removed under Alternative B (interim and ultimate). Table 4-1 lists the permanent and temporary impacts on cottonwood riparian under Alternative B.

Project construction could result in injury or mortality to the species if occupied roost sites are removed at times when bats are not awake and active (e.g., early in the day, periods of cold weather).

Indirect Impacts

No indirect impacts from the project on special-status bats are anticipated.

Alternative C

Alternative C (interim and ultimate) would similarly affect special-status bats but would result in greater permanent and temporary impacts on habitat for the species than Alternative B. Table 4-1 lists the permanent and temporary impacts on cottonwood riparian forest that provides suitable tree roosting habitat for special-status bat species.

4.3.5.3 Avoidance and Minimization Efforts

Implementation of Measures 1–3, 10, and 13 would ensure that construction activities avoid and minimize potential impacts on bat species within and adjacent to the limits of disturbance associated with construction.

> **Measure 13: Conduct Preconstruction Surveys for Roosting Bats and Implement Protective Measures**
>
> To avoid and minimize potential impacts on pallid bat, western red bat, and non-special-status bat species from the removal of trees and buildings, the project proponent will implement the following actions.
>
> **Preconstruction Surveys**
>
> Within 2 weeks prior to tree trimming or removal and/or any building demolition, a qualified biologist will examine trees to be removed or trimmed and buildings planned for demolition with suitable bat roosting habitat. High-quality habitat features (e.g., large tree cavities, basal hollows, loose or peeling bark, larger snags, abandoned buildings, and attics) will be identified, and the area around these features searched for bats and bat sign (e.g., guano, culled insect parts, and staining). Riparian woodland and stands of mature

broadleaf trees will be considered potential habitat for solitary foliage-roosting bat species.

If suitable roosting habitat or bat sign is detected, biologists will conduct an evening visual emergence survey of the source habitat feature, from a half hour before sunset to 1–2 hours after sunset for a minimum of 2 nights. Full-spectrum acoustic detectors will be used during emergence surveys to assist in species identification. If site security allows, detectors should be set to record bat calls for the duration of each night. All emergence and monitoring surveys will be conducted during favorable weather conditions (calm nights with temperatures conducive to bat activity and no precipitation predicted). The biologist will analyze the bat call data using appropriate software and document the results in a report.

Timing of Tree Removal and Building Demolition

Exclusion devices will be installed on trees and buildings planned for removal and demolition between September 15 and October 31 to avoid affecting maternal and hibernating bat roosts. The exact timing of removal and demolition will be determined based on the preconstruction surveys of trees and buildings.

Protective Measures

Protective measures may be necessary if it is determined that bats are using buildings or trees in the BSA as roost sites, or if sensitive bats species are detected during acoustic monitoring. The following measures will be implemented when roosts are found within trees or buildings planned for removal according to the timing discussed above. Specific measures will be approved by the project proponent and CDFW prior to excluding bats from occupied roosts.

- Exclusion from buildings or bridge structures will not take place until temporary or permanent replacement roosting habitat is available.
- Exclusion from roosts will take place late in the day or in the evening to reduce the likelihood of evicted bats falling prey to diurnal predators and will take place during weather and temperature conditions conducive to bat activity.
- Biologists experienced with bats and bat evictions will carry out or oversee the exclusion tasks and will monitor tree trimming and removal and building demolition, if they are determined to be occupied.
- Trees that provide suitable roost habitat will be removed in pieces, rather than felling the entire tree, should be done late in the day or in the evening to reduce the likelihood of evicted bats falling prey to diurnal predators, and will take place during warm weather conditions conducive to bat activity.
- Structural changes may be made to a known roost proposed for removal, to create conditions in the roost that are undesirable to roosting bats and encourage the bats to leave on their own (e.g., open additional portals so that the temperature, wind, light and precipitation regime in the roost change). Structural changes to the roost will be

authorized by CDFW and will be performed during the appropriate exclusion timing (listed above) to avoid harming bats.

- Non-injurious harassment at the roost site, such as ultrasound deterrents or other sensory irritants, may be used to encourage bats to leave on their own.
- One-way door devices will be used where appropriate to allow bats to leave the roost but not to return.
- Prior to building demolition and tree removal/trimming, and after other eviction efforts have been attempted, any confirmed roost site will be gently shaken or repeatedly struck with a heavy implement such as a sledge hammer or an axe. Several minutes should pass before beginning demolition work, felling trees, or trimming limbs to allow bats time to arouse and leave the roost. A biological monitor will search downed vegetation for dead and injured bats. The presence of dead or injured bats will be reported to CDFW. Injured bats will be transported to the nearest CDFW-permitted wildlife rehabilitation facility.

4.3.5.4 Compensatory Mitigation

No compensatory mitigation specifically for special-status bats is proposed at this time. Measure 4 would compensate for the loss of cottonwood riparian habitat.

4.3.5.5 Cumulative Impacts

Cumulative impacts on special-status bat species would result from removal of suitable roosting habitat, including cottonwood riparian forest, through construction of other general development and levee projects in Sacramento and Yolo Counties. The permanent and temporary impacts on cottonwood riparian habitat that would result from implementation of the proposed project would contribute to cumulative impacts. Alternative C would have a greater contribution than Alternative B. For both alternatives, implementation of Measures 1–3, 10, and 13 to ensure that construction activities avoid or minimize potential impacts would reduce the project's contribution to a less than cumulatively considerable level. Implementation of Measure 4 would also compensate for the loss of cottonwood riparian habitat.

4.4 Special-Status Fish Species

As described in Chapter 3, *Environmental Setting*, special-status fish species known to occur in the BSA were identified after a review of the CNDDB search results; the USFWS and NMFS lists of endangered, threatened, and proposed species within the project region (Appendix B); and species' distribution and habitat data (e.g., Moyle 2002; Moyle et al. 2015; U.S. Fish and Wildlife Service 2019). Table 3-2 lists all special-status fish species that were identified as occurring in the project region. The special-status fish species and their designated critical habitats, where appropriate, are discussed below.

4.4.1 Chinook Salmon and Steelhead

Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, CV fall- and late-fall-run Chinook salmon, and CCV steelhead are discussed below.

Sacramento River Winter-Run Chinook Salmon

The Sacramento River winter-run Chinook salmon evolutionarily significant unit (ESU) is listed as endangered under the ESA (59 FR 440; January 4, 1994). The ESU includes all naturally spawned populations of winter-run Chinook salmon in the Sacramento River and its tributaries, as well as artificially-propagated fish from the Livingston Stone National Fish Hatchery (70 FR 37160–37204; June 28, 2005). The Sacramento River winter-run Chinook salmon ESU was listed as endangered under CESA in September 1989.

NMFS designated critical habitat for Sacramento River winter-run Chinook salmon on June 16, 1993 (58 FR 33212–33219); critical habitat includes the water column, river bottom, and adjacent riparian zones of the Sacramento River up to the OHWM, as defined by the USACE in 33 CFR 329.11. The biological and physical features (also referred to as *primary constituent elements*) of critical habitat in the BSA include freshwater rearing habitat with water quantity and quality, natural cover, forage, and passage conditions supporting migration and rearing of winter-run Chinook salmon.

Winter-run Chinook salmon currently are found in the mainstem Sacramento River downstream of Keswick dam. Areas where winter-run Chinook salmon historically migrated to and spawned are now inaccessible because of the construction of Keswick and Shasta Dams. The current population in the Sacramento River is maintained through cold water releases from Shasta Reservoir that create spawning and rearing habitat in the reach between Redding and the Red Bluff Diversion Dam. Efforts currently are underway to reestablish a population of Sacramento River winter-run Chinook salmon in North Fork Battle Creek with the purpose of recovering the species.

Winter-run Chinook salmon spend 1 to 3 years in the ocean. Adult winter-run Chinook salmon leave the ocean and migrate up the Sacramento River from December through July, with the majority of the run passing the Red Bluff Diversion Dam from January through May, peaking in mid-March (National Marine Fisheries Service 2009a, 2014). Adults spawn from mid-April through mid-August, with peak activity in May and June (Vogel and Marine 1991). Fry emerge from the gravel beginning in late June, with emergence continuing through October (Fisher 1994). Juvenile winter-run Chinook salmon have been observed emigrating past Sherwood Harbor (located approximately 3 miles downstream from the BSA) from October through April, with most passing through the area in November, December, and February through April (Table 4-2), based on USFWS Sacramento trawl survey data from 2009 to 2019 (U.S. Fish and Wildlife Service 2019).

During juvenile rearing and downstream movement, salmonids prefer stream margin habitats with sufficient depths and velocities to provide suitable cover and foraging opportunities. Ephemeral habitats, such as floodplains and the lower reaches of small streams, also are very

important to rearing Chinook salmon as these areas can be much more productive than the main channel and provide refuge from predatory fishes (Maslin et al. 1997; Sommer et al. 2001).

Winter-run Chinook salmon use the Sacramento River within the BSA for upstream migration (adults) and downstream migration and rearing (juveniles); spawning and egg incubation do not occur in the BSA. Table 4-3 summarizes the life stage timing and distribution of winter-run Chinook salmon in the Sacramento River, including in the BSA.

One of the main factors in the decline of winter-run Chinook salmon is habitat loss and degradation. On the Sacramento River, Shasta Dam blocked access to historical spawning and rearing habitat. Other factors affecting abundance include the effects of reservoir operations on water temperature, drought effects, passage impediments, harvesting and fishing pressure, entrainment in diversions, contaminants, predation by non-native species, and interaction with hatchery stock (U.S. Army Corps of Engineers 2000).

In the Sacramento River, operation of the Central Valley Project (CVP) and State Water Project (SWP) influences river flow, which can reduce habitat area and adversely affect water quality. Factors such as levee construction and bank armoring have altered the critical habitat of winter-run Chinook salmon. These factors reduce floodplain habitat, change riverbank substrate size, and decrease the amount of SRA cover and riparian habitat—which in turn, reduce habitat availability and quality (National Marine Fisheries Service 2006).

Table 4-2. Number of Winter-Run Size Juvenile Chinook Salmon Captured by Trawl at Sherwood Harbor (RM 55) by Month (January 2009 through October 2019)

Month/ Year	2009	2010	2011	2012	2013[a]	2014	2015	2016	2017	2018	2019	Monthly Total[b]
Jan	1	1		2				1		4	17	9
Feb	14	7	3	2		45	2			4	19	76
Mar			3	24		23	1	6	61	12	16	127
Apr			5	1		3	2	2	47	0	27	60
May												0
Jun												0
Jul												0
Aug												0
Sep												0
Oct	3	2										5
Nov	2			48		2	1					45
Dec		7		26		13	4			22		72
Annual Total	**20**	**17**	**11**	**93**	**0**	**84**	**10**	**9**	**108**	**42**	**NA**	**394**

NA = not applicable.
RM = river mile.
[a] No winter-run size juvenile Chinook salmon were detected by trawl surveys.
[b] 2019 data are excluded from total because data are incomplete.

Table 4-3. Life Stage Timing of Listed and MSA-Managed Fish Species in the Biological Study Area

Species/Life Stage	Distribution	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Winter-Run Chinook Salmon													
Adult migration and holding	San Francisco Bay to upper Sacramento River		P	P	P								
Juvenile movement and rearing	Upper Sacramento River to San Francisco Bay		P	P									P
Spring-Run Chinook Salmon													
Adult migration	San Francisco Bay to upper Sacramento River and tributaries				P	P	P						
Juvenile movement	Upper Sacramento River and tributaries to San Francisco Bay			P	P	P							
Late Fall–Run Chinook Salmon													
Adult migration	San Francisco Bay to upper Sacramento River and tributaries												P
Juvenile movement and rearing	Upper Sacramento River and tributaries											P	P
Fall-Run Chinook Salmon													
Adult migration and holding	San Francisco Bay to upper Sacramento River and tributaries									P	P		
Juvenile movement	Upper Sacramento River and tributaries to San Francisco Bay		P	P	P	P							
Steelhead													
Adult migration	San Francisco Bay to upper Sacramento River and tributaries		K	K	K	K			P	P	P	P	
Juvenile and smolt movement	Upper Sacramento River and tributaries to San Francisco Bay		P	P									
Green Sturgeon													
Adult migration and holding	San Francisco Bay to upper Sacramento River												
Juvenile rearing)	Upper Sacramento River to San Francisco Bay		P	P	P		P	P					
Juvenile movement and rearing	Upper Sacramento River to San Francisco Bay												
Delta Smelt													
Adult migration	South Delta to north Delta and lower Sacramento River												
Spawning	Upper Delta to lower Sacramento River				P	P							
Longfin Smelt													
Adult migration and spawning	San Francisco Bay to upper Delta												

Sources: Moyle 2002; National Marine Fisheries Service 2018; Delta Juvenile Fish Monitoring Program (U.S. Fish and Wildlife Service 2019).

Note: Gray shading indicates primary periods of species and life stage occurrence included in the assessment of project effects.
K = period when kelts (post-spawning adults) may be returning to ocean.
MSA = Magnuson-Stevens Fishery Management and Conservation Act.
P = peak period of occurrence.

Central Valley Spring-Run Chinook Salmon

The CV spring-run Chinook salmon ESU is federally listed as threatened (70 FR 37160; June 28, 2005). The ESU includes naturally spawned populations in the Sacramento River and its tributaries, including the Feather and Yuba Rivers, and artificially-propagated fish from the Feather River Fish Hatchery. The CV spring-run Chinook salmon ESU was listed as threatened under CESA in February 1999.

NMFS proposed critical habitat for CV spring-run Chinook salmon on December 10, 2004, and published a final rule designating critical habitat for this ESU on September 2, 2005 (70 FR 52488, September 2, 2005). Critical habitat for CV spring-run Chinook salmon includes the water column, river bottom, and adjacent riparian zone of the Sacramento River up to the OHWM, as defined by the USACE in 33 CFR 329.11. The physical and biological features of critical habitat in the Sacramento River within the BSA include freshwater rearing habitat with water quantity and quality, natural cover, forage, and passage conditions supporting migration and rearing of spring-run Chinook salmon.

Adult spring-run Chinook salmon enter the mainstem Sacramento River from February through September, with the peak upstream migration occurring from May through June (Yoshiyama et al. 1998). Adults generally enter tributaries from the Sacramento River between mid-April and mid-June (National Marine Fisheries Service 2006). Spring-run Chinook salmon are sexually immature during upstream migration, and adults hold in deep, cold pools near spawning habitat until spawning commences in late summer and fall. Spawning habitat occurs in the upper reaches of the Sacramento River and tributaries, including Butte Creek.

Juvenile spring-run Chinook salmon typically spend up to 1 year rearing in fresh water before migrating to sea as yearlings, but some may migrate downstream as young-of-year juveniles. Rearing takes place in their natal streams, the mainstem of the Sacramento River, inundated floodplains (including the Sutter and Yolo Bypasses), and the Delta. Based on observations in Butte Creek and the Sacramento River, young-of-year juveniles typically migrate from November through May. Yearling spring-run Chinook salmon migrate from October to March, with peak migration in November (Cramer and Demko 1997; Hill and Webber 1999). Downstream migration of yearlings typically coincides with the onset of the winter storm season, and migration may continue through March (California Department of Fish and Game 1998). Juvenile spring-run Chinook salmon have been observed emigrating past Sherwood Harbor (located approximately 3 miles downstream from the BSA) from November through June, with most passing through the area in March, April, and May (Table 4-4), based on USFWS Sacramento trawl survey data from 2009 to 2019 (U.S. Fish and Wildlife Service 2019).

Table 4-4. Number of Spring-Run Size Juvenile Chinook Salmon Captured by Trawl at Sherwood Harbor (RM 55) by Month (January 2009 through October 2019)

Month/ Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Monthly Total[a]
Jan			10	1	1	0	2	3	5	0	17	22
Feb	2	3	20	1	0	99	9	2	18	4	26	158
Mar	2	13	9	115	1	135	1	30	187	53	95	546
Apr	148	101	169	88	251	316	33	137	1,200	78	320	2,521
May	39	5	4	4	5	6	0	1	508	5	10	577
Jun									1			1
Jul												0
Aug												0
Sep												0
Oct												0
Nov								1				1
Dec		25		10	0	21	0	8		4		68
Annual Total	**191**	**147**	**212**	**219**	**258**	**577**	**45**	**182**	**1,919**	**144**	**NA**	**3,894**

NA = not applicable.
RM = river mile.
[a] 2019 data are excluded from total because data are incomplete.

Spring-run Chinook salmon use the Sacramento River within the BSA for upstream migration (adults) and downstream migration and rearing (juveniles); spawning and egg incubation do not occur in the BSA (Moyle 2002). Table 4-3 summarizes the life stage timing and distribution of spring-run Chinook salmon in the Sacramento River, including in the BSA.

Reasons for the decline and current status of spring-run Chinook salmon fall into three general categories: (1) loss of historical spawning habitat; (2) degradation of remaining habitat; and (3) threats to the genetic integrity of the wild spawning populations. The construction of debris, hydropower, flood control, and water supply dams eliminated virtually all historical spawning habitat of spring-run Chinook salmon. Altered flows and water temperatures from dam operations and water diversions; losses of suitable spawning substrate; channel alterations (e.g., channelization, levees) associated with navigation and flood risk reduction; and associated losses of riparian, floodplain, and wetland habitat are contributing factors to past declines and the current status of spring-run Chinook salmon populations in the Central Valley.

Central Valley Fall- and Late Fall–Run Chinook Salmon

The CV fall-run and late fall–run Chinook salmon ESU includes all naturally spawned populations of fall-run and late fall–run Chinook salmon in the Sacramento and San Joaquin River basins and their tributaries east of the Carquinez Strait in California (64 FR 50394). On September 16, 1999, after reviewing the best available scientific and commercial information, NMFS determined that listing CV fall- and late fall–run Chinook salmon was not warranted. On April 15, 2004, the CV fall- and late fall–run Chinook salmon ESU was identified by NMFS as a species of concern (69 FR 19975). Critical habitat is not designated for fall- and late fall–run Chinook salmon because the species is not listed under the ESA.

The CV fall- and late fall-run Chinook salmon ESU is not listed under CESA but is considered a California species of special concern. CDFW classifies the current status of CV fall-run Chinook salmon as Moderate Concern (i.e., the species is under no immediate threat of extinction; but populations are in long-term decline or are naturally small and isolated, and warrant frequent status re-assessment) and CV late fall–run Chinook salmon as High Concern (considered to be under severe threat of extinction, but extinction is less imminent than for other more imperiled species) (Moyle et al. 2015).

Currently, fall-run Chinook salmon spawn below rim dams and barriers to migration in the Sacramento and San Joaquin Rivers and their tributaries. Some smaller streams that lack unpassable barriers have runs that extend into historical fall-run habitat. Late fall–run Chinook salmon currently spawn almost exclusively in the upper Sacramento River from Keswick Dam to the Anderson-Cottonwood Irrigation District Dam. Adult fall-run Chinook salmon migrate through the Delta and into Central Valley rivers from June through December and spawn from September through December. Peak spawning activity usually occurs in October and November. The life history characteristics of late fall–run Chinook salmon are not well understood. Adult late fall–run Chinook salmon migrate through the Delta and into the Sacramento River from October through April and may wait for 1 to 3 months before spawning from December through April. Peak spawning activity occurs in February and March.

Upon emergence from the gravel, fry swim or are displaced downstream (Healey 1991); most movement occurs during twilight (National Marine Fisheries Service 2014). Fry seek nearshore habitats providing shallow water; vegetation; and substrates that provide aquatic and terrestrial invertebrates, cover and shelter from predators, and slower water velocities for resting (National Marine Fisheries Service 2014).

CV fall-run Chinook salmon fry (i.e., juveniles shorter than 2 inches long) generally emerge from December through March, with peak emergence occurring by the end of January. In general, fall-run Chinook salmon fry abundance in the Delta increases following high winter flows. Most fall-run Chinook salmon fry rear in fresh water from December through June, with smolt emigration occurring primarily from April through June. Smolts that arrive in the estuary after rearing upstream migrate quickly through the Delta and Suisun and San Pablo Bays. A very small number (generally less than 5 percent) of fall-run juveniles spend over a year in fresh water and emigrate as yearling smolts the following November through April. Juvenile fall-run Chinook salmon have been observed emigrating past Sherwood Harbor (located approximately 3 miles downstream from the BSA) from December through August, with most passing through the area from January through June (Table 4-5), based on USFWS Sacramento trawl survey data from 2009 to 2019 (U.S. Fish and Wildlife Service 2019).

Table 4-5. Number of Fall-Run Size Juvenile Chinook Salmon Captured by Trawl at Sherwood Harbor (RM 55) by Month (January 2009 through October 2019)

Month/ Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Monthly Total[a]
Jan	1	62	59	242	162	0	1	198	183	141	459	1,049
Feb	247	119	80	123	70	2,213	197	73	753	45	770	3,920
Mar	73	38	83	339	5	1,459	1	221	333	246	597	2,798
Apr	215	238	358	315	493	692	27	220	781	119	283	3,458
May	497	44	316	263	341	74	10	27	2,271	177	327	4,020
Jun	24	6	96	13	16	1			697	4	10	857
Jul	6	4	3	2	1				6	1	2	23
Aug	1			3	1				1		1	6
Sep												
Oct												
Nov												
Dec		112		58		103	1	14	1	16		305
Annual Total	**1,064**	**623**	**995**	**1,358**	**1,089**	**4,542**	**237**	**753**	**5,026**	**749**	**NA**	**16,436**

NA = not applicable.
RM = river mile.
[a] 2019 data are excluded from total because data are incomplete.

CV late fall–run Chinook salmon fry generally emerge from April through June. Late fall–run fry rear in fresh water from April through the following April and emigrate as smolts from October through February (Snider and Titus 2000). Juvenile late fall–run Chinook salmon have been observed emigrating past Sherwood Harbor (located approximately 3 miles downstream from the BSA) from August through April, with most passing through the area in November and December (Table 4-6), based on USFWS Sacramento trawl survey data from 2009 to 2019 (U.S. Fish and Wildlife Service 2019).

CV fall- and late fall–run Chinook salmon use the Sacramento River within the BSA for upstream migration (adults) and downstream migration and rearing (juveniles); spawning and egg incubation do not occur in the BSA (Moyle 2002). Table 4-3 summarizes the life stage timing and distribution of fall- and late fall–run Chinook salmon in the Sacramento River, including in the BSA.

Factors that contributed to the decline of CV fall- and late fall–run Chinook salmon are similar to those described earlier for Sacramento River winter-run Chinook salmon and CV spring-run Chinook salmon. Access to much or all of their historical spawning habitat was eliminated by dams, although fall-run Chinook salmon were less affected by these barriers because much of their historical spawning habitat included the lower-gradient reaches downstream of these dams (Reynolds et al. 1993; McEwan 2001). Levee construction, channelization, and bank armoring have reduced and degraded the value and availability of natural habitat features for rearing and emigrating juvenile Chinook salmon (Brandes and McLain 2001). Other factors that have contributed to the current status of CV fall-run and late fall–run Chinook salmon and currently affect their abundance include harvest, artificial propagation programs (ecological and genetic effects), entrainment, and contaminants (Moyle 2002).

Table 4-6. Number of Late Fall–Run Size Juvenile Chinook Salmon Captured by Trawl at Sherwood Harbor (RM 55) by Month (January 2009 through October 2019)

Month/ Year	2009	2010	2011[a]	2012	2013[a]	2014	2015	2016	2017	2018	2019	Monthly Total[b]
Jan										1	1	1
Feb									1			1
Mar								1				1
Apr				1							1	1
May												0
Jun												0
Jul												0
Aug	1			1								2
Sep		1										1
Oct		1										1
Nov	1			5								6
Dec	1			4		5	1	4		7		22
Annual Total	**3**	**2**	**0**	**11**	**0**	**5**	**1**	**5**	**1**	**8**	**NA**	**36**

NA = not applicable.
RM = river mile.
[a] No late fall–run size juvenile Chinook salmon were detected by trawl surveys.
[b] 2019 data are excluded from total because data are incomplete.

California Central Valley Steelhead

The CCV steelhead DPS was federally listed as threatened on March 19, 1998 (National Marine Fisheries Service 1998) (63 FR 13347). The threatened status of CCV steelhead was reaffirmed in NMFS's final listing determination on January 5, 2006 (71 FR 834). At the same time, NMFS adopted the term *DPS*, in place of *ESU*, to describe CCV steelhead and other population segments of this species. The DPS includes all naturally spawned populations of steelhead in the Sacramento and San Joaquin Rivers and their tributaries, excluding steelhead from San Francisco and San Pablo Bays and their tributaries. Artificially propagated fish from Coleman National Fish Hatchery and Feather River Fish Hatchery are included in the DPS (71 FR 834, January 5, 2006). The CCV steelhead DPS is not listed under CESA.

Critical habitat for CCV steelhead was designated by NMFS on September 2, 2005 (70 FR 52488) and includes all stream reaches accessible to CCV steelhead in the Sacramento and San Joaquin Rivers and their tributaries. Also included are adjacent riparian zones within the OHWM (70 FR 52537, September 2, 2005). The physical and biological features of critical habitat in the Sacramento River portion of the BSA are freshwater rearing habitat with water quantity and quality, natural cover, forage, and passage conditions supporting migration and rearing of steelhead. Within the BSA, the Sacramento River and adjacent riparian zones below the OHWM are considered critical habitat for this species.

Steelhead exhibit highly variable life history patterns throughout their range but are broadly categorized into winter and summer reproductive ecotypes. Winter steelhead, the most widespread reproductive ecotype, is the only type currently present in Central Valley streams (McEwan and Jackson 1996). Winter steelhead become sexually mature in the ocean; enter

spawning streams in summer, fall, or winter; and spawn a few months later in winter or spring (Meehan and Bjornn 1991; Behnke 1992).

Adult steelhead immigration into Central Valley streams typically begins in August, continues into March or April (McEwan 2001; National Marine Fisheries Service 2014), and generally peaks during January and February (Moyle 2002); but adult steelhead immigration potentially can occur during all months of the year (National Marine Fisheries Service 2009a). Steelhead spawning generally occurs from December through April, with peaks from January through March, in small streams and tributaries (National Marine Fisheries Service 2009a).

After fry emerge, they inhabit shallow areas along the stream margin and prefer riffles; they use a greater variety of habitats as they grow and develop (Barnhart 1986; National Marine Fisheries Service 2014). Habitat use is affected by the presence of predators; and juvenile steelhead survival increases when cover, such as wood debris and large cobble, is available (Mitro and Zale 2002).

Juvenile CCV steelhead typically migrate to the ocean after spending 1 to 3 years in fresh water (California Department of Fish and Game 1996). Steelhead fry and fingerlings rear and migrate downstream in the Sacramento River during most months of the year, but the primary period of emigration is January to June (Hallock et al. 1961; McEwan 2001). Juvenile steelhead have been observed emigrating past Sherwood Harbor (located approximately 3 miles downstream from the BSA) from January through June, with peaks during February and March for hatchery fish and February through May for wild fish (Table 4-7), based on USFWS Sacramento trawl survey data from 2009 to 2019 (U.S. Fish and Wildlife Service 2019). Because of their varied freshwater residence times, steelhead fry and juveniles can be rearing and migrating in the Sacramento River year-round (McEwan 2001).

Table 4-7. Number of Hatchery and Wild Juvenile Steelhead Captured by Trawl at Sherwood Harbor (RM 55) by Month (January 2009 through October 2019)

Month/ Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Monthly Total[a]
Jan	11	1	3	32(1)	3	1	1	6	1	36	24	95(1)
Feb	45	27(4)	23	74(5)	4	248(6)	13	25	11(4)	37(1)	91(1)	507(20)
Mar	3	1	11	13	1	10(3)	0	2	17(6)	50(1)	83(3)	108(10)
Apr	1	4(2)	1	3(1)	1(2)	3(1)	1(1)	1	3	1(1)	3(1)	19(8)
May	0(2)		0(1)	1(1)	0(1)				0(1)	0(1)	1(1)	1(7)
Jun		0(1)	0(1)						0(1)			0(3)
Jul												
Aug												
Sep												
Oct												
Nov												
Dec												
Annual Total	**60(2)**	**33(7)**	**38(2)**	**123(8)**	**9(3)**	**262(10)**	**15(1)**	**34(0)**	**32(12)**	**124(4)**	**NA**	**730(49)**

Note: Number of wild steelhead are in parentheses.
NA = not applicable.
RM - river mile.
[a] 2019 data are excluded from total because data are incomplete.

CCV steelhead use the Sacramento River in the BSA for upstream migration (adults) and downstream migration (post-spawning adults and juveniles) and rearing (juveniles); spawning and egg incubation do not occur in the BSA (Moyle 2002). Table 4-3 summarizes the life stage timing and distribution of CCV steelhead in the Sacramento River, including in the BSA.

Steelhead once were abundant in Central Valley drainages; however, population numbers have declined significantly in recent decades. Factors that have contributed to their present status include habitat loss as a result of barriers, water development, water conveyance and flood control, hatchery operations and practices, land use activities, water quality, sport harvest, disease and predation, environmental variation (e.g., climatic and ocean conditions), and invasive species (National Marine Fisheries Service 2014).

4.4.1.1 Survey Results

Focused surveys for Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, CV fall and late fall–run Chinook salmon, and CCV steelhead were not conducted in the BSA—in part, because the protected status of these species precluded the use of fish sampling as part of the habitat assessment, and because it is well documented that these species use the BSA as a migration corridor during upstream (adult) and downstream (juvenile) migration and for juvenile rearing.

The temporal occurrence and relative abundance of juvenile Chinook salmon and steelhead in the BSA can be inferred based on the weekly trawl surveys of the Sacramento River at Sherwood Harbor (RM 55) as part of the Delta Juvenile Fish Monitoring Program (DJFMP) (U.S. Fish and Wildlife Service 2019) (Table 4-2 and Tables 4-4 through 4-7). Sherwood Harbor is located approximately 3 miles downstream of the BSA, and the trawls conducted by USFWS provide a consistent and reliable method for observing the timing of occurrence and relative abundance of juvenile Chinook salmon and steelhead in the BSA. USFWS uses a Kodiak trawl at Sherwood Harbor from December through March and switches to a mid-water trawl beginning in April.

As mentioned in Chapter 2, a survey of existing SRA cover along the river in the BSA was conducted. Quantification of SRA cover habitat in the BSA was based on a combination of field observations (August 24, 2017) and interpretation of recent aerial photographs by ICF biologists. USFWS defines *SRA cover* as “the unique, near-shore aquatic cover that occurs at the interface between a stream or river and adjacent woody riparian habitat” and is an essential component of salmonid habitat. Key features of SRA cover include the following.

- An adjacent bank composed of natural, often eroding substrate that supports overhanging riparian vegetation and vegetation that may protrude into the water.
- A stream channel with variable amounts of woody material and detritus, and variable water velocity and depth.

SRA cover is composed of two components: overhead cover and instream cover. Overhead cover consists of overhanging riparian vegetation that provides important stream shading and contributes leaf litter and insects to the stream. Instream cover consists of submerged woody material (exposed roots, branches, and trunks), aquatic plants, substrate (gravel, cobble, and boulders), and undercut banks. These attributes provide high-value feeding areas, burrowing

substrates, escape cover, and reproductive cover for numerous regionally important fish and wildlife species (U.S. Fish and Wildlife Service 1992).

Table 4-8 shows the amount of SRA cover in the form of overhead vegetation present along both banks of the Sacramento River in the BSA relative to the total bank length.

Table 4-8. Existing Shaded Riverine Aquatic Cover (Overhead Vegetation and Undercut Banks) in the Biological Study Area

River Bank	Existing Bank Length[a] (linear feet)	Existing Overhead Vegetation	
		Bank Length[a] (linear feet)	Percent Bank Length[a]
City of Sacramento	1,741	1,103	63
City of West Sacramento	1,437	940	65
Total	**3,177**	**2,043**	**64**

4.4.1.2 Project Impacts

The following assessment addresses potential direct and indirect effects of the proposed project on special-status fish species, including listed species, and designated critical habitat (where applicable). Potential project effects on listed species and critical habitat include both short-term and long-term effects. Short-term effects include temporary construction-related impacts on fish and aquatic habitat that may last from a few hours to days (e.g., suspended sediment and turbidity, construction noise, and artificial lighting). Long-term effects (e.g., addition of overwater structure, loss of aquatic habitat [substrate and water column], and loss of SRA cover habitat) typically would last months or years, or would be permanent. These effects generally are due to physical alteration of important habitat attributes of the channel, shoreline, and adjacent bank. Short-term effects on listed fish species were evaluated quantitatively (when possible) and qualitatively based on general knowledge of the impact mechanisms and species responses to construction actions. Long-term effects were measured in terms of the area or linear feet of artificial shade, aquatic habitat, and SRA cover habitat permanently affected by the proposed project.

It should be noted that the impacts on special-status fish species and designated critical habitat (where applicable) from project construction discussed below would be the same for the interim year (2030) and design year (2040), as the design and construction methods for the new bridge would be the same regardless of future conditions. However, impacts on special-status fish and habitat would vary according to bridge design (bascule, vertical lift, swing) and build alternative; these differences are described below.

Alternative B

Permanent and Temporary Direct Impacts

Pile Driving Noise

Pile driving and other sources of anthropogenic noise have the potential to adversely affect fish through a broad range of behavioral, physiological, or physical effects (McCauley et al. 2003;

Popper and Hastings 2009). These effects may include behavioral responses, physiological stress, temporary and permanent hearing loss, tissue damage (auditory and non-auditory), and direct mortality depending on the intensity and duration of exposure. In salmonids, the presence of a swim bladder to maintain buoyancy increases their vulnerability to direct physical injury (i.e., tissue and organ damage) from underwater noise (Hastings and Popper 2005). Underwater noise also may damage hearing organs and temporarily affect hearing sensitivity, communication, and the ability to detect predators or prey (Popper and Hastings 2009). In addition, underwater noise may cause behavioral effects (e.g., startle or avoidance responses) that can disrupt or alter normal activities (e.g., migration, holding, or feeding) or expose individuals to increased predation (Voellmy et al. 2014; Simpson et al. 2016).

Among the construction activities likely to generate noise, the use of impact hammers for pile installation poses the greatest risk to fish because the levels of underwater noise produced by impulsive types of sounds can reach levels of sufficient intensity to injure or kill fish (Popper and Hastings 2009). Factors that may influence the potential for injury include species, life stage, and size of fish; type and size of pile and hammer; frequency and duration of pile driving; site characteristics (e.g., water depth); and distance of fish from the source. Dual interim criteria representing the acoustic thresholds associated with the onset of physiological effects in fish have been established to provide guidance for assessing the potential for injury resulting from pile driving noise (Fisheries Hydroacoustic Working Group 2008) (Table 4-9). These criteria have been established only for impact pile driving. Other pile driving methods such as vibratory, oscillatory, and drilling methods generally produce more continuous, lower energy sounds below the thresholds associated with injury. No established noise thresholds currently are associated with continuous sound waves, and vibratory and oscillation methods generally are considered effective measures for avoiding or minimizing the risk of injury of fish from pile driving noise.

Table 4-9. Interim Criteria for Assessing the Potential for Injury to Fish from Pile Driving Activities

Interim Criteria	Agreement in Principle
Peak sound pressure level (SPL)	206 dB re 1µPa (for all sizes of fish)
Cumulative sound exposure level (SEL)	187 dB re 1µPa^2-sec—for fish size ≥ 2 grams 183 dB re 1µPa^2-sec—for fish size < 2 grams
Behavioral (RMS)	150 dB re 1µPa (for all sizes of fish)

Source: Fisheries Hydroacoustic Working Group 2008.
dB = decibel(s).
dB re 1µPa = dB referenced to a pressure of 1 microPascal.
dB re 1µPa^2-sec = dB referenced to a pressure of 1 microPascal squared per second.
RMS = root mean square.

The dual criteria are: (1) 206 decibels (dB) for peak sound pressure level (SPL); and (2) 187 dB for cumulative sound exposure level (SEL) for fish larger than 2 grams and 183 dB SEL for fish smaller than 2 grams. The peak SPL threshold is considered the maximum SPL a fish can receive from a single strike without injury. The cumulative SEL threshold is considered the total amount of acoustic energy that a fish can receive from single or multiple strikes without injury. The cumulative SEL threshold is based on the total daily exposure of a fish to noise from sources that are discontinuous (in this case, noise that occurs up to 12 hours a day, with 12 hours between exposures). This assumes that fish are able to recover from any effects during this 12-hour period between exposures.

In the following analysis, the potential for injury to fish from exposure to pile driving sounds was evaluated using a spreadsheet model developed by NMFS to calculate the distances from the pile that sound attenuates to the peak or cumulative criterion. These distances define the area in which the criteria are expected to be exceeded and potentially result in the injury of fish that may be present. The NMFS spreadsheet calculates these distances based on estimates of the single-strike sound levels for each pile type (measured at 10 meters [33 feet] from the pile) and the rate at which sound attenuates with distance. In the following analysis, the standard sound attenuation rate of 4.5 dB per doubling of distance was used in the absence of other data. To account for the exposure of fish to multiple pile driving strikes, the model computes a cumulative SEL for multiple strikes based on the single-strike SEL and the number of strikes per day or pile driving event. The NMFS spreadsheet also uses the concept of *effective quiet*, which assumes that cumulative exposure of fish to pile driving sounds of less than 150 dB SEL does not cause injury. Because insufficient data currently are available to support the establishment of a noise threshold for behavioral effects (Popper et al. 2006), NMFS generally assumes that a noise level of 150 dB root mean square (RMS) is an appropriate threshold for behavioral effects.

The reference levels used to estimate the noise levels for pile driving activities were selected from data reported for projects with similar types of pile driving and demolition operations and site characteristics (California Department of Transportation 2015). The peak level represents the maximum reported noise level. The single-strike SELs and RMS levels represent noise levels from a typical pile strike; typical pile strike levels were developed by averaging a range of data collected from past projects. The computation of cumulative SELs is based on the maximum number of piles that can reasonably be installed in 1 day and the estimated number of strikes required to drive each pile. Because of uncertainties in site conditions potentially encountered during pile driving operations (e.g., bed resistance), it was assumed that approximately half the length of each pile can be installed using vibratory pile driving, with impact driving used to drive the remaining half. The computed distances over which pile driving sounds are expected to exceed the injury and behavioral thresholds assume an unimpeded sound propagation path. However, site conditions such as shallow water, major channel bends, and other in-water structures can reduce these distances by impeding the propagation of underwater sound waves.

Where impact driving is proposed in open water, computations also were performed to evaluate the potential effect of an attenuation device (e.g., bubble curtain, dewatered cofferdam) on the distances to the injury thresholds. The amount of noise reduction from attenuation devices depends on numerous factors, including water depth and flow and attenuation type, design, and deployment. For assessment purposes, the standard practice is to assume between 5 and 10 dB reduction from attenuation. Because precise site conditions where the piles would be installed are unknown, it is difficult to predict the effectiveness of an attenuation device. For this reason, it was assumed that a maximum of 5 dB reduction could be achieved with implementation of an attenuation system for the piles that would be impact driven in open water. If a pile is driven in flowing water, it was assumed that a bubble curtain would be deployed inside an isolation casing to prevent the bubbles from dispersing away from the pile.

The estimated number of pile strikes per day was provided by the project engineers. Because juveniles of some species in the project area could be smaller than 2 grams, the cumulative SEL threshold of 183 dB (i.e., the more protective threshold) was used in this analysis. It should be noted, however, that in cases where the estimated daily number of strikes per day exceeds 5,000

strikes, the distance to the onset of physical injury does not increase because pile driving energy does not accumulate once the single strike SEL drops to 150 dB (i.e., effective quiet); therefore, the distance to the 183 dB and 187 dB thresholds are the same.

Pile Driving Noise Impacts

The primary source of underwater noise associated with constructing either one of three alternative bridge types (i.e., bascule, vertical lift, swing) would be driving the 238 16-inch steel pile or 16-inch steel H-piles with an impact hammer for the temporary trestles and work platforms, the 16 16-inch spud piles for the barges, the 20 to 40 (depending on bridge type) 16-inch steel pipe piles in water for the two in-water piers (i.e., piers 4 and 5), the 40 16-inch steel pipe piles on land for the two in-levee abutments (i.e., abutments 1 and 6), the 6 to 18 (depending on bridge type) 60-inch CISS piles for the two in-water piers (i.e., piers 2 and 3) for the movable span, and the 60 14-inch square concrete or 16-inch steel pipe piles for the bridge fender system. Additional sources of underwater noise associated with the project would occur during installation and removal of temporary sheet piles with a vibratory hammer for the temporary cofferdams used to isolate the in-water construction areas for bridge piers 4 and 5. Only driving of piles with an impact hammer is expected to produce sound levels that could result in injury to fish.

Table 4-10 summarizes the pile driving activities (location, timing, and duration) associated with constructing the new bridge.

Temporary Trestle Piles

Two temporary construction trestles would be installed to support work platforms during construction, one extending from the Sacramento bank and the other extending from the West Sacramento bank of the river (Appendix A, Figure 8). Each trestle would require piles to be driven on land and in the water. Two pile types are being considered: 16-inch diameter steel pipe piles and 16-inch steel H-piles. This assessment assumes that 10 to 20 piles would be installed per day and that each pile would require approximately 800 blows to install. Installation of the trestle piles would occur during the first in-water construction season (May 1 to November 30) and would require an estimated 3 weeks to complete (Appendix A, Figure 5). Table 4-11 shows the assumed installation rate and computed distances to the injury and behavioral thresholds for each trestle pile type and location. The computed distances for the in-water piles are shown for both unattenuated and attenuated impact driving.

Table 4-10. Summary of Pile Driving Activities with Potential to Affect Fish

Activity	Location	Approximate Timing	Approximate Duration (days)
Vibratory and impact driving of 16-inch steel pipe or H piles for construction trestle	On land and in water	Season 1, May 3–May 21	20
Vibratory and impact driving of 16-inch steel pipe piles for temporary barges	In water	Seasons 1 and 2, May 1–October 27	10
Vibratory driving of sheet piles for cofferdams	In water	Season 1, May 24–June 4	12
Vibratory and impact driving of 16-inch steel pipe piles for fixed span (piers 4 and 5)	In water	Season 1, June 7–June 11	5
Vibratory and impact driving of 16-inch steel pipe piles for abutments 1 and 6	On land	Season 1, June 8–June 14	5
Removal of sheet piles with vibratory driver	In water	Season 1, July 12–July 23	12
Vibratory and impact driving of 60-inch CISS piles for movable span (piers 2 and 3)	In water	Season 1, May 24–August 13	10
Vibratory and impact driving of 14-inch concrete or 16-inch steel pipe piles for bridge fender system	In water	Season 2, September 25–October 6	6
Removal of 16-inch steel pipe or H piles for construction trestle with vibratory driver	In water	Season 2, September 25–October 17	20

For the piles driven on land, peak SPLs exceeding the injury threshold are predicted to occur within less than 33 feet for the 16-inch-diameter steel pipe piles and the 16-inch-diameter steel H-piles (Table 4-11). Cumulative SELs exceeding the 183-dB and 187-dB injury thresholds are predicted to occur within a radius of 824 feet from the 16-inch steel pipe piles and 328 feet from the 16-inch steel H-piles, assuming an unimpeded propagation path. These potential impacts would occur over a period of approximately 2 days.

For the piles in water, peak SPLs exceeding the injury threshold are predicted to occur within 46 feet for the 16-inch-diameter steel pipe piles and less than 33 feet for the 16-inch-diameter steel H-piles (Table 4-11). The use of an attenuation device is expected to reduce these distances to 33 feet or less. Cumulative SELs exceeding the 183-dB and 187-dB injury thresholds are predicted to occur within a radius of 1,775 feet from the 16-inch steel pipe piles and 705 feet from the 16-inch steel H-piles, assuming an unimpeded propagation path. The use of an attenuation device is expected to reduce these distances for the respective piles by slightly more than 50 percent. These potential impacts could occur over a period of approximately 24 days.

Table 4-11. Distances to Injury and Behavioral Thresholds for Impact Driving of 16-Inch Steel Pipe or 16-Inch Steel H-Piles for the Temporary Construction Trestles

Pile Size/Type	Location	Number of Piles	Number of Piles per Day	Number of Strikes per Day	Distance to 206-dB Peak Criterion (feet)[a]	Distance to 187-dB Cumulative SEL Criterion (feet)[a]	Distance to 183-dB Cumulative SEL Criterion (feet)[a]	Distance to 150 dB RMS Criterion (feet)[a]
16-inch steel pipe	In water	234	10–20	16,000–32,000[b]	46 (<33)	1,775 (824)[c]	1,775 (824)[c]	9,610 (4,459)[d]
	On land	4	2–4	3,200–6,400[b]	<33	824[c]	824[c]	5,200[d]
16-inch steel H-pile	In water	234	10–20	16,000–32,000[b]	<33	705 (328)[c]	705 (328)[c]	3,281 (1,522)[d]
	On land	4	2–4	3,200–6,400[b]	<33	328[c]	328[c]	1,522

dB = decibels.
RMS = root mean square.
SEL = sound exposure level.

[a] Distances in parentheses are based on a 5-dB level of attenuation.

[b] Based on an estimate of 1,600 strikes per pile.

[c] Pile driving energy does not accumulate once the single strike SEL drops to 150 dB (i.e., “effective quiet”). The distance to the onset of physical injury therefore cannot extend beyond the distance to effective quiet. Once the daily number of strikes exceeds 5,000 strikes per day, the distance to the onset of injury does not increase. For this reason, the distances to the 183-dB and 187-dB thresholds are the same.

[d] Maximum distance limited to 6,000 feet upstream and 1,900 feet downstream of proposed bridge location due to the presence of river bends.

Noise levels exceeding the behavioral threshold of 150 dB RMS would theoretically extend thousands of feet from pile driving activities, assuming an unimpeded propagation path (Table 4-11). However, river bends located approximately 1,900 feet downstream and approximately 6,000 feet upstream of the pile driving activity likely would limit the extent of these noise levels. These potential impacts could occur over a period of 4 days.

Temporary Barge Piles

Four temporary construction barges would be used to facilitate bridge construction. Each barge would require four spud piles to be driven in the water to anchor the barge. One pile type is being considered: 16-inch diameter steel pipe piles. This assessment assumes that 4 to 16 piles would be installed on a single day, and each pile would require approximately 800 blows to install. Installation of the spud piles would occur during the first and second in-water construction seasons (May 1 to November 30) and would require approximately 1 week to complete (Appendix A, Figure 5). Table 4-12 shows the assumed installation rate and computed distances to the injury and behavioral thresholds for spud piles. The computed distances for the in-water piles are shown for both unattenuated and attenuated impact driving.

For spud piles in water, peak SPLs exceeding the injury threshold are predicted to occur within 46 feet (Table 4-12). The use of an attenuation device is expected to reduce this distance to 33 feet or less. Cumulative SELs exceeding the 183-dB and 187-dB injury thresholds are predicted to occur within a radius of 1,316 and 1,775 feet, respectively, from the pile, on the days one barge (four piles) is anchored, assuming an unimpeded propagation path. The use of an attenuation device is expected to reduce these distances by slightly more than 50 percent. If two or more barges (8 to 16 piles) are anchored in a single day, then cumulative SELs exceeding the 183-dB and 187-dB injury thresholds are predicted to occur within a radius of 1,775 feet from the pile, assuming an unimpeded propagation path. The use of an attenuation device is expected to reduce these distances by slightly more than 50 percent. These potential impacts could occur on 1 or more days throughout each construction season as the barges are periodically repositioned to support construction activities.

Noise levels exceeding the behavioral threshold of 150 dB RMS theoretically would extend thousands of feet from pile driving activities, assuming an unimpeded propagation path, regardless of whether one or more barges are anchored on the same day (Table 4-12). However, river bends located approximately 1,900 feet downstream and approximately 6,000 feet upstream of the pile driving activity likely would limit the extent of these noise levels. These potential impacts could occur on 1 or more days throughout each construction season as the barges are periodically repositioned to support construction activities.

Table 4-12. Distances to Injury and Behavioral Thresholds for Impact Driving of 16-Inch Steel Pipe Piles for the Temporary Construction Barges

Pile Size/Type	Location	Number of Piles	Number of Piles Per Day	Number of Strikes Per Day	Distance to 206-dB Peak Criterion (feet)[a]	Distance to 187-dB Cumulative SEL Criterion (feet)[a]	Distance to 183-dB Cumulative SEL Criterion (feet)[a]	Distance to 150-dB RMS Criterion (feet)[a]
16-inch steel pipe	In water	4	4	3,200[b]	46 (<33)	1,316 (610)	1,775 (824)	9,610 (4,459)[d]
16-inch steel pipe	In water	8	8	6,400[b]	46 (<33)	1,775 (824)[c]	1,775 (824)[c]	9,610 (4,459)[d]
16-inch steel pipe	In water	12	12	9,600[b]	46 (<33)	1,775 (824)[c]	1,775 (824)[c]	9,610 (4,459)[d]
16-inch steel pipe	In water	16	16	12,800[b]	46 (<33)	1,775 (824)[c]	1,775 (824)[c]	9,610 (4,459)[d]

[a] Distances in parentheses are based on a 5-dB level of attenuation.

[b] Based on an estimate of 800 strikes per pile.

[c] Pile driving energy does not accumulate once the single strike SEL drops to 150 dB (i.e., effective quiet). The distance to the onset of physical injury therefore cannot extend beyond the distance to effective quiet. Once the daily number of strikes exceeds 5,000 strikes per day, the distance to the onset of injury does not increase. For this reason, the distances to the 183 dB and 187 dB thresholds are the same.

[d] Maximum distance limited to 6,000 feet upstream and 1,900 feet downstream of proposed bridge location due to the presence of river bends.

Permanent Bridge Piles

Two pile types are being considered for each of the three bridge types (i.e., bascule, vertical lift, swing): 60-inch-diameter CISS piles for the movable span (i.e., piers 2 and 3) and 16-inch-diameter steel pipe piles for the in-water piers (i.e., piers 4 and 5) and the two in-levee abutments (abutments 1 and 6). The only difference would be the number of piles that would be installed for each of the three bridge types. This assessment assumes that the bascule bridge would require 12 60-inch CISS piles, the vertical lift bridge would require 6 to 8 60-inch CISS piles, and the swing bridge would require 18 60-inch CISS piles. It also was assumed that from two to four piles would be driven per day and that each pile would require approximately 1,500 blows to install. For the 16-inch steel pipe piles, 20 piles would be required for the in-water piers for the swing bridge and 40 piles would be required for the in-water piers for both the bascule and vertical lift bridges. All three bridge types would require 40 16-inch steel pipe piles for the in-levee abutments. Table 4-12 shows the assumed installation rate and computed distances to the injury and behavioral thresholds for each pile type and location for the three bridge types. The computed distances for the in-water piles are shown for both unattenuated and attenuated impact driving.

60-Inch CISS Piles for Piers 2 and 3. For the 60-inch CISS piles, peak SPLs exceeding the injury threshold are predicted to occur within 59 feet (Table 4-13). The use of an attenuation device is expected to reduce this distance to 33 feet or less. Cumulative SELs exceeding the 183-dB and 187-dB injury thresholds are predicted to occur within a radius of 7,067 feet, assuming an unimpeded propagation path. The use of an attenuation device is expected to reduce this distance by more than 50 percent.

Noise levels exceeding the behavioral threshold of 150 dB RMS would theoretically extend 33,000 feet from pile driving activities, assuming an unimpeded propagation path (Table 4-13). The use of an attenuation device is expected to reduce this distance by approximately 50 percent. River bends located approximately 1,900 feet downstream and approximately 6,000 feet upstream of the proposed location of pile driving activity would likely limit the extent of these noise levels.

Although the distances to injury and behavioral thresholds would be the same for the movable span for all three bridge types, potential impacts on fish associated with piers 2 and 3 would vary by bridge type because of the different number of piles required to construct the fixed spans of each of these three bridge types. For example, potential impacts on fish during construction of the fixed spans would occur over a period of approximately 6 days for the bascule bridge, approximately 4 days for the vertical lift bridge, and approximately 9 days for the swing bridge.

Table 4-13. Distances to Injury and Behavioral Thresholds for Impact Driving of 60-Inch CISS and 16-Inch Steel Pipe Piles for a Bascule, Vertical Lift, and Swing Bridge

Pile Size/Type	Location	Number of Piles (Bridge Type)	Number of Piles Per Day	Number of Strikes Per Day	Distance to 206-dB Peak Criteria (feet)[a]	Distance to 187-dB Cumulative SEL Criteria (feet)[a]	Distance to 183-dB Cumulative SEL Criteria (feet)[a]	Distance to 150-dB RMS Criteria (feet)[a]
60-inch CISS	In water (piers 2 and 3)	12 (Bascule)	2–4	3,000–6,000[b]	59 (<33)	7,067 (3,000)[c]	7,067 (3,000)[c]	33,000 (15,230)[d]
		6–8 (Vertical Lift)						
		18 (Swing)						
16-inch steel pipe	In water (piers 4 and 5)	40 (Bascule)	4–8	6,400–12,800[e]	46 (<33)	1,775 (824)[c]	1,775 (824)[c]	9,610 (4,459)[d]
		40 (Vertical Lift)						
		20 (Swing)						
16-inch steel pipe	On land (Abutments 1 and 6	40 (All)	4–8	6,400–12,800[e]	<33	824[c]	824[c]	5,200[d]

[a] Distances in parentheses are based on a 5-dB level of attenuation.

[b] Based on an estimate of 1,500 strikes per pile.

[c] Pile driving energy does not accumulate once the single strike SEL drops to 150 dB (i.e., effective quiet). The distance to the onset of physical injury therefore cannot extend beyond the distance to effective quiet. Once the daily number of strikes exceeds 5,000 strikes per day, the distance to the onset of injury does not increase. For this reason, the distances to the 183-dB and 187-dB thresholds are the same.,

[d] Maximum distance limited to 6,000 feet upstream and 1,900 feet downstream of proposed bridge location due to the presence of river bends.

[e] Based on an estimate of 1,600 strikes per pile.

16-Inch Steel Pipe Piles for Piers 4 and 5. For the 16-inch steel pipe piles in water, peak SPLs exceeding the injury threshold are predicted to occur within 46 feet from pile driving activities (Table 4-13). The use of an attenuation device is expected to reduce this distance to 20 feet or less. Cumulative SELs exceeding the 183-dB and 187-dB injury thresholds are predicted to occur within a radius of 1,775 feet, assuming an unimpeded propagation path. The use of an attenuation device is expected to reduce this distance by more than 50 percent.

Noise levels exceeding the behavioral threshold of 150 dB RMS would extend 446 feet from pile driving activities (Table 4-13). The use of an attenuation device is expected to reduce this distance by slightly more than 50 percent.

Although the distances to injury and behavioral thresholds would be the same for all three bridge types, potential impacts on fish associated with piers 4 and 5 would vary by bridge type because of the different number of piles required to construct each bridge type. Potential impacts could occur over a period of 10 days for the bascule and vertical lift bridge types, and 5 days for the swing bridge type.

16-Inch Steel Pipe Piles for Abutments 1 and 6. For the 16-inch steel pipe piles on land, peak SPLs exceeding the injury threshold are predicted to occur within a radius of 10 feet from pile driving activities (Table 4-13). Cumulative SELs exceeding the 183-dB and 187-dB injury thresholds are predicted to occur within a radius of 824 feet, assuming an unimpeded propagation path.

Noise levels exceeding the behavioral threshold of 150 dB RMS would extend 5,200 feet from pile driving activities, assuming an unimpeded propagation path (Table 4-13). River bends located approximately 1,900 feet downstream and approximately 6,000 feet upstream of the proposed location of pile driving activity likely would limit the extent of these noise levels.

The distances to injury and behavioral thresholds associated with abutments 1 and 6 would be the same for all three bridge types because the same number of piles would be required to construct all of the three bridge types. Potential impacts could occur over a period of 10 days for all three bridge types.

Bridge Fender Piles

Two pile types are being considered for the bridge fender system: 14-inch-square concrete piles and 16-inch-diameter steel pipe piles. The only difference between the two approaches is the size and type of pile material; the same number of piles would be installed regardless of the type of pile used.

For the 14-inch-square concrete piles in water, peak SPLs exceeding the injury threshold are predicted to occur within a radius of 46 feet from pile driving activities (Table 4-14). The use of an attenuation device is expected to reduce this distance to 33 feet or less. Cumulative SELs exceeding the 183-dB and 187-dB injury thresholds are predicted to occur within a radius of 384 feet, assuming an unimpeded propagation path. The use of an attenuation device is expected to reduce this distance by approximately 50 percent. These potential impacts could occur over a period of 6 days.

Table 4-14. Distances to Injury and Behavioral Thresholds for Impact Driving of 14-Inch-Square Concrete or 16-Inch-Diameter Steel Pipe Piles for the Bridge Fender System

Pile Size/Type	Location	Number of Piles	Number of Piles Per Day	Number of Strikes Per Day	Distance to 206-dB Peak Criterion (feet)[a]	Distance to 187-dB Cumulative SEL Criterion (feet)[a]	Distance to 183-dB Cumulative SEL Criterion (feet)[a]	Distance to 150-dB RMS Criterion (feet)[a]
14-inch-square concrete	In water	60	10–20	10,000–20,000[b]	46 (<33)	384 (177)[c]	384 (177)[c]	1,775 (824)[d]
16-inch-diameter steel pipe	In water	60	10–20	10,000–20,000[b]	46 (<33)	1,775 (824)[c]	1,775 (824)[c]	9,610 (4,459)[d]

[a] Distances in parentheses are based on a 5-dB level of attenuation.

[b] Based on an estimate of 1,000 strikes per pile.

[c] Pile driving energy does not accumulate once the single strike SEL drops to 150 dB (i.e., effective quiet). The distance to the onset of physical injury therefore cannot extend beyond the distance to effective quiet. Once the daily number of strikes exceeds 5,000 strikes per day, the distance to the onset of injury does not increase. For this reason, the distances to the 183-dB and 187-dB thresholds are the same.

[d] Maximum distance limited to 6,000 feet upstream and 1,900 feet downstream of proposed bridge location due to the presence of river bends.

Noise levels exceeding the behavioral threshold of 150 dB RMS would extend 1,775 feet from pile driving activities, assuming an unimpeded propagation path (Table 4-14). The use of an attenuation device is expected to reduce this distance by slightly more than 50 percent.

For the 16-inch steel pipe piles in water, peak SPLs exceeding the injury threshold are predicted to occur within a radius of 46 feet from pile driving activities (Table 4-14). The use of an attenuation device is expected to reduce this distance to 33 feet or less. Cumulative SELs exceeding the 183-dB and 187-dB injury thresholds are predicted to occur within a radius of 1,775 feet, assuming an unimpeded propagation path. The use of an attenuation device is expected to reduce this distance by slightly more than 50 percent. These potential impacts could occur over a period of 6 days.

Noise levels exceeding the behavioral threshold of 150 dB RMS would extend 9,610 feet from pile driving activities (Table 4-14). The use of an attenuation device is expected to reduce this distance by slightly more than 50 percent. River bends located approximately 1,900 feet downstream and approximately 6,000 feet upstream of the proposed location of pile driving activity likely would limit the extent of these noise levels.

Sheet Piles for Temporary Cofferdams

Two cofferdams would be installed to construct piers 4 and 5 (Appendix A, Figure 8). The sheet piles for the cofferdams would be installed and removed with a vibratory pile driver; this method of installation and removal would not generate high underwater noise levels that result in injury to fish. Vibratory pile driving is a preferred method for minimizing the exposure of fish to potentially harmful pile driving sounds (National Marine Fisheries Service 2009b). The sheet piles for the two cofferdams would be installed over a 2-week period in late May and early June of the first construction season (Appendix A, Figure 5).

Summary of Effects and Proposed Minimization Measures

Based on hydroacoustic measurements from similar types of pile driving operations, underwater noise produced by impact pile driving is expected periodically to reach levels in the Sacramento River that exceed the injury and behavioral thresholds for fish. Although underwater noise levels exceeding the injury thresholds would be limited to the proposed in-water construction season (May 1 to November 30), small proportions of adult and juvenile salmonids that may be migrating or rearing in the BSA after May 1 may be adversely affected (impacts on specific species/races are described below). The potential for injury would occur over an estimated 50-day period during installation of the temporary trestle piles and permanent bridge piles (from approximately May 1 to August 15 in the first year of construction) and during an estimated 6-day period during installation of the bridge fender piles (from late September to early October in the second year of construction). In addition, the potential for injury would occur periodically during installation of the temporary barge spud piles (from May 1 to November 30 in the first and second in-water construction seasons).

The potential for behavioral effects would occur during the same periods described above for noise levels exceeding the injury thresholds in the first and second in-water construction seasons. Noise levels exceeding the behavioral threshold of 150 dB RMS potentially would extend much

farther from the source than would noise levels exceeding the injury thresholds, although river bends located approximately 1,900 feet downstream and approximately 6,000 feet upstream of the proposed location of pile driving activity likely would limit the extent of these noise levels and associated behavioral effects. Species-specific effects related to pile driving noise are described below.

Winter-Run Chinook Salmon. Impact pile driving for the temporary trestles and the permanent bridge piles in the first in-water construction season is not expected to expose juvenile or adult winter-run Chinook salmon to underwater sound levels that exceed the injury and behavioral thresholds for fish because pile driving would occur when juvenile winter-run Chinook salmon are not expected to be present in the BSA (Tables 4-2 and 4-3). However, impact driving of any spud piles for the temporary barges in October or November in either in-water construction season and impact driving of the bridge fender piles in early October in the second in-water construction season would overlap the beginning of the juvenile and adult winter-run Chinook salmon migration season, thereby exposing a portion of the juvenile winter-run Chinook salmon migrating in the Sacramento River during these months to underwater sound levels that exceed the injury and behavioral thresholds for fish. Adults would be expected to tolerate higher sound pressures than the levels associated with the onset of injury in smaller fish, such as juveniles. At a minimum, any adults or juveniles encountering pile driving noise may exhibit some form of behavioral response, including an avoidance response that could disrupt or delay their movement or feeding. Evidence suggests that some fish species avoid or disperse from areas subject to pile driving and other human-generated noises (Popper and Hastings 2009).

Spring-Run Chinook Salmon. Impact pile driving for the temporary trestles and the permanent bridge piles in the first in-water construction season would overlap the end of the juvenile migration season, thereby exposing a portion of the juvenile spring-run Chinook salmon migrating in the Sacramento River in May and June to underwater sound levels that exceed the injury and behavioral thresholds for fish (Table 4-4). Similarly, impact pile driving for the temporary trestles and the permanent bridge piles in the first in-water construction season would overlap the latter half of the adult migration season. Any impact driving of spud piles for the temporary barges in October or November in either construction season and impact driving of the bridge fender piles in late September and early October in the second in-water construction season would not be expected to expose juvenile or adult spring-run Chinook salmon to underwater sound levels that exceed the injury and behavioral thresholds for fish because pile driving would occur when juvenile and adult spring-run Chinook salmon are not expected to be present in the BSA (Tables 4-3 and 4-4).

Fall-Run Chinook Salmon. Impact pile driving for the temporary trestles and the permanent bridge piles in the first in-water construction season would overlap the latter few months of the juvenile migration season and the beginning of the adult migration season, thereby potentially exposing juvenile and adult fall-run Chinook salmon migrating in the Sacramento River from May to August and from June to August, respectively, to underwater sound levels that exceed the injury and behavioral thresholds for fish (Tables 4-3 and 4-5). Any impact driving of spud piles for the temporary barges in October or November in either construction season and impact driving of the bridge fender piles in late September and early October in the second in-water construction season would not be expected to expose juvenile fall-run Chinook salmon to underwater sound levels that exceed the injury and behavioral thresholds for fish because pile

driving would occur when juvenile fall-run Chinook salmon are not expected to be present in the BSA (Table 4-5). However, impact driving of spud and fender piles during this timeframe would expose adults to these underwater sound levels (Table 4-3).

Late Fall–Run Chinook Salmon. Impact pile driving for the temporary trestles and the permanent bridge piles in the first in-water construction season would overlap the beginning of the juvenile migration season, thereby avoiding exposing most juvenile late fall–run Chinook salmon in the Sacramento River to underwater sound levels that exceed the injury and behavioral thresholds for fish (Table 4-6). However, impact driving of any spud piles for the temporary barges in October or November in either construction season and impact driving of the bridge fender piles in late September and early October in the second in-water construction season would expose a small proportion of juvenile and adult late fall–run Chinook salmon in the Sacramento River to underwater sound levels that exceed the injury and behavioral thresholds for fish (Tables 4-3 and 4-6).

Steelhead. Impact pile driving for the temporary trestles and the permanent bridge piles in the first in-water construction season would overlap the end of the juvenile and kelt (post-spawning adult) migration season, thereby exposing a portion of the juvenile steelhead migrating in the Sacramento River in May and June and adult kelts migrating in the Sacramento River in May to underwater sound levels that exceed the injury and behavioral thresholds for fish (Tables 4-3 and 4-7). Any impact driving of spud piles for the temporary barges in October or November in either construction season and impact driving of the bridge fender piles in late September and early October in the second in-water construction season would be unlikely to expose a significant number of juvenile steelhead to underwater sound levels that exceed the injury and behavioral thresholds for fish because pile driving would occur when juvenile steelhead are expected to be least abundant in the BSA (Table 4-7). However, these activities would occur during the peak upstream migration season for adults (Table 4-3).

Fish Entrapment in Cofferdams

Cofferdams would be required in order to construct piers 4 and 5 for the new bridge. Cofferdams would be constructed of sheet piles; when installed, each cofferdam would be approximately 35 feet wide and 95 feet long. The potential exists for entrapment and mortality of fish following cofferdam closure and dewatering. The proposed timing of cofferdam installation (late May to early June) would avoid the primary period of occurrence of juvenile Chinook salmon and steelhead in the Sacramento River; however, the potential would remain for some juvenile salmonids to become entrapped in the cofferdams.

Direct Physical Injury

During construction of the new bridge, fish could be injured or killed by direct contact with equipment or materials that enter or operate within the open waters of the Sacramento River. Potential mechanisms include fish being crushed by falling rock (riprap), impinged by piles, or struck by propellers related to barge operations. Restriction of in-water activities to May 1 to November 30 would avoid the primary migration and rearing periods of anadromous salmonids in the Sacramento River. Based on the general timing of migration of adult and juvenile salmonids in the BSA, the potential for exposure for most life stages would occur in May to mid-

August, October, and November when in-water activities with the greatest potential to cause direct physical injury would occur. However, most Chinook salmon and steelhead that are likely to be present in the BSA during in-water construction activities are likely to be large, migrating adults and juveniles that would be expected to avoid or move away from active construction areas.

Transporting of the four barges also would increase the frequency of wave-induced shoreline disturbances, which could adversely affect rearing juvenile salmonids that depend on shallow nearshore areas for resting, feeding, and protection from predators. The estimated total of eight barge-trips per season (four in May as the barges are brought to the work site and four in November as the barges are removed from the work site at the end of the construction season) and periodic repositioning of the barges during the in-water construction season suggest that any increases in injury, harassment, or mortality of listed salmonids would be expected to be small.

Water Quality Impacts

Erosion and Mobilization of Sediment

Site clearing, earthwork, driving of permanent piles, driving and removal of piles for the temporary trestles and barges, vibrating and removal of sheet piles for cofferdams, and installation of RSP would result in disturbance of soil and riverbed sediments, potentially resulting in temporary increases in turbidity and suspended sediments in the Sacramento River. In addition, dewatering and soil removal from the inside of the cofferdams could result in temporary increases in turbidity and suspended sediments in the river, if water (and associated spoils) from within the cofferdams is not properly disposed of or contained and treated before being discharged back to the river.

The potential for disturbance of riverbed sediments and associated increases in sedimentation and turbidity in the Sacramento River are anticipated to be greatest during activities to extract the piles used for the temporary trestles and cofferdams. These activities would result in greater disturbance to riverbed sediments than during pile driving for piers and the bridge fender system; these piles would be driven only and not extracted.

In addition to increasing exposure to contaminants (described below), elevated levels of suspended sediments have the potential to result in physiological, behavioral, and habitat effects related to increased sediment concentrations in the water column. The severity of these effects depends on the sediment concentration, duration of exposure, and sensitivity of the affected life stage. Short-term increases in turbidity and suspended sediment may disrupt normal behavior patterns of fish, potentially affecting foraging, rearing, and migration. The level of disturbance also may cause juveniles to abandon protective habitat or reduce their ability to detect predators, potentially increasing their vulnerability to predators (e.g., striped bass and largemouth bass). Previous studies have documented these effects. For example, juvenile salmonids have been observed to avoid streams that are chronically turbid (Lloyd et al. 1987) or move laterally or downstream to avoid turbidity plumes (Sigler et al. 1984). Bisson and Bilby (1982) reported that juvenile coho salmon avoid turbidities exceeding 70 nephelometric turbidity units (NTUs). Chronic exposure to high turbidity and suspended sediment may affect growth and survival by impairing respiratory function, reducing tolerance to disease and contaminants, and causing

physiological stress (Waters 1995). Sigler et al. (1984) found that prolonged exposure to turbidities between 25 and 50 NTUs resulted in reduced growth and increased emigration rates of juvenile coho salmon and steelhead compared to controls. Increased sediment delivery also can smother aquatic invertebrates (a fish food item), degrade forage habitat, and reduce cover for juvenile fish.

Increased Exposure to Contaminants

Disturbance and resuspension of river bottom sediments during in-water construction pose a risk to juvenile and adult winter-run Chinook salmon because of potential increases in the exposure to contaminated sediments.

Sand, silt, and gravel characterize bottom substrate in the BSA. Non-soluble contaminants with a tendency to adsorb to sediments (as opposed to soluble contaminants, which have a tendency to be readily diluted in water) can accumulate in the substrate over time. Non-soluble contaminants that are known to be present in the Sacramento River include polychlorinated biphenyls (PCBs), mercury, pesticides and insecticides (i.e., dieldrin, chlorodane, DDT), and other unknown toxicities (State Water Resources Control Board 2011). Resuspension of sediments with adsorbed metals during in-water construction potentially could lead to degradation of water quality and food resources in the BSA. In addition, resuspended particulate material could be transported to other locations in the Sacramento River as a result of transport by river currents, thus leading to potential degradation of water quality and food resources beyond the BSA. Although salmonids may be present in the BSA during any month, restricting in-water construction to the May 1 to November 30 window would minimize or avoid exposure of most juvenile and adult Chinook salmon and steelhead to contaminants because they occur less frequently in the Sacramento River during this time of year (Tables 4-2 through 4-7).

In-water construction would be limited to pile driving, installation and removal of sheet piles for cofferdams, and placement of RSP. These activities would be limited to daylight hours each day. Thus, disturbance of channel substrate and the potential for increased contaminants would be temporary (up to 12 hours each day) and localized. Assuming that mobilization of sediment is also an indication of contaminant mobilization, the proposed in-water construction methods should minimize the increase in contaminants.

Given the relatively short exposure time and the restricted area of in-water construction relative to the distribution and temporal occurrence of adult and juvenile salmonids between May 1 and November 30, the effect of contaminants mobilized by in-water construction is not expected to significantly affect the survival or growth of adult or juvenile salmonids.

Contaminant Spills

Construction activities that occur in or near the Sacramento River channel can result in the discharge of contaminants that are potentially lethal to fish. The operation of heavy equipment, cranes, pile drivers, drilling rigs, barges, and other construction equipment during vegetation removal, excavation, and bridge construction could result in spills and leakage of fuel, lubricants, hydraulic fluids, and coolants. Other sources of potential contamination include asphalt, wet concrete, and other materials that may come into direct contact with surface water during

construction activities. For example, concrete that is being poured for the bridge decking could be discharged accidentally to the river, thereby contaminating the river with uncured concrete (which can raise pH) and related compounds.

The potential magnitude of biological effects resulting from contaminants depends on a number of factors, including the proximity of spills to the river; the type, volume, concentration, and solubility of the contaminant; and the timing and duration of the spill or release of the contaminant into the water column. Contaminants can affect the survival, growth, and reproductive success of fish and other aquatic organisms. The level of effect depends on the species, life stage sensitivity, duration of exposure, condition or health of exposed individuals, and the physical and chemical properties of the water (e.g., temperature, pH, dissolved oxygen, and other factors).

Temporary Disturbance to and Permanent Loss of Aquatic Habitat

The proposed project would result in the temporary disturbance to and permanent loss of aquatic habitat area and volume, including foraging and rearing habitat for juvenile Chinook salmon and steelhead. Table 4-15 shows the temporary and permanent loss of aquatic habitat that would result from constructing the proposed project.

Installation of sheet pile cofferdams to isolate the in-water construction areas for piers 4 and 5 from the water column during pier construction would result in temporary disturbance of aquatic habitat (substrate and water column) equal to the enclosed area and volume of the in-water cofferdams. The proposed dimensions of each cofferdam are 35 feet by 95 feet, or 3,325 square feet. Together, the two cofferdams would result in temporary disturbance of 6,650 square feet (0.15 acre) of substrate habitat and up to 325,850 cubic feet of water column habitat below the OHWM (based on a water surface elevation of +19 feet). The temporary cofferdams would remain in place for 2 months in the first in-water construction season. Similarly, installation of piles for the temporary trestles would result in temporary disturbance to substrate and water column habitat equal to the total area and volume of the in-water piles used to support the temporary trestles. The temporary trestle piles would remain in place throughout the duration of construction, although the work platforms would be removed at the end of the first in-water construction season before the onset of winter. A total of approximately 234 16-inch-diameter pipe or H piles that would be installed below the OHWM to support the temporary trestles would result in temporary disturbance to 327 square feet (0.007 acre) of substrate habitat and up to 16,023 cubic feet of water column habitat below the OHWM. (Four of the 238 piles for the temporary trestles would be installed above the OHWM.) Similarly, a total of 16 16-inch-diameter pipe or H piles would be installed in the wetted channel to anchor the temporary barges, resulting in temporary disturbance to 22 square feet (0.0005 acre) of substrate habitat and up to 1,078 cubic feet of water column habitat below the OHWM. Together, this would result in total temporary disturbance to 6,999 square feet (0.16 acre) of substrate habitat and 342,951 cubic feet of water column habitat below the OHWM.

Installation of the new bridge piers (piers 2 through 5) and piles for the new bridge fender system would result in permanent loss of aquatic habitat (substrate and water column) equal to the cumulative area (substrate) and volume (water column) of the in-water piers and bridge fender piles. Two 75-foot-wide by 95-foot-long piers (piers 2 and 3) that would be installed in the river

to support the movable span of the new bridge (bascule bridge) would result in a permanent loss of up to 13,500 square feet (0.31 acre) of substrate habitat and up to 661,500 cubic feet of water column habitat below the OHWM. The footprint of piers 2 and 3 for the vertical lift and swing bridge types would be less. Similarly, two piers (piers 4 and 5) that would be installed in the river to support the fixed spans of the new bridge would result in a permanent loss of 360 square feet (0.01 acre) of substrate habitat and up to 17,640 cubic feet of water column habitat below the OHWM.

Placement of rock revetment (riprap) on the waterside slope of the new bridge abutments below the OHWM also would result in permanent loss of natural substrate habitat equal to the net increase in area of rock revetment. Up to 824 linear feet of shoreline (398 linear feet on the City of Sacramento shoreline and 426 linear feet on the City of West Sacramento shoreline), covering up to 24,126 square feet (0.55 acre) of the bank below the OHWM, would be lined with RSP (assumed 1/4-ton stone weight, machine positioned [Method B]). A total of 2,949 cubic yards of RSP would be placed below the OHWM, and a total of 4,216 cubic yards would be placed above the OHWM. The RSP above and below the OHWM would cover a total of 58,622 square feet (1.35 acre).

Table 4-15. Amount of Temporarily and Permanently Affected Aquatic Habitat in the Sacramento River

Feature/Habitat	Temporary Impact		Permanent Impact	
	Alternative B	Alternative C	Alternative B	Alternative C
Temporary Cofferdams				
Substrate area (square feet [acre])	6,650 (0.15)	9,000 (0.21)	NA	NA
Water column volume (cubic feet)	325,850	441,000	NA	NA
Temporary Trestle Piles				
Substrate area (square feet [acre])	327 (0.007)	327 (0.007)	NA	NA
Water column volume (cubic feet)	16,023	16,023	NA	NA
Temporary Barge Spud Piles				
Substrate area (square feet [acre])	22 (0.0005)	22 (0.0005)	NA	NA
Water column volume (cubic feet)	1,078	1,078	NA	NA
Piers 2 and 3				
Substrate area (square feet [acre])	NA	NA	13,500 (0.31)[a]	13,500 (0.31)[a]
Water column volume (cubic feet)	NA	NA	661,500[a]	661,500[a]
Piers 4 and 5				
Substrate area (square feet [acre])	NA	NA	360 (0.01)	360 (0.01)
Water column volume (cubic feet)	NA	NA	17,640	17,640
Piles for Bridge Fender System				
Substrate area (square feet [acre])	NA	NA	84 (0.002)	84 (0.002)
Water column volume (cubic feet)	NA	NA	4,106	4,106
Shoreline Rock Revetment (RSP)				
Substrate area (square feet [acre])	NA	NA	24,126 (0.55)	19,431 (0.45)
Total				
Substrate area (square feet [acre])	6,999 (0.16)	9,349 (0.21)	38,070 (0.87)	33,375
Water column volume (cubic feet)	342,951	458,101	683,246	683,246

NA = not applicable.
RSP = rock slope protection.
[a] Assumes bascule bridge type (worst-case scenario).

Installation of these features may result in direct and indirect effects by inhibiting establishment of riparian vegetation; inhibiting recruitment and retention of sediment and woody debris; and eliminating shallow, low-velocity river margins preferred by juvenile fish.

Compensation for impacts on critical habitat, as described below, would offset the effects of permanent impacts on the substrate and water column resulting from construction of the new bridge piers and installation of RSP.

Temporary and Permanent Loss of Riparian Vegetation (Including SRA Cover)

Clearing of the existing cottonwood riparian forest vegetation within the proposed project footprint would result in permanent loss of up to 1.273 acres and temporary disturbance to up to 0.625 acre of cottonwood riparian forest within the BSA, of which approximately 0.368 acre is below the OHWM and contributes to overhead (shade) and instream SRA cover (see additional discussion below regarding SRA cover). The permanent loss of existing cottonwood forest would result from activities related to construction of the two fixed-span bridge approach structures and the bikeways that would pass under the east end of the bridge structure in the City of Sacramento and the west end of the bridge structure in the City of West Sacramento (Appendix A, Figure 8). The temporary disturbance to cottonwood riparian forest would occur from trimming riparian vegetation and removing additional trees and understory vegetation to provide equipment access. Portions of this affected riparian forest also provide SRA cover habitat that is an important component of anadromous fish habitat (see additional discussion below). Clearing of the existing cottonwood riparian forest that contributes to SRA cover would result in temporary disturbance to up to 330 linear feet and permanent loss of up to 302 linear feet of overhead SRA cover (shade) along the summer (low-flow) shoreline of the Sacramento River (Table 4-16).

Table 4-16. Temporary and Permanent Impacts on Overhead SRA Cover Vegetation in the Biological Study Area

Location	Shaded River Aquatic Cover			
	Temporary Disturbance (feet)		Permanent Loss (feet)	
	Alternative B	Alternative C	Alternative B	Alternative C
West riverbank	90	297	125	224
East riverbank	240	290	177	275
Total	**330**	**587**	**302**	**499**

SRA = shaded riverine aquatic.

Riparian vegetation is important in controlling stream bank erosion, contributing to instream structural diversity, and maintaining undercut banks in the absence of RSP. In addition, canopy cover (overhanging vegetation [a form of SRA cover]) maintains shade that is necessary to reduce thermal input and provides an energy input to the aquatic habitats in the form of fallen leaves and insects (a food source for fish). SRA cover also provides fish with protection from predators in the form of undercut banks and instream woody material in the form of submerged branches, roots, and logs.

Without appropriate mitigation, removal of streamside vegetation is likely to adversely affect anadromous salmonids and other fish species because riparian and SRA cover habitats are

essential components of salmonid rearing habitat that may limit the production and abundance of salmonids in the Sacramento River. Salmonid populations are highly influenced by the amount of available cover (Raleigh et al. 1984). The amount of existing riparian and SRA cover habitat in the BSA and in the region is of variable quality because of past and ongoing impacts, including levee construction and bank protection activities (i.e., placement of rock revetment).

USFWS mitigation policy identifies California's riparian habitats, including SRA cover habitat, as a Resource Category 2 habitat. The designation criteria for habitat in Resource Category 2 is "habitat to be impacted is of high quality for evaluation species and is relatively scarce or becoming scarce on a national basis or in the ecoregion section" (U.S. Fish and Wildlife Service 2015), for which "no net loss of in-kind habitat value" is recommended (46 FR 7644, January 23, 1981). In addition, NMFS typically recommends revegetating onsite at a 3:1 ratio (three units replaced for every one unit of affected habitat) with native riparian species to facilitate the development of SRA cover habitat.

Indirect Impacts

Increases in Impervious Surface Area and Storm Water Runoff

The proposed project would result in 2 acres of added impervious surface area which could increase runoff volume to the Sacramento River. Increased traffic loads on the new bridge resulting from improved access could result in increased deposition of particulates onto the bridge deck that then could be transported to the Sacramento River with road runoff.

Heavy metals, oil, grease, and polycyclic aromatic hydrocarbons (PAHs) are common pollutants in road runoff. Some of these pollutants can accumulate in stream sediments, with lethal and sublethal consequences for fish and other aquatic species—particularly during "first flush" rain events. PAHs are organic compounds—containing only carbon and hydrogen—that occur in motor vehicle exhaust, petroleum products, materials associated with asphalt, and various other municipal and industrial sources. PAHs are widely distributed in the environment and are important environmental pollutants because of their carcinogenicity and tendency to bioaccumulate. PAHs are readily absorbed by fish and other aquatic organisms and, depending on concentration, can lead to lethal and deleterious sublethal effects in these organisms (Tuvikene 1995). PAHs tend to adsorb to any particulate matter, including fine sediment; therefore, relative concentrations of PAHs in aquatic ecosystems generally are highest in sediments, followed by aquatic biota and the water column (Tuvikene 1995). There is evidence that urban runoff containing roadway sediment may be an important PAH input to aquatic habitats and that a significant contribution to the PAH content of roadway sediment comes from materials associated with asphalt (Wakeham et al. 1980).

Although the new bridge and roadway modifications would add impervious surface area, the proposed project would not substantially increase impervious surface area in the watershed, relative to existing conditions. Furthermore, the purpose of the new bridge is to improve the connectivity across the river, thereby reducing the trip lengths currently required to cross the river via one of the other three bridges in the project vicinity (i.e., Pioneer, Tower, I Street). However, it is anticipated that the new bridge would result in some added vehicle trips across the river because of the increased convenience the new bridge would offer, thereby potentially

increasing the pollutant load that currently is delivered to the river. Because the added vehicle trips are not anticipated to substantially increase the amount of pollutants, the proposed project is not anticipated to contribute to a cumulative water quality impact during operations.

Increase in Overwater Structure (Artificial Shade)

Overwater structures can alter underwater light conditions and provide potential holding conditions for juvenile and adult fish, including species that prey on juvenile fishes. Temporary shading attributable to the presence of the temporary trestles, work platforms, and barges during bridge construction and permanent shading from the new bridge potentially could reduce the primary productivity of affected habitats. Temporary shading also could increase the number of predatory fishes (e.g., striped bass, largemouth bass) holding in the BSA or their ability to prey on juvenile fishes. Because the temporary trestles, work platforms, and barges would be present only during construction, the effects of trestle, work platform, and barge shading would be temporary and localized.

Barge shading would occur only during the in-water construction season (May 1 to November 30) as the temporary barges would be removed at the end of the first construction season before the onset of winter. Four barges, each approximately 60 feet wide and 150 feet long (9,000 square feet [0.21 acre]), would be present during construction and would provide a total of 36,000 square feet (0.83acre) of temporary over-water structure (Table 4-17). Because the barges would be present only during construction and moved periodically as construction of the bridge progresses, effects of barge shading would be temporary and localized.

Shading by the temporary work platforms would occur only during the in-water construction season (May 1 to November 30) as the temporary work platforms would be removed at the end of the first construction season before the onset of winter (the temporary trestle piles could remain in place). Two trestles, approximately 22 feet wide and varying in length and configuration (Appendix A, Figure 8), would be present during construction and would provide a total of approximately 33,500 square feet (0.77 acre) of temporary over-water structure (Table 4-17). Because the trestles and work platforms would be present only during construction, effects of temporary work platform shading would be temporary and localized. Together, the barges and temporary work platforms would create up to 69,500 square feet (1.60 acres) of temporary overwater structure (i.e., shade) (Table 4-17).

The new bridge would create approximately 56,000 square feet (1.29 acres) of permanent over-water structure where no over-water structure currently exists. The increased shading created by the new bridge could affect the migration of adult and juvenile Chinook salmon and steelhead, and other species. In the Sammamish River in Washington State, migrating adult salmon hold in shaded areas beneath bridges (Carrasquero 2001). Juvenile salmonids also prefer shaded areas created by bridges, which may make them more vulnerable to predatory fish (e.g., striped bass, Sacramento pikeminnow, and largemouth bass) that also prefer structural and overhead cover (e.g., artificial shade) for ambushing prey. Because of the height of the new bridge over the water, ambient light levels generally would be expected to penetrate into the water, thereby minimizing the effect of bridge shading on aquatic habitats in the Sacramento River.

Table 4-17. Amount of Artificial Overwater Structure (Shade) Created on the Sacramento River in the Biological Study Area

Overwater Structure	Square Feet (acre) of Shaded Area	
	Alternative B (Barge/Trestle/Bridge)	Alternative C (Barge/Trestle/Bridge)
Barges (temporary)	36,000 (0.83)	36,000 (0.83)
Trestle (temporary)	33,500 (0.77)	33,500 (0.77)
Bridge (permanent)	56,000 (1.29)	56,800 (1.30)
Total		
Net change (temporary)	69,500 (1.60)	69,500 (1.60)
Net change (permanent)	56,000 (1.29)	56,800 (1.30)

Introduction of Aquatic Invasive Species

During construction, the operation of barges and other in-water equipment originating from regions or areas outside the project region could result in the introduction and spread of aquatic invasive species (AIS), including the Asian overbite clam (*Corbula amurensis*), quagga mussel (*Dreissena bugensis*), zebra mussel (*Dreissena polymorpha*), hydrilla (*Hydrilla verticillata*), and Brazilian elodea (*Egeria densa*) (California Department of Fish and Game 2008). These species can adversely affect native fishes and other ecologically and economically important species through a number of mechanisms, including competition for resources, predation, parasitism, interbreeding, disease transmission, and changes in the physical or chemical attributes of aquatic habitat.

Increase in Direct Lighting on Sacramento River

Temporary lighting of work areas to facilitate nighttime construction, especially at construction sites adjacent to or over the Sacramento River, and permanent lighting associated with the new bridge may result in increased nighttime light intensity on the water surface of the Sacramento River. Increases in direct lighting of the Sacramento River at night may affect the migratory behavior of juvenile fish; alter the behavior of animals that prey on fish (e.g., piscivorous birds, mammals, and fish) in adjacent and affected habitats; or make juvenile fish more visible to predators, thereby leading to increased mortality of fish through increased predation (Tabor et al. 2001).

The proposed project is *likely to adversely affect* Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, and CCV steelhead based on temporary effects on water quality (increased turbidity and suspended sediment), rearing and movement habitat (noise and shade), and channel substrates (cofferdams, temporary trestles, and temporary barges); temporary and permanent effects on riparian and SRA cover habitat (vegetation removal, bridge construction); and permanent effects on aquatic habitat (construction of bridge piers, shade, and placement of RSP) in the Sacramento River.

Impacts on Sacramento River Winter-Run Chinook Salmon, Central Valley Spring-Run Chinook Salmon, and California Central Valley Steelhead Critical Habitat

As mentioned earlier, the Sacramento River within the BSA is included in the designated critical habitat for Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, and

CCV steelhead. The physical and biological features of critical habitat in the BSA for Sacramento River winter-run Chinook salmon are: (1) migratory corridors for upstream migrating adults and downstream migrating juveniles; (2) habitat and adequate prey items free of contaminants; and (3) riparian and floodplain habitat for successful juvenile development and survival. The physical and biological features of critical habitat in the BSA for CV spring-run Chinook salmon and CCV steelhead are: (1) freshwater rearing habitat; and (2) freshwater migration corridors for upstream migrating adults and downstream migrating juveniles. Critical habitat for Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, and CCV steelhead in the BSA includes the river water column, river bottom, and the lateral extent as defined by the ordinary or mean high water elevation, which are used by adults for migration and juveniles for migration and rearing.

The project is *likely to adversely affect* designated critical habitat for Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, and CCV steelhead. Impacts on physical and biological features of critical habitat for these species include temporary effects on rearing and movement habitat (underwater noise and sound pressure, and water quality impacts) and prey habitat (cofferdams, and trestle and barge piles); temporary and permanent effects on riparian, SRA cover, and floodplain habitat (vegetation removal, bridge and bike path construction, and placement of RSP); and permanent effects on rearing, movement, and prey habitat (construction of bridge piers, shade, and placement of RSP) in the Sacramento River. These impacts would be the same as the habitat effects described above for Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, and CCV steelhead.

Alternative C

Permanent and Temporary Direct Impacts

Alternative C would similarly affect Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, and CCV steelhead with respect to pile driving noise, water quality impacts, fish entrapment in cofferdams, and direct physical injury because the proposed bridge would be similar to the bridge proposed under Alternative B (Appendix A, Figure 9). However, Alternative C would result in greater temporary impacts on substrate and water column habitat, fewer permanent impacts on substrate habitat from RSP placement, greater permanent and temporary impacts on riparian habitat, greater impacts on SRA cover habitat along the Sacramento River, and slightly greater permanent shade impacts on the Sacramento River. These impacts are discussed below.

Installation of sheet pile cofferdams to isolate the in-water construction areas for piers 4 and 5 from the water column during pier construction would result in temporary disturbance of aquatic habitat (substrate and water column) equal to the enclosed area and volume of the in-water cofferdams (Appendix A, Figure 9). The proposed dimensions of each cofferdam are 45 feet by 10 feet, or 4,500 square feet. Together, the two cofferdams would result in temporary disturbance of 9,000 square feet (0.21 acre) of substrate habitat and up to 441,000 cubic feet of water column habitat below the OHWM (based on a water surface elevation of +19 feet) (Table 4-15).

Up to 861 linear feet of shoreline (395 linear feet on the City of Sacramento shoreline and 466 linear feet on the City of West Sacramento shoreline), covering up to 19,431 square feet

(0.45 acre) of the bank below the OHWM, would be lined with RSP (Table 4-15). A total of 2,375 cubic yards of RSP would be placed below the OHWM, and a total of 3,592 cubic yards would be placed above the OHWM. The RSP above and below the OHWM would cover a total of 48,818 square feet (1.12 acre).

Clearing of the existing cottonwood riparian forest vegetation within the proposed project footprint would result in permanent loss of up to 1.290 acres and temporary disturbance to up to 1.035 acres of cottonwood riparian forest within the BSA, of which approximately 0.352 acre is below the OHWM and contributes to overhead (shade) and instream SRA cover. Clearing of the existing cottonwood riparian forest that contributes to SRA cover would result in temporary disturbance to up to 587 linear feet and permanent loss of up to 499 linear of overhead SRA cover (shade) along the summer (low-flow) shoreline of the Sacramento River (Table 4-16).

Indirect Impacts

Alternative C would similarly affect Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, and CCV steelhead but would result in 2.2 acres of added impervious surface (i.e., 0.2 acre more than would occur under Alternative B).

Impacts on Sacramento River Winter-Run Chinook Salmon, Central Valley Spring-Run Chinook Salmon, and California Central Valley Steelhead Critical Habitat

As described above for Alternative B, the project is *likely to adversely affect* designated critical habitat for Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, and CCV steelhead. The impacts of Alternative C on critical habitat would be similar to those described above for Alternative B with respect to pile driving noise and water quality impacts. However, Alternative C would result in greater temporary impacts on substrate and water column habitat, fewer permanent impacts on substrate habitat from RSP placement, greater permanent and temporary impacts on riparian habitat, and greater impacts on SRA cover habitat along the Sacramento River, and slightly greater permanent shade impacts on the Sacramento River, as described above.

4.4.1.3 Avoidance and Minimization Efforts

Implementation of Measures 1–5 and 14–22 would avoid or minimize direct and indirect impacts on Chinook salmon and steelhead and their designated critical habitat.

> **Measure 14: Conduct All In-Water Construction Activities between May 1 and November 30 and Only during Daylight Hours**
>
> The project proponent will conduct all in-water construction work, including pile driving (in-water and shore-based within 250 feet of the Sacramento River), installation of cofferdams, removal of temporary sheet piles, and placement of rock revetment between May 1 and November 30 to avoid or minimize causing disturbance and injury to, or mortality of, special-status fish species in the affected reaches of the Sacramento River. In addition, in-water work will be conducted only during daylight hours to provide fish in

the affected reaches of the Sacramento River an extended quiet period during nighttime hours for feeding and unobstructed passage.

Limiting in-water construction to the May 1–November 30 period would achieve several goals.

- In-water construction activities with the potential to generate harmful levels of underwater noise (e.g., driving piles with an impact hammer) would avoid the primary migration periods of adults and juveniles of special-status fish species.
- The length of the in-water work window will allow most of the in-water construction work to be completed during the first construction season, thereby limiting the number of year classes of fish species that potentially would be exposed to in-water construction effects.

Measure 15: Implement Measures to Minimize Exceedance of Interim Threshold Sound Levels during Pile Driving

The project proponent will require the contractor to implement the following measures to minimize the exposure of listed fish species to potentially harmful underwater sounds.

- The contractor will vibrate all piles to the maximum depth possible before using an impact hammer.
- No more than 20 piles will be driven per day.
- During impact driving, the contractor will limit the number of strikes per day to the minimum necessary to complete the work and will limit the total number of hammer strikes to 32,000 strikes per day (i.e., 1,600 hammer strikes per pile, per day) for piles for the temporary trestles, 20,000 strikes per day (i.e., 1,000 hammer strikes per pile, per day) for the piles for the bridge fender system, 12,800 strikes per day (i.e., 1,600 hammer strikes per pile, per day) for piles for the fixed span piers, 6,000 strikes per day (i.e., 1.500 strikes per pile, per day) for the CISS piles for the movable span piers.
- During impact driving, the project proponent will require the contractor to use a bubble curtain or dewatered cofferdam to minimize the extent to which the interim peak and cumulative SEL thresholds are exceeded (see Section 4.4.1.2, *Project Impacts*).
- No pile driving activity will occur at night, thereby providing fish with an extended quiet period during nighttime hours on days pile driving is being conducted for feeding and unobstructed passage.

Measure 16: Develop and Implement a Hydroacoustic Monitoring Plan

The project proponent or their contractor will develop and implement a hydroacoustic monitoring plan. The monitoring plan will be submitted to the resource agencies (CDFW, NMFS, and USFWS) for approval at least 60 days before the start of project activities. The plan will include the following requirements.

- The project proponent or their contractor will monitor underwater noise levels during all impact pile driving activities on land and in water to ensure that peak and cumulative SELs do not exceed estimated values (Tables 4-10 through 4-14).
- The monitoring plan will describe the methods and equipment that will be used to document the extent of underwater sounds produced by pile driving, including the number, location, distances, and depths of the hydrophones and associated monitoring equipment.
- The monitoring plan will include a reporting schedule for daily summaries of the hydroacoustic monitoring results and for more comprehensive reports to be provided to the resource agencies on a monthly basis during the pile driving season.
- The daily reports will include the number of piles installed per day; the number of strikes per pile; the interval between strikes; the peak SPL, SEL, and RMS per strike; and the accumulated SEL per day at each monitoring station.
- The project proponent or their contractor will ensure that a qualified fish biologist is onsite during impact pile driving to document any occurrences of stressed, injured, or dead fish. If stressed, injured, or dead fish are observed during pile driving, the project proponent or their contractor will reduce the number of strikes per day to ensure that fish are no longer showing signs of stress, injury, or mortality.

Measure 17: Monitor Turbidity in the Sacramento River

The project proponent will require their contractor to monitor turbidity levels in the Sacramento River during in-water construction activities (e.g., pile driving, extraction of temporary sheet piles used for cofferdams, and placement of RSP). Turbidity will be measured using standard techniques upstream and downstream of the construction area to determine whether changes in ambient turbidity levels exceed the thresholds derived from the *Water Quality Control Plan (Basin Plan) for the California Regional Water Quality Control Board Central Valley Region* (Central Valley Regional Water Quality Control Board 2018). If it is determined that turbidity levels exceed the Basin Plan thresholds, the project proponent or their contractor will adjust work to ensure that turbidity levels do not exceed the Basin Plan thresholds.

Measure 18: Implement Cofferdam Restrictions

The following restrictions will be implemented during installation of the cofferdams and cofferdam dewatering.

- The extent of cofferdam footprints will be limited to the minimum necessary to support construction activities.
- Sheet piles used for cofferdams will be installed and removed using a vibratory pile driver.
- Cofferdams will be installed and removed only during the proposed in-water work window (between May 1 and November 30).

- Cofferdams will not be left in place over winter where they could be overtopped by winter/spring flows and when juveniles of listed species are most likely to be present in the construction area.
- All pumps used during dewatering of cofferdams will be screened according to CDFW and NMFS guidelines for pumps.
- Cofferdam dewatering and fish rescue/relocation from within cofferdams will commence immediately following cofferdam closure to minimize the duration that fish are trapped in the cofferdam.

Measure 19: Prepare and Implement a Fish Rescue and Relocation Plan

The project proponent or their contractor will develop and implement a fish rescue and relocation plan to recover any fish trapped in cofferdams. The fish rescue and relocation plan will be submitted to the resource agencies (CDFW, NMFS, and USFWS) for approval at least 60 days before initiating activities to install cofferdams. At a minimum, the plan will include the following.

- A requirement that fish rescue and relocation activities will commence immediately after cofferdam closure and that dewatering has sufficiently lowered water levels inside cofferdams to make it feasible to rescue fish.
- A description of the methods and equipment proposed to collect, transfer, and release all fish found trapped within cofferdams. Capture methods may include seining, dip netting, and electrofishing, as approved by CDFW, NMFS, and USFWS. The precise methods and equipment to be used will be developed cooperatively by CDFW, NMFS, USFWS, and the project proponent or their contractor.
- A requirement that only CDFW-, NMFS-, and USFWS-approved fish biologists will conduct the fish rescue and relocation.
- A requirement that fish biologists will contact CDFW, NMFS, and USFWS immediately if any listed species are found dead or injured.
- A requirement that a fish rescue and relocation report be prepared and submitted to CDFW, NMFS, and USFWS within 5 business days following completion of the fish relocation. Data will be provided in tabular form and at a minimum will include the species and number rescued and relocated, approximate size of each fish (or alternatively, approximate size range if a large number of individuals are encountered), date and time of their capture, and general condition of all live fish (e.g., good–active with no injuries; fair–reduced activity with some superficial injuries; poor–difficulty swimming/orienting with major injuries). For dead fish, additional data will include fork length and description of injuries and/or possible cause of mortality if it can be determined.

Measure 20: Develop and Implement a Barge Operations Plan

The project proponent or their contractor will develop and implement a barge operations plan. The barge operations plan will be submitted to the resource agencies (CDFW,

NMFS, and USFWS) for approval at least 60 days before the start of project activities. The plan will address the following.

- Bottom scour from propeller wash.
- Bank erosion or loss of submerged or emergent vegetation from propeller wash or excessive wake.
- Accidental material spillage.
- Sediment and benthic community disturbance from accidental or intentional barge grounding or deployment of barge spuds (extendable shafts for temporarily maintaining barge position) or anchors.
- Hazardous materials spills (e.g., fuel, oil, and hydraulic fluids).

The barge operations plan will serve as a guide to barge operations and to a biological monitor who will evaluate barge operations during construction with respect to stated performance measures. This plan, when approved by the resource agencies, will be read by barge operators and kept aboard all vessels operating at the construction site.

Measure 21: Prevent the Spread or Introduction of Aquatic Invasive Species

The project proponent or their contractor will implement the following actions to prevent the potential spread or introduction of AIS associated with the operation of barges and other in-water construction activities. Species of concern related to the operation of barges and other equipment in the lower Sacramento River include invasive mussels (e.g., quagga mussels [*Dreissena bugensis*] and zebra mussels [*Dreissena polymorpha*]) and aquatic plants (e.g., Brazilian waterweed [*Egeria densa*] and hydrilla [*Hydrilla verticillata*]) (California Department of Fish and Game 2008).

- Coordinate with the CDFW Invasive Species Program to ensure that the appropriate BMPs are implemented to prevent the spread or introduction of AIS.
- Educate construction supervisors and managers about the importance of controlling and preventing the spread of AIS.
- Train vessel and equipment operators and maintenance personnel in the recognition and proper prevention, treatment, and disposal of AIS.
- If feasible, prior to departure of vessels from their place of origin and before in-water construction equipment is allowed to operate within the waters of the Sacramento River, thoroughly inspect and remove and dispose of all dirt, mud, plant matter, and animals from all surfaces that are submerged or may become submerged, or places where water can be held and transferred to the surrounding water.

Measure 22: Minimize or Avoid Permanent Bridge Lighting from Directly Radiating on Water Surfaces of the Sacramento River

The project proponent or their contractor will minimize or avoid the effects of permanent bridge lighting on special-status fish species by implementing the following actions.

- Minimize nighttime lighting of the bridge structure for aesthetic purposes.
- Use the minimal amount of lighting necessary to safely and effectively illuminate vehicular, bicycle, and pedestrian areas on the bridge.
- Shield and focus lights on vehicular, bicycle, and pedestrian areas and away from the water surface of the Sacramento River, to the maximum extent practicable.

4.4.1.4 Compensatory Mitigation

Implementation of Measure 23 would compensate for permanent impacts on critical habitat.

Measure 23: Purchase Channel Enhancement Credits for Impacts on Critical Habitat

Permanent impacts on critical habitat (bank and substrate below the OHWM and water column habitat), totaling 1.87 acres (up to 57,600 square feet [1.32 acre] from bridge shading of aquatic habitat and new bridge piers; 24,126 square feet [0.55 acre] from RSP; and 84 square feet (0.002 acre) from bridge fender system) will be mitigated at a 3:1 ratio. The project proponent proposes to mitigate the permanent loss of critical habitat through purchase of 5.61 acres of mitigation credits at a NMFS- and USFWS-approved anadromous fish and delta smelt conservation bank.

4.4.1.5 Cumulative Impacts

Under the ESA, cumulative effects are "those effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area of the federal action subject to consultation" (50 CFR 402.2). Future federal actions that are unrelated to the proposed action are not considered in this assessment because they require separate consultation pursuant to Section 7 of the ESA.

Current, future, and reasonably foreseeable actions in the project region that also could affect special-status fish species, SRA cover habitat, and critical habitat potentially affected by the proposed project include the following.

- Flood management projects affecting the Sacramento River.
- Restoration and other water-related projects in and near the Sacramento River that could affect fish or vegetation on the waterside of levees.
- Development in the West Sacramento and Sacramento area that could result in effects similar to those of the proposed project.

Without compensation, construction of either build alternative for the proposed project would contribute a small amount to the cumulative loss of suitable aquatic habitat (substrate, water column) for Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, and CCV steelhead in the project region. However, with implementation of Measures 1–5 and 14–22 and compensatory Measure 23, the project's contribution to effects on Chinook salmon and steelhead would be reduced to a less than cumulatively considerable level.

Caltrans is not aware of any future state or private activities that are reasonably certain to affect Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, or CCV steelhead or designated critical habitat within the area potentially affected by the proposed project.

4.4.2 Southern Distinct Population Segment of North American Green Sturgeon

On January 23, 2003, NMFS determined that green sturgeon is composed of two populations, a northern and a southern DPS (National Marine Fisheries Service 2003). The northern DPS includes populations extending from the Eel River northward, and the southern DPS includes populations south of the Eel River to the Sacramento River. The Sacramento River supports the southernmost spawning population of green sturgeon (Moyle 2002). NMFS listed the southern DPS of North American green sturgeon as threatened under the ESA on April 7, 2006 (71 FR 17757–17766). Green sturgeon is not listed under CESA; however, CDFW considers green sturgeon to be a California species of special concern (California Department of Fish and Wildlife 2019; Moyle et al. 2015).

NMFS designated critical habitat for green sturgeon on October 9, 2009 (74 FR 52300), including the water column, river bottom, and adjacent riparian zone of the Sacramento River up to the OHWM. The physical and biological features of critical habitat in the BSA include freshwater areas with water flow, water quality, depth, forage, sediment quality, and passage conditions supporting migration and rearing of green sturgeon.

The green sturgeon is anadromous, but it is the most marine-oriented species in the sturgeon family and has been found in nearshore marine waters from Mexico to the Bering Sea (Colway and Stevenson 2007; Moyle 2002; 70 FR 17386–17401). They are known to spawn in the Sacramento, Feather, Yuba, and Klamath Rivers in California, and the Rogue River in Oregon (Moyle et al. 1992; Adams et al. 2002; Poytress et al. 2015; Seesholtz et al. 2015; Beccio pers. comm.). In the Sacramento River, spawning has been confirmed between Hamilton City (river mile [RM] 199) and Inks Creek (RM 264.5) based on egg mat sampling (Poytress et al. 2015), and may occur as far upstream as Cow Creek (RM 280) based on adult distribution (Heublein et al. 2009; Klimley et al. 2015; Mora et al. 2018).

Adults typically migrate upstream into rivers between late February and late July. Spawning occurs from March to July, with peak spawning from mid-April to mid-June. It is believed that green sturgeon spawn every 2 to 6 years, although every 3 to 4 years may be more typical (National Marine Fisheries Service 2018). Young green sturgeon appear to rear for the first 1 to 2 months in the upper Sacramento River between Keswick Dam and Hamilton City (California Department of Fish and Game 2002). Juveniles spend 1 to 4 years in fresh and estuarine waters before migrating to salt water (Nakamoto et al. 1995) at lengths of 300 to 750 millimeters (mm) (70 FR 17386–17401).

Green sturgeon use the Sacramento River, including in the BSA, as a migration corridor during upstream (adult) and downstream (adult, juvenile) migration, and for holding and rearing (juveniles). Table 4-3 summarizes the life stage timing and distribution of green sturgeon in the Sacramento River, including the BSA.

Musick et al. (2000) noted that the abundance of North American green sturgeon populations has declined by 88 percent throughout much of its range. A number of threats and stressors exist for green sturgeon, specifically reduced spawning habitat from migration barriers, exposure to toxins, harvest, reduced rearing habitat, increased water temperatures, dredging, non-native aquatic species, and entrainment in unscreened diversions.

4.4.2.1 Survey Results

Focused surveys for North American green sturgeon were not conducted. However, it is well documented that green sturgeon use the BSA as a migration corridor during upstream (adult) and downstream (juvenile) migration. In addition, juvenile green sturgeon use the lower reaches of the Sacramento River for seasonal rearing. Spawning and egg incubation do not occur in the BSA (Moyle 2002).

Green sturgeon, which are benthic-oriented, generally are not susceptible to the USFWS trawls that sample the water column; therefore, little is known about their seasonal use of habitats and relative abundance in the BSA. However, general information on their distribution and habitat use indicates that green sturgeon have the potential to occur in the BSA year-round.

4.4.2.2 Project Impacts

Alternative B

Project impacts on North American green sturgeon under Alternative B would be similar to those described in Section 4.4.1.2, *Project Impacts* for Chinook salmon and steelhead. Green sturgeon may be at higher risk of exposure to sediment- and associated pollutant-related impacts than other listed species because their benthic nature may make them more likely to encounter sediment plumes that may be more concentrated near the river bottom. In addition, pile driving would overlap the migration season of adults and juveniles and the rearing season of juveniles. Because of their relatively large size, however, green sturgeon may be less susceptible to pile driving impacts than other fish species.

Under Alternative B, the proposed project *is likely to adversely affect* North American green sturgeon based on the potential for exposure to underwater noise during pile driving activities and temporary effects on water quality (increased turbidity and suspended sediment), rearing and movement habitat (noise and shade), and channel substrates (cofferdams, and temporary trestles and barges); temporary and permanent effects on riparian, SRA cover, and floodplain habitat (vegetation removal, bridge and bike path construction); and permanent effects on aquatic habitat (construction of bridge piers, shade, and placement of RSP) in the Sacramento River.

Alternative C

Project impacts on North American green sturgeon under Alternative C would be similar to those described under Alternative C in Section 4.4.1.2, *Project Impacts* for Chinook salmon and steelhead.

Under Alternative C, the proposed project *is likely to adversely affect* North American green sturgeon based on the potential for exposure to underwater noise during pile driving activities and temporary effects on water quality (increased turbidity and suspended sediment), rearing and movement habitat (noise and shade), and channel substrates (cofferdams, and temporary trestles and barges); temporary and permanent effects on riparian, SRA cover, and floodplain habitat (vegetation removal, bridge and bike path construction); and permanent effects on aquatic habitat (construction of bridge piers, shade, and placement of RSP) in the Sacramento River.

Impacts on North American Green Sturgeon Critical Habitat

The Sacramento River within the BSA is included in the designated critical habitat for the southern DPS of North American green sturgeon (74 FR 52300, October 9, 2009). The physical and biological features of critical habitat in the BSA include freshwater areas with water flow, water quality, depth, forage, sediment quality, and passage conditions supporting migration and rearing of green sturgeon. Critical habitat for North American green sturgeon in the BSA includes the river water column, river bottom, and adjacent riparian zone—up to the ordinary or mean high water elevation—which is used by adults for migration and juveniles for rearing.

The project *is likely to adversely affect* North American green sturgeon designated critical habitat. Impacts on North American green sturgeon critical habitat include temporary effects on the water column (underwater noise and sound pressure, and water quality impacts) and channel substrate (cofferdams and trestles), and permanent loss of aquatic habitat (water column and substrate) and riparian and SRA cover habitat in the Sacramento River. These impacts would be the same as those described in Section 4.4.1.2, *Project Impacts* for Chinook salmon and steelhead for Alternatives B and C.

4.4.2.3 Avoidance and Minimization Efforts

Implementation of Measures 1–5 and 14–22 would avoid or minimize the potential for construction-related effects on adult and juvenile North American green sturgeon and designated critical habitat in the BSA.

4.4.2.4 Compensatory Mitigation

Compensation for impacts on critical habitat (Measure 23) and loss of riparian and SRA cover habitat (Measure 4), as described above, also would benefit North American green sturgeon. No further compensatory mitigation would be required.

4.4.2.5 Cumulative Impacts

Cumulative impacts on North American green sturgeon would be the same as those described in Section 4.4.1.5, *Cumulative Impacts* for Chinook salmon and steelhead.

4.4.3 Delta Smelt

Delta smelt was federally listed as threatened on March 5, 1993 (58 FR 12854–12863). On April 7, 2010, USFWS ruled that a change in the status of delta smelt from threatened to endangered was warranted but was precluded by other higher priority listing actions (75 FR

17667). Delta smelt was listed as a threatened species under CESA on December 9, 1993. On March 4, 2009, the California Fish and Game Commission elevated the status of delta smelt to endangered under CESA.

USFWS designated critical habitat for delta smelt on December 19, 1994 (59 FR 65256–65278). The primary constituent elements of critical habitat determined to be essential to the conservation of the species are physical habitat, water, river flow, and salinity concentrations required to maintain delta smelt habitat for spawning, larval and juvenile transport, rearing, and adult migration (U.S. Fish and Wildlife Service 2006). Shallow water habitat is an element of delta smelt habitat of particular importance to the species because it includes the highly productive photic zone. Shallow water habitat is defined as all waters between mean high water and 3 meters (9.8 feet) below mean lower low water mark (U.S. Fish and Wildlife Service 2004).

Delta smelt occur primarily downstream of Isleton on the Sacramento River, in the Cache Slough subregion (Cache Slough–Liberty Island and the Deep Water Ship Channel), downstream of Mossdale on the San Joaquin River, and in Suisun Bay and Suisun Marsh (Moyle 2002). Delta smelt also have been collected in the Petaluma and Napa Rivers (Bennett 2005); the Sacramento River above Rio Vista; and Cache, Lindsey, Georgiana, Prospect, Beaver, Hog, Sycamore, and Barker Sloughs (U.S. Fish and Wildlife Service 1996). In the Sacramento River, delta smelt have been observed as far upstream as Knights Landing (Vincik and Julienne 2012) and in the Deep Water Ship Channel as far upstream as West Sacramento (Merz et al. 2011). Over the last 2 decades, the center of adult delta smelt abundance in fall (September through December) has been the West Delta and Suisun Bay subregions (Sommer et al. 2011). There is evidence that a life-history contingent of delta smelt may remain in the Cache Slough subregion throughout their lives (Nobriga et al. 2008; Sommer et al. 2011).

Delta smelt are endemic to the Sacramento–San Joaquin estuary and are found seasonally in Suisun Bay and Suisun Marsh (Moyle 2002). They typically are found in shallow water (<10 feet) where salinity ranges from 2 to 7 parts per thousand (ppt), although they have been observed at salinities between 0 and 18.4 ppt (Moyle 2002). Delta smelt have relatively low fecundity, and most live for 1 year (Moyle 2002). They feed on planktonic copepods, cladocerans, amphipods, and insect larva (Moyle 2002).

Delta smelt are semi-anadromous. During their spawning migration, adults move into the freshwater channels and sloughs of the Delta between December and January (Moyle 2002). Spawning occurs between January and July, with peak spawning from April through mid-May (Moyle 2002). Spawning locations in the Delta have not been identified and are inferred from larval catches (Bennett 2005). Larval fish have been observed in Montezuma Slough (Wang 1986); Suisun Slough in Suisun Marsh (Moyle 2002); the Napa River estuary (Stillwater Sciences 2006); the Sacramento River above Rio Vista; and Cache, Lindsey, Georgiana, Prospect, Beaver, Hog, Sycamore, and Barker Sloughs (U.S. Fish and Wildlife Service 1996). Spawning also was detected in the Sacramento River up to Garcia Bend (RM 51) during drought conditions as a result of increased saltwater intrusion that moved delta smelt spawning and rearing farther inland (Wang and Brown 1993). Laboratory experiments have found eggs to be adhesive and demersal, and usually attached to substrate composed of gravel, sand, or other submerged material (Moyle 2002; Wang 1991). Hatching takes approximately 9 to 13 days, and larvae begin feeding 4 to 5 days later (Moyle 2002). Newly hatched larvae contain a large oil

globule that makes them semi-buoyant and allows them to stay near the bottom (Moyle 2002). As their fins and swim bladder develop, they move higher into the water column and are transported downstream to the open waters of the estuary (Moyle 2002). Adult delta smelt have been observed in the vicinity of Sherwood Harbor (located approximately 3 miles downstream from the BSA) in March and April (Table 4-18), based on USFWS Sacramento trawl survey data from 2009 to 2019 (U.S. Fish and Wildlife Service 2019). However, delta smelt have not been observed in the trawls since 2014.

Delta smelt use the Sacramento River, including in the BSA, as a migration corridor during upstream migration (adult), downstream transport (larvae), and rearing (juveniles). Table 4-3 summarizes the life stage timing and distribution of delta smelt in the Sacramento River, including the BSA.

Diversions and Delta inflow and outflow may affect survival of delta smelt. Estimates of delta smelt entrainment at the CVP and SWP South Delta export facilities suggest a population decline in the early 1980s, mirroring the decline indicated by mid-water trawl, summer tow-net, Kodiak trawl, and beach seine data (Bennett 2005). Diversions and upstream storage, including operation of the CVP and SWP, control Delta inflow and outflow during most months. Reduced Delta flow may inhibit or slow movement of larvae and juveniles to estuarine rearing habitat, increasing their residence in the deeper and narrower channels of the Delta and exposure to lower prey availability and increased predation (Moyle 2002). Reduced Delta flow also may increase entrainment in diversions, including entrainment at the CVP and SWP export pumps (Moyle 2002). Additional factors affecting delta smelt abundance include extremely high river outflow that increases entrainment at export facilities, changes in prey abundance and composition, predation by non-native species, toxic substances, disease, and loss of genetic integrity through interbreeding with the introduced wakasagi smelt (*Hypomesus nipponensis*) (Moyle 2002; Bennett 2005).

4.4.3.1 Survey Results

Focused surveys for delta smelt were not conducted. However, it is well documented that delta smelt occur in the Sacramento River in the vicinity of the BSA. Spawning locations in the Delta have not been identified and are inferred from the location of gravid females and larval catches (Bennett 2005).

The temporal occurrence and relative abundance of adult delta smelt in the vicinity of the BSA can be inferred based on the weekly trawl surveys of the Sacramento River at Sherwood Harbor (RM 55) as part of the DJFMP (U.S. Fish and Wildlife Service 2019) (Table 4-18). In addition to collecting data on the relative number and timing of occurrence of delta smelt, USFWS collects information on the maturation status of adult smelt (i.e., individuals are physically examined at the time of capture to determine their readiness to spawn based on whether eggs or milt can be manually expressed from the individual). Maturation status provides information on the potential timing of spawning and, therefore, the potential occurrence of the species' eggs and larvae in the river. The occurrence of mature adults in the trawl samples suggests that delta smelt may spawn in this part of the Sacramento River, including the BSA.

Table 4-18. Number of Delta Smelt Captured by Trawl at Sherwood Harbor (RM 55) by Month (January 2009 through October 2019)

Month/ Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Monthly Total[a]
Jan												
Feb												
Mar		1		28		18						47
Apr				1	1	3						5
May												
Jun												
Jul												
Aug												
Sep												
Oct												
Nov												
Dec												
Annual Total		**1**		**29**	**1**	**21**						**52**

RM = river mile.
[a] 2019 data are excluded from total because data are incomplete.

4.4.3.2 Project Impacts

Alternative B

Project impacts on delta smelt would be similar to those described in Section 4.4.1.2, *Project Impacts* for Chinook salmon and steelhead under Alternative B. In addition, because delta smelt spawn in the Delta and lower Sacramento River, the proposed project has the potential to affect delta smelt eggs and larvae, and spawning habitat.

Under Alternative B, the proposed project is *likely to adversely affect* delta smelt based on the potential for exposure to underwater noise during pile driving activities and temporary effects on water quality (increased turbidity and suspended sediment), rearing and movement habitat (noise and shade), and channel substrates (cofferdams, and temporary trestles and barges); temporary and permanent effects on riparian, SRA cover, and floodplain habitat (vegetation removal, bridge and bike path construction); and permanent effects on aquatic habitat (construction of bridge piers, shade, and placement of RSP) in the Sacramento River.

Alternative C

Project impacts on delta smelt would be similar to those described in Section 4.4.1.2, *Project Impacts* for Chinook salmon and steelhead under Alternative C. In addition, because delta smelt spawn in the Delta and lower Sacramento River, the proposed project has the potential to affect delta smelt eggs and larvae, and spawning habitat.

Under Alternative C, the proposed project is *likely to adversely affect* delta smelt based on the potential for exposure to underwater noise during pile driving activities and temporary effects on water quality (increased turbidity and suspended sediment), rearing and movement habitat (noise and shade), and channel substrates (cofferdams, and temporary trestles and barges); temporary

and permanent effects on riparian, SRA cover, and floodplain habitat (vegetation removal, bridge and bike path construction); and permanent effects on aquatic habitat (construction of bridge piers, shade, and placement of RSP) in the Sacramento River.

Impacts on Delta Smelt Critical Habitat

The Sacramento River within the BSA is included in the designated critical habitat for delta smelt (59 FR 65256, December 19, 1994). Physical and biological features of critical habitat determined to be essential to the conservation of the species are physical habitat, water, river flow, and salinity concentrations required to maintain delta smelt habitat for spawning, larval and juvenile transport, rearing, and adult migration (U.S. Fish and Wildlife Service 2006). Where it is designated, critical habitat for delta smelt consists of all water and submerged lands below ordinary high water and the entire water column, which is used by adults for migration and spawning and juveniles for rearing.

The project *is likely to adversely affect* delta smelt designated critical habitat. Impacts on delta smelt critical habitat include temporary effects on the water column (underwater noise and sound pressure, and water quality impacts) and channel substrate (cofferdams and trestles), and permanent loss of aquatic habitat (water column and substrate) and riparian and SRA cover habitat in the Sacramento River. These impacts would be the same as those described in Section 4.4.1.2, *Project Impacts* for Chinook salmon and steelhead under Alternatives B and C.

4.4.3.3 Avoidance and Minimization Efforts

Implementation of Measures 1–5 and 14–22 would avoid or minimize the potential for construction-related effects on delta smelt and designated critical habitat in the BSA.

4.4.3.4 Compensatory Mitigation

Compensation for impacts on critical habitat (Measure 23) and loss of riparian and SRA cover habitat (Measure 4), as described above, would compensate for permanent impacts on delta smelt critical habitat and on riparian and SRA cover habitat.

4.4.3.5 Cumulative Impacts

Cumulative effects on delta smelt would be the same as those described in Section 4.4.1.5, *Cumulative Impacts* for Chinook salmon and steelhead.

4.4.4 Longfin Smelt

The San Francisco Bay-Delta DPS of longfin smelt is a candidate species under the ESA. Longfin smelt was listed as a threatened species under CESA on June 26, 2009. Longfin smelt is included in the *Recovery Plan for the Sacramento-San Joaquin Delta Native Fishes,* which was completed in 1996 (U.S. Fish and Wildlife Service 1996).

Longfin smelt are a small, euryhaline (tolerant of a range of salinities) fish found in open waters of bays and estuaries (Moyle 2002). In the San Francisco estuary, longfin smelt rarely are found upstream of Rio Vista on the Sacramento River and Medford Island on the San Joaquin River

(Moyle 2002), although adults have been observed in the Sacramento River as far upstream as Colusa and in the San Joaquin River as far upstream as Lathrop (Merz et al. 2013). Although adults occur seasonally as far downstream as South San Francisco Bay, they are concentrated primarily in North San Francisco, San Pablo, and Suisun Bays (Moyle 2002).

Bay-Delta longfin smelt are anadromous, leaving coastal marine areas and the brackish bays in fall and moving upstream to spawn in the freshwater reaches of the lower Sacramento and San Joaquin Rivers in winter and spring. Although spawning of Bay-Delta longfin smelt has not been observed, the location of spawning sites can be inferred from CDFW surveys that collect adult female and larval smelt. Based on these surveys, spawning habitat is presumed to exist in the Cache Slough subregion (Sacramento River Deep Water Ship Channel, Cache-Liberty Island Complex), the West Delta subregion (lower Sacramento River), the eastern Suisun Bay subregion including upper Grizzly Bay, and Montezuma Slough in the Suisun Marsh subregion. Adult longfin smelt also have been observed as far upstream as Hog Slough off the South Fork Mokelumne River and in Old River south of Indian Slough during their winter and spring spawning period (77 FR 19757). The exact location of spawning likely varies from year to year, in response to changing environmental conditions.

Adult longfin smelt may spawn as early as November and as late as June, although spawning is believed to typically occur from January through April based on the occurrence of larvae during this period and the decline in abundance of adult smelt after this period (77 FR 19757; Moyle 2002). Spawning occurs primarily over sandy or gravel substrates, rocks, and aquatic plants when water temperatures are between 7.2 and14.4°Celsius (°C) (45–58°Fahrenheit [°F]) (Moyle 2002). Most Bay-Delta longfin smelt live for 2 years, spawn, and then die—although some individuals may spawn as 1- or 3-year-olds. Some longfin smelt, mostly females, survive after spawning and live another year; it is not known whether these fish spawn more than once (Moyle 2002). Adult longfin smelt rarely are observed in the vicinity of Sherwood Harbor (located approximately 3 miles downstream from the BSA). From January 2005 through October 2019, one adult longfin smelt was captured in the trawl in December 2012 (U.S. Fish and Wildlife Service 2019), suggesting that their abundance and frequency of use of habitat in the BSA is probably very low.

Embryos hatch in 40 days at 7.2°C (45°F); the number of days to hatching is inversely related to water temperature. Newly hatched larvae are 5–8 mm long and buoyant. The buoyant larvae move into the upper part of the water column and are carried into the estuary by river currents. During years with high Delta outflows, larvae mostly are transported to Suisun and San Pablo Bays, where survival is often better than it is during low outflow years—when larvae mostly are transported into the western Delta and Suisun Bay. Rearing habitat conditions are more favorable in Suisun and San Pablo Bays than in the Delta, where juveniles may become entrained and exposed to more adverse conditions (Moyle 2002).

Longfin smelt use the Sacramento River, including in the BSA, as a migration corridor during upstream migration (adult), downstream transport (larvae), and rearing (juveniles). Table 4-3 summarizes the life stage timing and distribution of longfin smelt in the Sacramento River, including the BSA.

Longfin smelt abundance in the Bay-Delta has declined significantly since the 1980s; over the last decade, abundance has been the lowest in the 40-year history of CDFW's monitoring surveys (77 FR 19763). Longfin smelt abundance is positively correlated with Delta outflow (Moyle 2002). Factors affecting the abundance of longfin smelt in the Bay-Delta are multiple and synergistic (Moyle 2002), and are likely to be similar to the factors affecting delta smelt.

4.4.4.1 Survey Results

Focused surveys for longfin smelt were not conducted. Longfin smelt rarely are captured in the weekly trawl surveys of the Sacramento River at Sherwood Harbor (RM 55) as part of the DJFMP (U.S. Fish and Wildlife Service 2019). From January 2009 through October 2019, one adult longfin smelt was captured in the trawl in December 2012, suggesting that their abundance and frequency of use of habitat in the BSA is probably very low. Longfin smelt may spawn in the BSA along shallow river margins.

4.4.4.2 Project Impacts

Alternative B

Project impacts on longfin smelt would be similar to those described in Section 4.4.1.2, *Project Impacts* for Chinook salmon and steelhead under Alternative B. In addition, because longfin smelt spawn in the Delta and lower Sacramento River, the proposed project has the potential to affect delta smelt eggs and larvae, and spawning habitat through exposure to underwater noise during pile driving activities and temporary effects on water quality (increased turbidity and suspended sediment), rearing and movement habitat (noise and shade), and channel substrates (cofferdams, and temporary trestles and barges); temporary and permanent effects on riparian, SRA cover, and floodplain habitat (vegetation removal, bridge and bike path construction); and permanent effects on aquatic habitat (construction of bridge piers, shade, and placement of RSP) in the Sacramento River. Because longfin smelt are not listed under the ESA, no take would be associated with implementation of the project.

Alternative C

Project impacts on longfin smelt would be similar to those described in Section 4.4.1.2, *Project Impacts* for Chinook salmon and steelhead under Alternative C. In addition, because longfin smelt spawn in the Delta and lower Sacramento River, the proposed project has the potential to affect delta smelt eggs and larvae, and spawning habitat through exposure to underwater noise during pile driving activities and temporary effects on water quality (increased turbidity and suspended sediment), rearing and movement habitat (noise and shade), and channel substrates (cofferdams, and temporary trestles and barges); temporary and permanent effects on riparian, SRA cover, and floodplain habitat (vegetation removal, bridge and bike path construction); and permanent effects on aquatic habitat (construction of bridge piers, shade, and placement of RSP) in the Sacramento River. Because longfin smelt are not listed under the ESA, no take would be associated with implementation of the project.

Impacts on Longfin Smelt Critical Habitat

Critical habitat has not been designated for longfin smelt because the species is not listed under the ESA. Consequently, no impacts on longfin smelt critical habitat would result from implementation of the project.

4.4.4.3 Avoidance and Minimization Efforts

Implementation of Measures 1–5 and 14–22 would avoid or minimize the potential for construction-related effects on longfin smelt and its habitat in the BSA.

4.4.4.4 Compensatory Mitigation

Compensation for impacts on critical habitat (Measure 23) and loss of riparian and SRA cover habitat (Measure 4), as described above, also would benefit longfin smelt. No further compensatory mitigation would be required.

4.4.4.5 Cumulative Impacts

Cumulative effects on longfin smelt would be the same as those described in Section 4.4.1.5, *Cumulative Impacts* for Chinook salmon and steelhead.

4.4.5 White Sturgeon

White sturgeon is not listed under the ESA, and critical habitat has not been designated. Although white sturgeon is not listed under CESA, the species is considered a California species of special concern. CDFW classifies the current status of white sturgeon as High Concern (Moyle et al. 2015). Species classified as High Concern are at high risk of becoming a critical concern species (i.e., they have a high risk of becoming extinct in the wild), and their existing range and abundance is significantly reduced relative to historical populations (Moyle et al. 2015). White sturgeon is a recreationally important species in the Delta, and CDFW has established special angling regulations (e.g., slot and bag restrictions) for white sturgeon to protect the declining population within the San Francisco Estuary and its tributaries (California Department of Fish and Game 2012).

White sturgeon inhabit riverine, estuarine, and occasionally marine habitats at various stages during their long life. In marine habitats, white sturgeon range from Ensenada, Mexico to the Gulf of Alaska, but they spawn only in the Sacramento–San Joaquin, Columbia, Snake, and Fraser River systems (Moyle 2002). In California, white sturgeon are most abundant in the Bay-Delta and Sacramento River (Moyle 2002); but they also have been observed in the San Joaquin River system, particularly in wet years (California Department of Fish and Game 2002; Beamesderfer et al. 2005; Jackson and Van Eenennaam 2013).

White sturgeon spend most of their lives in the brackish portions of the upper estuary, although some individuals move extensively in the ocean between river systems (Moyle et al. 2015). Adult white sturgeon move from the waters of San Francisco Bay into the Delta and lower Sacramento River (and presumably the San Joaquin River) during the late fall and winter to spawn. Spawning typically occurs between late February and early June (Moyle et al. 2015).

Spawning in the Sacramento River occurs primarily between Knights Landing (RM 90) and Colusa (RM 144). It is thought that adults broadcast spawn in the water column in deep water over gravel substrates or in rocky pools with swift currents (Moyle et al. 2015). Young white sturgeon use river edge habitats, especially floodplain and backwater habitats containing flooded riparian vegetation and rocky substrates (Moyle et al. 2015).

White sturgeon use the Sacramento River, including in the BSA, for upstream (adults) and downstream (adults and juveniles) migration and rearing (larvae, juveniles). Spawning and egg incubation do not occur in the BSA (Moyle 2002).

4.4.5.1 Survey Results

Focused surveys for white sturgeon were not conducted. However, it is well documented that white sturgeon use the BSA as a migration corridor during upstream (adult) and downstream (juvenile) migration. In addition, juvenile white sturgeon use the lower reaches of the Sacramento River for seasonal rearing. Spawning and egg incubation do not occur in the BSA (Moyle 2002).

White sturgeon, which are benthic-oriented, generally are not susceptible to the USFWS trawls that sample the water column; therefore, little is known about their seasonal use of habitats and relative abundance in the BSA. However, general information on their distribution and habitat use indicates that white sturgeon have the potential to occur in the BSA year-round.

4.4.5.2 Project Impacts

Alternative B

Project impacts on white sturgeon would be similar to those described in Section 4.4.1.2, *Project Impacts* for Chinook salmon and steelhead under Alternative B. The proposed project has the potential to affect white sturgeon through exposure to underwater noise during pile driving activities and temporary effects on water quality (increased turbidity and suspended sediment), rearing and movement habitat (noise and shade), and channel substrates (cofferdams, and temporary trestles and barges); temporary and permanent effects on riparian, SRA cover, and floodplain habitat (vegetation removal, bridge and bike path construction); and permanent effects on aquatic habitat (construction of bridge piers, shade, and placement of RSP) in the Sacramento River. Because white sturgeon are not listed under the ESA, no take would be associated with implementation of the project.

Alternative C

Project impacts on white sturgeon would be similar to those described in Section 4.4.1.2, *Project Impacts* for Chinook salmon and steelhead under Alternative C. The proposed project has the potential to affect white sturgeon through exposure to underwater noise during pile driving activities and temporary effects on water quality (increased turbidity and suspended sediment), rearing and movement habitat (noise and shade), and channel substrates (cofferdams, and temporary trestles and barges); temporary and permanent effects on riparian, SRA cover, and floodplain habitat (vegetation removal, bridge and bike path construction); and permanent effects

on aquatic habitat (construction of bridge piers, shade, and placement of RSP) in the Sacramento River. Because white sturgeon are not listed under the ESA, no take would be associated with implementation of the project.

Impacts on White Sturgeon Critical Habitat

Critical habitat has not been designated for white sturgeon because the species is not listed under the ESA. Consequently, no impacts on white sturgeon critical habitat would result from implementation of the project.

4.4.5.3 Avoidance and Minimization Efforts

Implementation of Measures 1–5 and 14–22 would avoid or minimize the potential for construction-related effects on white sturgeon and its habitat in the BSA.

4.4.5.4 Compensatory Mitigation

Compensation for impacts on critical habitat (Measure 23) and loss of riparian and SRA cover habitat (Measure 4), as described above, also would benefit white sturgeon. No further compensatory mitigation would be required.

4.4.5.5 Cumulative Impacts

Cumulative effects on white sturgeon would be the same as those described in Section 4.4.1.5, *Cumulative Impacts* for Chinook salmon and steelhead.

4.4.6 Sacramento Splittail

4.4.6.1 Status and Distribution

Sacramento splittail was listed as threatened under the ESA on February 8, 1999 (64 FR 5963); however, the listing was withdrawn on September 22, 2003 (68 FR 55139). Although Sacramento splittail is not listed under CESA, CDFW considers the species to be a California species of special concern.

Sacramento splittail were endemic to the sloughs, lakes, and rivers of California's Central Valley but now are confined to the downstream reaches of the Sacramento and San Joaquin Rivers, and the Delta. In the Sacramento River, splittail range from the Delta up to the Red Bluff Diversion Dam; in the San Joaquin River, they range from the Delta up to RM 135. Selected observations in the lower portions of the Sacramento River and tributaries include the American River to RM 12, the Feather River to RM 58 and to just below the Thermalito Afterbay outlet (Oppenheim pers. comm.; Seesholtz pers. comm.), and in Butte Creek/Sutter Bypass in the vicinity of Colusa State Park.

Adult splittail exhibit a gradual movement upstream during winter and spring, presumably to forage and spawn in flooded areas. They have been observed to leave Suisun Bay and the Delta during December through March, and it appears that the Yolo and Sutter Bypasses provide important spawning habitat in years when the bypasses are flooded (Sommer et al. 1997). In the

Sacramento River, adult splittail spawn between Knights Landing and Colusa in most years and occasionally spawn as far upstream as Hamilton City (Moyle et al. 2004). Splittail spawn in late April and May in Suisun Marsh, between early March and May in the upper Delta and lower reaches and flood bypasses of the Sacramento and San Joaquin Rivers, and on the Cosumnes River Preserve (Moyle et al. 1989, 2004). Spawning has been observed to occur as early as January and may continue through early July (Wang 1986; Moyle 2002), although spawning typically occurs from late February through April (Moyle et al. 2004). The adhesive eggs are deposited over flooded terrestrial or aquatic vegetation when water temperature is between 48 and 68°F (8.9 and 20°C) (Moyle 2002; Wang 1986).

Larval splittail commonly are found in shallow, vegetated areas near spawning habitat. Larvae eventually move into deeper and more open-water habitat as they grow and become juveniles. Young-of-year juvenile splittail (i.e., larvae and juveniles) frequently occur in the flood bypasses when these areas are inundated during late winter and spring (Jones & Stokes Associates 1993; Sommer et al. 1997). Juvenile splittail have been observed in the vicinity of Sherwood Harbor (located approximately 3 miles downstream from the BSA) in March and April (Table 4-19), based on USFWS beach seine data at Garcia Bend from 2009 to 2019 (U.S. Fish and Wildlife Service 2019).

Sacramento splittail use the Sacramento River, including in the BSA, for migration and rearing and may spawn in the BSA.

4.4.6.2 Survey Results

Focused surveys for Sacramento splittail were not conducted. However, it is well documented that Sacramento splittail use the BSA as a migration corridor during upstream (adult) and downstream (juvenile) migration. In addition, Sacramento splittail may spawn in the BSA, although spawning locations have not been identified.

The temporal occurrence and relative abundance of Sacramento splittail in the BSA can be inferred based on the weekly beach seine surveys of the Sacramento River at Garcia Bend (RM 49) as part of the DJFMP (U.S. Fish and Wildlife Service 2019) (Table 4-19).

Table 4-19. Number of Sacramento Splittail Captured by Beach Seine at Garcia Bend (RM 49) by Month (January 2008 through December 2018)

Month/ Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Monthly Total
Jan												
Feb												
Mar												
Apr		5				5	11	6	1	13		41
May	36	24	6	28	1	1	31	37	14	27	39	244
Jun	3	14	18	75	62	10	0	7	1	3	42	235
Jul				16	34							50
Aug												
Sep												
Oct												
Nov												
Dec									1			1
Annual Total	**39**	**43**	**24**	**119**	**97**	**16**	**42**	**50**	**17**	**43**	**81**	**571**

Note: 2019 data are not shown because there were significant gaps in sampling effort in water year 2019.
RM = river mile.

4.4.6.3 Project Impacts

Alternative B

Project impacts on Sacramento splittail would be similar to those described in Section 4.4.1.2, *Project Impacts* for Chinook salmon and steelhead under Alternative B. In addition, because Sacramento splittail may spawn in the BSA, the proposed project has the potential to affect splittail eggs and larvae, and spawning habitat through exposure to underwater noise during pile driving activities and temporary effects on water quality (increased turbidity and suspended sediment), rearing and movement habitat (noise and shade), and channel substrates (cofferdams, and temporary trestles and barges); temporary and permanent effects on riparian, SRA cover, and floodplain habitat (vegetation removal, bridge and bike path construction); and permanent effects on aquatic habitat (construction of bridge piers, shade, and placement of RSP) in the Sacramento River. Because Sacramento splittail is not listed under the ESA, no take would be associated with implementation of the project.

Alternative C

Project impacts on Sacramento splittail would be similar to those described in Section 4.4.1.2, *Project Impacts* for Chinook salmon and steelhead under Alternative C. In addition, because Sacramento splittail may spawn in the BSA, the proposed project has the potential to affect splittail eggs and larvae, and spawning habitat through exposure to underwater noise during pile driving activities and temporary effects on water quality (increased turbidity and suspended sediment), rearing and movement habitat (noise and shade), and channel substrates (cofferdams, and temporary trestles and barges); temporary and permanent effects on riparian, SRA cover, and floodplain habitat (vegetation removal, bridge and bike path construction); and permanent effects on aquatic habitat (construction of bridge piers, shade, and placement of RSP) in the Sacramento

River. Because Sacramento splittail is not listed under the ESA, no take would be associated with implementation of the project.

Impacts on Sacramento Splittail Critical Habitat

Critical habitat has not been designated for Sacramento splittail because the species is not listed under the ESA. Consequently, no impacts on Sacramento splittail critical habitat would result from implementation of the project.

4.4.6.4 Avoidance and Minimization Efforts

Implementation of Measures 1–5 and 14–22 would avoid or minimize the potential for construction-related effects on Sacramento splittail and its habitat in the BSA.

4.4.6.5 Compensatory Mitigation

Compensation for impacts on critical habitat (Measure 23) and loss of riparian and SRA cover habitat (Measure 4), as described above, also would benefit Sacramento splittail. No further compensatory mitigation would be required.

4.4.6.6 Cumulative Impacts

Cumulative effects on Sacramento splittail would be the same as those described in Section 4.4.1.5, *Cumulative Impacts* for Chinook salmon and steelhead.

4.4.7 Sacramento Hitch

Sacramento hitch is not listed under the ESA or CESA. However, Sacramento hitch is a California species of special concern (Moyle et al. 2015). CDFW classifies the current status of the species as Moderate Concern. Critical habitat for Sacramento hitch has not been designated.

Sacramento hitch once were found throughout the Central Valley in low elevation streams and rivers, and in the Delta. Presently, scattered populations of Sacramento hitch are found in the Sacramento River drainage, the San Joaquin River drainage downstream of the Merced River, a few larger tributaries to the San Francisco Estuary, and the Delta. Populations also have become established in several reservoirs in California as a result of introductions, including populations in several Southern California reservoirs that receive water from the California Aqueduct. (Moyle et al. 2015.)

Sacramento hitch inhabit a wide range of habitats, including clear streams, turbid sloughs, lakes, and reservoirs. In streams, they generally prefer shallow (less than 3 feet deep) stream habitats where they inhabit pools or runs containing aquatic vegetation and substrates ranging from mud to small gravel. Young Sacramento hitch also will use riffles. Sacramento hitch can withstand a wide range of water temperatures (up to 38°C [100.4°F] for short periods of time with proper acclimation), although they are most abundant in the wild in habitats that remain cooler than 25°C (77°F) in summer. Although found primarily in fresh water, they can tolerate salinities as high as 9 ppt. The spawning habits and requirements of Sacramento hitch are poorly understood; however, spawning has been documented in streams, ponds, and reservoirs from May to July. In

streams, Sacramento hitch spawn mainly in riffles and have been observed to spawn on vegetation. Spawning occurs at temperatures ranging from 14 to 26°C (57.2 to 78.8°F). In the first few months, young hitch occupy shallow water, often in close association with aquatic vegetation such as emergent tules. At about 50 mm fork length, juvenile hitch leave the shallows in favor of more open water. Young also will use floodplain habitats when available.

Sacramento hitch use the Sacramento River, including in the BSA, for migration and rearing.

4.4.7.1 Survey Results

Focused surveys for Sacramento hitch were not conducted. However, hitch are known to occur in the Sacramento River (Moyle 2002). Sacramento hitch may spawn on flood vegetation in the BSA, although specific spawning areas are not known.

4.4.7.2 Project Impacts

Alternative B

Project impacts on Sacramento hitch would be similar to those described in Section 4.4.1.2, *Project Impacts* for Chinook salmon and steelhead under Alternative B. In addition, because Sacramento hitch may spawn in the BSA, the proposed project has the potential to affect hitch eggs and larvae, and spawning habitat through exposure to underwater noise during pile driving activities and temporary effects on water quality (increased turbidity and suspended sediment), rearing and movement habitat (noise and shade), and channel substrates (cofferdams, and temporary trestles and barges); temporary and permanent effects on riparian, SRA cover, and floodplain habitat (vegetation removal, bridge and bike path construction); and permanent effects on aquatic habitat (construction of bridge piers, shade, and placement of RSP) in the Sacramento River. Because Sacramento hitch is not listed under the ESA, no take would be associated with implementation of the project.

Alternative C

Project impacts on Sacramento hitch would be similar to those described in Section 4.4.1.2, *Project Impacts* for Chinook salmon and steelhead under Alternative C. In addition, because Sacramento hitch may spawn in the BSA, the proposed project has the potential to affect hitch eggs and larvae, and spawning habitat through exposure to underwater noise during pile driving activities and temporary effects on water quality (increased turbidity and suspended sediment), rearing and movement habitat (noise and shade), and channel substrates (cofferdams, and temporary trestles and barges); temporary and permanent effects on riparian, SRA cover, and floodplain habitat (vegetation removal, bridge and bike path construction); and permanent effects on aquatic habitat (construction of bridge piers, shade, and placement of RSP) in the Sacramento River. Because Sacramento hitch is not listed under the ESA, no take would be associated with implementation of the project.

Impacts on Sacramento Hitch Critical Habitat

Critical habitat has not been designated for Sacramento hitch because the species is not listed under the ESA. Consequently, no impacts on Sacramento hitch critical habitat would result from implementation of the project.

4.4.7.3 Avoidance and Minimization Efforts

Implementation of Measures 1–5 and 14–22 would avoid or minimize the potential for construction-related effects on Sacramento hitch and its habitat in the BSA.

4.4.7.4 Compensatory Mitigation

Compensation for impacts on critical habitat (Measure 23) and loss of riparian and SRA cover habitat (Measure 4), as described above, also would benefit Sacramento hitch. No further compensatory mitigation would be required.

4.4.7.5 Cumulative Impacts

Cumulative effects on Sacramento hitch would be the same as those described in Section 4.4.1.5, *Cumulative Impacts* for Chinook salmon and steelhead.

4.4.8 Hardhead

Hardhead is not listed under the ESA or CESA, nor has critical habitat for hardhead been designated. However, hardhead is a California species of special concern. CDFW classifies the status of hardhead as Moderate Concern (Moyle et al. 2015).

Hardhead are a large cyprinid (minnow) and are widely distributed in low- to mid-elevation streams (to an elevation of approximately 5,000 feet) in the Sacramento-San Joaquin drainage from the Kern River in the south to the Pit River in the north. They also are present in the Napa and Russian Rivers and in some mid-elevation reservoirs (e.g., Redinger and Kerckhoff Reservoirs on the San Joaquin River, and Britton Reservoir on the Pit River). Although hardhead continue to be widely distributed, populations are becoming increasingly isolated from one another and are less abundant than they were historically (Moyle et al. 2015).

Hardhead typically are found in streams that exceed 68°F (20°C) during summer and appear to prefer temperatures of 75 to 82°F (24.9 to 27.8°C). Generally, they prefer pool and run habitats greater than 2.5 feet deep that contain substrates of sand, gravel, and boulders and with relatively slow water velocities. Hardhead always are found in association with Sacramento pikeminnow (another native cyprinid) and often are found with native Sacramento sucker. They generally tend to be absent from streams where introduced species (e.g., centrarchids [bass and sunfish]) are abundant and from streams that have been severely altered by dams and diversions, agriculture, urbanization, stream modification for transportation infrastructure, and alien species (Moyle 2002; Moyle et al. 2015).

Hardhead become sexually mature following their second year of life and spawn mainly during April and May; spawning may extend into August in some foothill streams. Adults in larger

rivers may make extensive migrations (more than 45 miles) during April and May to spawn in tributary streams. Spawning activity has not been documented; but reproductive behavior may involve mass spawning over gravel substrates in riffles, runs, and at the heads of pools. It is believed that hardhead larvae and post-larvae prefer stream margins with abundant cover and move into deeper water with increasing size (Moyle et al. 2015).

4.4.8.1 Survey Results

Focused surveys for hardhead were not conducted. However, hardhead are known to occur in the Sacramento River (Moyle 2002), and the BSA provides suitable habitat for rearing and movement. Hardhead are unlikely to spawn in the BSA.

4.4.8.2 Project Impacts

Alternative B

Project impacts on hardhead would be similar to those described in Section 4.4.1.2, *Project Impacts* for Chinook salmon and steelhead under Alternative B. The proposed project has the potential to affect hardhead through exposure to underwater noise during pile driving activities, and temporary effects on water quality (increased turbidity and suspended sediment), rearing and movement habitat (noise and shade), and channel substrates (cofferdams, and temporary trestles and barges); temporary and permanent effects on riparian, SRA cover, and floodplain habitat (vegetation removal, bridge and bike path construction); and permanent effects on aquatic habitat (construction of bridge piers, shade, and placement of RSP) in the Sacramento River. Because hardhead is not listed under the ESA, no take would be associated with implementation of the project.

Alternative C

Project impacts on hardhead would be similar to those described in Section 4.4.1.2, *Project Impacts* for Chinook salmon and steelhead under Alternative C. The proposed project has the potential to affect hardhead through exposure to underwater noise during pile driving activities and temporary effects on water quality (increased turbidity and suspended sediment), rearing and movement habitat (noise and shade), and channel substrates (cofferdams, and temporary trestles and barges); temporary and permanent effects on riparian, SRA cover, and floodplain habitat (vegetation removal, bridge and bike path construction); and permanent effects on aquatic habitat (construction of bridge piers, shade, and placement of RSP) in the Sacramento River. Because hardhead is not listed under the ESA, no take would be associated with implementation of the project.

Impacts on Sacramento Hitch Critical Habitat

Critical habitat has not been designated for hardhead because the species is not listed under the ESA. Consequently, no impacts on hardhead critical habitat would result from implementation of the project.

4.4.8.3 Avoidance and Minimization Efforts

Implementation of Measures 1–5 and 14–22 would avoid or minimize the potential for construction-related effects on hardhead and its habitat in the BSA.

4.4.8.4 Compensatory Mitigation

Compensation for impacts on critical habitat (Measure 23) and loss of riparian and SRA cover habitat (Measure 4), as described above, also would benefit hardhead. No further compensatory mitigation would be required.

4.4.8.5 Cumulative Impacts

Cumulative effects on hardhead would be the same as those described in Section 4.4.1.5, *Cumulative Impacts* for Chinook salmon and steelhead.

4.4.9 Pacific Lamprey

Pacific lamprey is a federal species of concern (U.S. Fish and Wildlife Service 2016) and a California species of special concern (Moyle et al. 2015). CDFW classifies the current status of the species as Moderate Concern (Moyle et al. 2015). Critical habitat for Pacific lamprey has not been designated.

Historically, the distribution of Pacific lamprey was thought to be similar to that for salmon and steelhead; however, recent data indicate that their distribution has been reduced in many areas for most of the same reasons that salmon and steelhead populations have declined—most notably dam construction (U.S. Fish and Wildlife Service 2016). Both historical and current abundance and distribution data are lacking. Pacific lamprey currently is found along the coast of the Pacific Ocean from Japan to Baja California, and anadromous forms occur in the rivers of the Central Valley below impassable dams (Moyle et al. 2015).

Adult Pacific lamprey spend the predatory phase of the life in the ocean and migrate into freshwater streams from January through June to spawn (Moyle 2002). Most movement occurs at night. Adults spawn by constructing a nest in gravelly areas of streams containing relatively fast velocities and with depths of 1 to 5 feet (Moyle 2002). After hatching, juvenile lamprey (ammocoetes) spend a short period in the nest before being washed downstream to areas of soft sand or mud where they burrow tail first into the substrate. It is thought that ammocoetes spend the next 5 to 7 years filter feeding in fresh water before metamorphosing into adult forms and migrating to the ocean (in winter and spring) where they prey on a wide variety of fishes, including salmon (Moyle 2002).

Pacific lamprey use the Sacramento River, including in the BSA, for migration and rearing. Spawning and egg incubation do not occur in the BSA (Moyle 2002).

4.4.9.1 Survey Results

Focused surveys for Pacific lamprey were not conducted. Based on their life history, Pacific lamprey are likely to be present in the BSA year-round as ammocoetes (larvae) living in the soft-

bottomed substrates, seasonally as juveniles migrating to the Delta and Pacific Ocean, and as adults making their way upstream toward spawning grounds.

4.4.9.2 Project Impacts

Alternative B

Project impacts on Pacific lamprey would be similar to those described in Section 4.4.1.2, *Project Impacts* for Chinook salmon and steelhead under Alternative B. The proposed project has the potential to affect Pacific lamprey through exposure to underwater noise during pile driving activities and temporary effects on water quality (increased turbidity and suspended sediment), rearing and movement habitat (noise and shade), and channel substrates (cofferdams, and temporary trestles and barges); temporary and permanent effects on riparian, SRA cover, and floodplain habitat (vegetation removal, bridge and bike path construction); and permanent effects on aquatic habitat (construction of bridge piers, shade, and placement of RSP) in the Sacramento River. Because Pacific lamprey is not listed under the ESA, no take would be associated with implementation of the project.

Alternative C

Project impacts on Pacific lamprey would be similar to those described in Section 4.4.1.2, *Project Impacts* for Chinook salmon and steelhead under Alternative C. The proposed project has the potential to affect Pacific lamprey through exposure to underwater noise during pile driving activities and temporary effects on water quality (increased turbidity and suspended sediment), rearing and movement habitat (noise and shade), and channel substrates (cofferdams, and temporary trestles and barges); temporary and permanent effects on riparian, SRA cover, and floodplain habitat (vegetation removal, bridge and bike path construction); and permanent effects on aquatic habitat (construction of bridge piers, shade, and placement of RSP) in the Sacramento River. Because Pacific lamprey is not listed under the ESA, no take would be associated with implementation of the project.

Impacts on Pacific Lamprey Critical Habitat

Critical habitat has not been designated for Pacific lamprey because the species is not listed under the ESA. Consequently, no impacts on Pacific lamprey critical habitat would result from implementation of the project.

4.4.9.3 Avoidance and Minimization Efforts

Implementation of Measures 1–5 and 14–22 would avoid or minimize the potential for construction-related effects on Pacific lamprey and its habitat in the BSA.

4.4.9.4 Compensatory Mitigation

Compensation for impacts on critical habitat (Measure 23) and loss of riparian and SRA cover habitat (Measure 4), as described above, also would benefit Sacramento splittail. No further compensatory mitigation would be required.

4.4.9.5 Cumulative Impacts

Cumulative effects on Pacific lamprey would be the same as those described in Section 4.4.1.5, *Cumulative Impacts* for Chinook salmon and steelhead.

4.4.10 Western River Lamprey

Western river lamprey (river lamprey, *Lampetra ayresi*) is a California species of special concern but has no other state or federal listing status (Moyle et al. 1995; 69 FR 77158). Although river lamprey is widely believed to be in decline, the species' exact status is uncertain, partly because it is often overlooked and seldom studied. Both historical and current abundance and distribution data are lacking.

River lamprey are found from San Francisco Bay in California to near Juneau, Alaska; however, detailed information on its distribution is lacking. Generally, river lamprey are associated with specific lower portions of large river systems, including the Fraser (Canada), Columbia, Klamath, Eel, and Sacramento Rivers (69 FR 77158). In California, river lamprey occur in the lower Sacramento River, lower San Joaquin River and its tributaries (Stanislaus and Tuolumne Rivers), Salmon Creek and tributaries to the lower Russian River in Sonoma County, and the Trinity and Klamath Rivers (69 FR 77158). Historically, river lamprey have been reported in Alameda Creek, Cache Creek, Napa River, and Sonoma Creek, although the population in Cache Creek is believed to be extirpated (Moyle et al. 1995; Moyle 2002; 69 FR 77158). Precise knowledge of the distribution of river lamprey in California is limited because of a lack of data and only a basic understanding of its life history (Moyle 2002).

Limited information is available regarding the life history of this species in California, and current accounts are based largely on information from Canadian populations (Moyle 2002). River lamprey are semelparous (i.e., they die after spawning) anadromous fish with long freshwater rearing periods. Adults return to fresh water to spawn in fall and winter, but spawning usually occurs in February through May in gravely riffles (Moyle 2002). Juvenile river lamprey (ammocoetes) remain in silty backwater habitats where they filter feed on various microorganisms for approximately 3 to 5 years; they then migrate to the ocean during late spring after completing the transformation from ammocoete to adult (the process of metamorphosis takes 9 to 10 months) (Moyle et al. 1995; Moyle 2002).

River lamprey use the Sacramento River, including in the BSA, for migration and rearing. Spawning and egg incubation do not occur in the BSA (Moyle 2002).

4.4.10.1 Survey Results

Focused surveys for river lamprey were not conducted. Based on their life history, river lamprey are likely to be present in the BSA year-round as ammocoetes (larvae) living in the soft-bottomed substrates, seasonally as juveniles migrating to the Delta and Pacific Ocean, and as adults making their way upstream toward spawning grounds.

4.4.10.2 Project Impacts

Alternative B

Project impacts on river lamprey would be similar to those described in Section 4.4.1.2, *Project Impacts* for Chinook salmon and steelhead under Alternative B. The proposed project has the potential to affect river lamprey through exposure to underwater noise during pile driving activities and temporary effects on water quality (increased turbidity and suspended sediment), rearing and movement habitat (noise and shade), and channel substrates (cofferdams, and temporary trestles and barges); temporary and permanent effects on riparian, SRA cover, and floodplain habitat (vegetation removal, bridge and bike path construction); and permanent effects on aquatic habitat (construction of bridge piers, shade, and placement of RSP) in the Sacramento River. Because river lamprey is not listed under the ESA, no take would be associated with implementation of the project.

Alternative C

Project impacts on Pacific lamprey would be similar to those described in Section 4.4.1.2, *Project Impacts* for Chinook salmon and steelhead under Alternative C. The proposed project has the potential to affect river lamprey through exposure to underwater noise during pile driving activities and temporary effects on water quality (increased turbidity and suspended sediment), rearing and movement habitat (noise and shade), and channel substrates (cofferdams, and temporary trestles and barges); temporary and permanent effects on riparian, SRA cover, and floodplain habitat (vegetation removal, bridge and bike path construction); and permanent effects on aquatic habitat (construction of bridge piers, shade, and placement of RSP) in the Sacramento River. Because river lamprey is not listed under the ESA, no take would be associated with implementation of the project.

Impacts on River Lamprey Critical Habitat

Critical habitat has not been designated for river lamprey because the species is not listed under the ESA. Consequently, no impacts on river lamprey critical habitat would result from implementation of the project.

4.4.10.3 Avoidance and Minimization Efforts

Implementation of Measures 1–5 and 14–22 would avoid or minimize the potential for construction-related effects on river lamprey and its habitat in the BSA.

4.4.10.4 Compensatory Mitigation

Compensation for impacts on critical habitat (Measure 23) and loss of riparian and SRA cover habitat (Measure 4), as described above, also would benefit river lamprey. No further compensatory mitigation would be required.

4.4.10.5 Cumulative Impacts

Cumulative effects on river lamprey would be the same as those described in Section 4.4.1.5, *Cumulative Impacts* for Chinook salmon and steelhead

4.4.11 Essential Fish Habitat

The MSA, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267) and the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006 (Public Law 109-479), requires federal agencies to consult with NMFS on activities that may adversely affect EFH for salmon managed by the Pacific Fishery Management Council under the Pacific Coast Salmon Fishery Management Plan (FMP) (Pacific Fishery Management Council 2016). The managed salmon species occurring in the Sacramento River and in the BSA, and potentially affected by the project, are Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, and CV fall- and late fall–run Chinook salmon.

Freshwater EFH for Chinook salmon consists of four major components: (1) spawning and incubation; (2) juvenile rearing; (3) juvenile migration corridors; and (4) adult migration corridors and holding habitat. Freshwater EFH depends on lateral (floodplain, riparian), vertical (hyporheic), and longitudinal connectivity to create habitat conditions for spawning, rearing, and migration, including: (1) water quality (dissolved oxygen, nutrients, and temperature); (2) water quantity, depth, and velocity; (3) riparian-stream-marine energy exchanges; (4) channel gradient and stability; (5) prey availability; (6) cover and habitat complexity (large woody material, pools, and aquatic and terrestrial vegetation); (7) space; (8) habitat connectivity (dispersal corridors) from headwaters to the ocean; (9) groundwater-stream interactions; and (10) substrate composition. (Pacific Fishery Management Council 2014.)

EFH designated under the FMP may be adversely affected by the proposed project. Habitat areas of particular concern (HAPCs) that may be directly or indirectly adversely affected include complex channels and floodplain habitat, and thermal refugia.

Effects on EFH and HAPCs for Chinook salmon would be similar to the impacts on species and critical habitat described in Section 4.4.1.2, *Project Impacts* for Chinook salmon and steelhead.

The following environmental conditions potentially affect Chinook salmon EFH and HAPCs.

- Sedimentation and turbidity.
- Hazardous materials and contaminant-related effects.
- Disturbance and direct injury.
- Temporary and permanent loss of aquatic habitat.
- Temporary and permanent loss of SRA cover habitat.

Effects on Pacific salmon EFH and HAPCs associated with sedimentation and turbidity, hazardous materials and contaminants, disturbance and direct injury, and habitat loss would be temporary. Potential adverse effects on EFH of increased fine sediment and turbidity would be

avoided or minimized through implementation of all applicable BMPs. The potential environmental effects of the project would be limited to short-term, localized, and minor increases in turbidity and suspended sediment. Implementation of the SWPPP along with applicable BMPs would substantially reduce or eliminate the potential for an accidental spill and unintentional discharge of contaminants, with potential associated effects on EFH. Potential injury to and mortality of fish associated with pile driving would be avoided or minimized by the following.

- During impact driving, limiting the number of strikes per day to the minimum necessary to complete the work, with the total maximum number of hammer strikes limited to 32,000 strikes per day (i.e., 1,600 hammer strikes per pile, per day) for piles for the temporary trestles, 20,000 strikes per day (i.e., 1,000 hammer strikes per pile, per day) for the piles for the bridge fender system, 12,800 strikes per day (i.e., 1,600 hammer strikes per pile, per day) for piles for the fixed span piers, 6,000 strikes per day (i.e., 1.500 strikes per pile, per day) for the CISS piles for the movable span piers.
- Using vibratory hammers whenever feasible.
- Using a bubble ring or similar device to minimize the magnitude and extent of potentially harmful underwater noise levels.
- Conducting pile driving during daylight hours only.
- Limiting in-water construction, including pile driving, to the proposed in-water construction window (May 1–November 30).

Long-term and permanent effects on EFH and HAPCs would be limited to the net loss of aquatic habitat (substrate, water column) associated with the new bridge piers and SRA cover habitat associated with the footprints for the bridge and bike trails. The displacement of EFH and HAPCs would be insignificant compared to the total extent of EFH available to these species in the Sacramento River.

The proposed project would adversely affect EFH; however, the temporary and permanent effects would be small relative to the total EFH available in the Sacramento River. Compensation for the permanent loss of critical habitat for Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, and CCV steelhead, as described in Section 4.4.1.4, *Compensatory Mitigation*, also would benefit EFH for Chinook salmon.

4.5 Other Protected and Managed Biological Resources

4.5.1 Migratory Birds

Several non-special-status migratory birds, including red-tailed hawk (*Buteo jamaicensis*), killdeer, Anna's hummingbird (*Calypte anna*), and northern mockingbird, could nest on the ground or in shrubs or trees in and adjacent to the limits of disturbance for proposed project construction. These generally common species are locally and regionally abundant. The breeding season for most birds generally is from February 1 to August 31. The occupied nests and eggs of migratory birds are protected by federal and state laws, including the MBTA and CFCG

Sections 3503 and 3503.5. USFWS is responsible for overseeing compliance with the MBTA, and CDFW is responsible for overseeing compliance with the CFGC and making recommendations on nesting bird and raptor protection.

4.5.1.1 Survey Results

Suitable nesting habitat for migratory birds is present within the cottonwood riparian forest and landscaped areas, and on buildings within the BSA.

No active nests were observed during reconnaissance-level surveys.

4.5.1.2 Project Impacts

Alternative B

Permanent and Temporary Direct Impacts

The project has the potential to affect nesting migratory birds either through direct injury or mortality during ground-disturbing activities or by disrupting normal behaviors, including nesting during both interim and ultimate design years.

Indirect Impacts

Vehicle traffic on the new bridge could result in some amount of increased disturbance to birds nesting along the Sacramento River; however, considering the existing conditions along both sides of the river, this increase would not be substantial.

Alternative C

Alternative C (interim and ultimate) would similarly affect migratory birds but would result in greater permanent and temporary impacts on habitat for migratory birds than Alternative B. Table 4-1 lists the permanent and temporary impacts on cottonwood riparian forest and landscaped areas that provide potential nesting habitat for migratory birds.

4.5.1.3 Avoidance and Minimization Efforts

Implementation of Measures 1–3, 10, and 12 would avoid or reduce potential impacts on migratory birds.

4.5.1.4 Compensatory Mitigation

No compensatory mitigation is required.

4.5.1.5 Cumulative Impacts

Cumulative impacts on migratory birds would result from construction and operation of other general development, transportation, and levee projects in Sacramento and Yolo Counties. The permanent and temporary direct impacts that would result from implementation of the proposed

project would contribute to cumulative impacts. Alternative C would have a greater contribution than Alternative B. For both alternatives, implementation of Measures 1–3, 10, and 12 to ensure that the proposed project avoids or minimizes potential impacts would reduce the project's contribution to a less than cumulatively considerable level.

4.5.2 Non-Special-Status Bats

Bats have the potential to nest in built structures and trees within the BSA. CFGC Section 4150 states that nongame mammals or parts thereof may not be taken or possessed, as provided in the code or in accordance with regulations adopted by the California Fish and Game Commission, which would include common bat species.

4.5.2.1 Survey Results

No directed surveys for bats were conducted for the proposed project; however, the buildings and trees within the BSA represent potential roosting habitat for bats. Several trees on both sides of the river have suitable habitat for foliage-roosting bats and cavity-roosting bats.

4.5.2.2 Project Impacts

Alternative B

Permanent and Temporary Direct Impacts

Under Alternative B (interim and ultimate), cottonwood riparian forest, individual trees in landscaped areas, and buildings, which represent potential roosting habitat for bats in the BSA, would be removed. Table 4-1 lists the permanent and temporary impacts on cottonwood riparian under Alternative B.

Project construction could result in injury to or mortality of bat species if occupied roost sites are removed at times when bats are not awake and active (e.g., early in the day, periods of cold weather).

Indirect Impacts

No indirect impacts from the project on bat species are anticipated.

Alternative C

Alternative C (interim and ultimate) would similarly affect special-status bats but would result in greater permanent and temporary impacts on habitat for the species than Alternative B. Table 4-1 lists the permanent and temporary impacts on cottonwood riparian and landscaped areas that provide suitable bat roosting habitat for bat species

4.5.2.3 Avoidance and Minimization Efforts

Implementation of Measures 1–3, 10, and 13 would ensure that construction activities avoid and minimize potential impacts on bats.

4.5.2.4 Compensatory Mitigation

No compensatory mitigation specifically for bat species is proposed. Measure 4 would compensate for the loss of cottonwood riparian habitat.

4.5.2.5 Cumulative Impacts

Cumulative impacts on non-special-status bat species would result from removal of suitable roosting habitat, including cottonwood riparian forest, through construction of other general development and levee projects in Sacramento and Yolo Counties. The permanent and temporary impacts on cottonwood riparian habitat that would result from implementation of the proposed project would contribute to cumulative impacts. Alternative C would have a greater contribution than Alternative B. For both alternatives, implementation of Measures 1–3, 10, and 13 to ensure that construction activities avoid or minimize potential impacts would reduce the project's contribution to a less than cumulatively considerable level. Implementation of Measure 4 also would compensate for the loss of cottonwood riparian habitat.

4.5.3 Protected Trees

A list of trees, by species, with a diameter of 4.5 feet above ground of 6 inches or greater was recorded for the accessible parts of the BSA (Appendix F). On private property, the City of Sacramento protects all trees with a dsh of 24 inches or greater on undeveloped land or commercial or industrial property; native oaks, California buckeye, western sycamore with a dsh of 12 inches or greater; and all trees in a riparian zone with a dsh of 12 inches or greater. The City of Sacramento also protects all city street trees. The City of West Sacramento Tree Preservation Ordinance protects all trees with a dbh of 24 inches or greater, native oaks with a dbh of 16 inches or greater, and street trees.

4.5.3.1 Survey Results

Tree species observed in the BSA occur in cottonwood riparian forest and landscaped communities. They include boxelder, white alder, deodar cedar, camphortree, Italian cypress, Oregon ash, California black walnut, London plane tree, western sycamore, Fremont's cottonwood, pines, valley oak, black locust, Goodding's black willow, elm, and California fan palm. Not all street trees in the BSA were included in the tree survey, and additional protected street trees likely are not accounted for in these estimates.

4.5.3.2 Project Impacts

The tree species located specifically in the project footprint include boxelder, camphortree, Oregon ash, western sycamore, Fremont's cottonwood, valley oak, Goodding's black willow, and elm. Approximately 33 trees in the project footprint meet the tree ordinance criteria for the city in which they occur—approximately 13 trees in West Sacramento and 20 trees in Sacramento (Appendix F). Implementation of the proposed project would result in loss of protected trees within the proposed project footprint from construction activities related to the abutments for the fixed-span approach structures and bike trails on both the City of West Sacramento and City of Sacramento sides (Appendix A, Figures 6 and 7).

Construction during the ultimate design year phase would include completion of roads for the full buildout of the approved mobility network (Appendix A, Figures 6 and 7). Because none of these roads occur in riparian habitat and would not affect street trees, this phase of construction would not affect protected trees. Impacts on protected trees would be the same for any proposed bridge design (bascule, vertical lift, swing). The impact discussions below, therefore, focus on the interim design year phases of the two alternative alignments.

Under either build alternative, state agencies would require avoidance, minimization, and compensatory mitigation for the loss of riparian trees, as described in Section 4.1.1.2, *Project Impacts* for cottonwood riparian forest. CDFW will require an LSAA for construction within the riparian habitat and compensation for removed trees and riparian habitat. The City of West Sacramento and City of Sacramento will require compensation for loss of protected riparian and street trees. The loss of protected trees that are within cottonwood riparian forest habitat would be mitigated based on the loss of riparian habitat and implementation of Measure 4. The loss of protected street trees that are in ruderal or landscaped habitat would be mitigated as described below in Measure 24.

Alternative B

Construction of the proposed project Alternative B would remove up to four protected riparian trees and potentially several street trees in the City of West Sacramento and up to eight protected riparian trees and additional street trees in the City of Sacramento. Trees would be removed for construction of abutments for the two fixed-span bridge approach structures and the bike trails on both the City of Sacramento and City of West Sacramento sides.

Additional temporary impacts on protected trees could occur during construction due to trimming of trees for construction access. However, the protection measures in each city's tree ordinance would be implemented to avoid impacts on protected trees outside of the permanent impact area.

Alternative C

Construction of the proposed project Alternative C would remove up to 6 protected riparian trees and potentially several street trees in the City of West Sacramento and up to 13 protected riparian trees and additional street trees in the City of Sacramento. Trees would be removed for construction of abutments for the two fixed-span bridge approach structures and the bike trails on both the City of Sacramento and City of West Sacramento sides.

Additional temporary impacts on protected trees under Alternative C would be the same as described above for Alternative B.

4.5.3.3 Avoidance and Minimization Efforts

Implementation of Measures 1–3 would ensure that the proposed project minimizes effects on protected trees adjacent to the project construction area.

4.5.3.4 Compensatory Mitigation

Implementation of Measure 24 would compensate for the loss of protected trees in the City of West Sacramento and the City of Sacramento. As noted above, mitigation for the loss of trees in the cottonwood riparian forest would be accomplished through implementation of Measure 4.

Measure 24: Compensate for Loss of Protected Trees in Landscaping or Ruderal Habitat

Within 1 year prior to construction, the project proponent will conduct a preconstruction inventory of all trees to be removed. The inventory will include the location, species, diameter of all trunks, approximate height and canopy diameter, and approximate age, in support of a tree permit for removal of the protected trees. All conditions of the tree permits will be implemented.

The project proponent will mitigate the loss of protected street trees using one or a combination of the two following options.

- Because it is unlikely that adequate space will be available in the project area for tree planting after construction, pay in-lieu fees to the City of West Sacramento and the City of Sacramento, based on the tree removal locations, which would be used to purchase and plant trees elsewhere in West Sacramento and Sacramento. Replacement trees will be required at a ratio of 1:1 (i.e., 1 inch diameter of replacement tree planted for every 1 inch diameter of tree removed). Replacement trees will be of the same species, except for the replacement of black locust, which is an invasive species and will be replaced with a native tree species. Mitigation will be subject to approval by the City's tree administrator and will take into account species affected, replacement species, location, health and vigor, habitat value, and other factors to determine fair compensation for tree loss. Replacement trees will be monitored annually for 3 years to document their vigor and survival. If any of the original replacement trees die within 3 years of the initial planting, the project proponent will plant additional replacement trees and monitor them until all trees survive for a minimum of 3 years after planting.
- If feasible, plant replacement trees at or near the location of the tree removal, following the same replacement ratio, species, monitoring, and tree survival requirements described for the option above.

4.5.3.5 Cumulative Impacts

Cumulative impacts on protected trees would result from construction of other general development projects in the City of West Sacramento and the City of Sacramento. The removal of protected riparian trees and several street trees that would result from construction of the proposed project would contribute to cumulative impacts. Alternative C would remove more trees than Alternative B, resulting in a greater cumulative contribution. For both alternatives, implementation of Measures 1–3 and compensatory Measure 24 would reduce the project's contribution to a less than cumulatively considerable level.

4.5.4 Invasive Plants

Invasive plant species include species designated as federal noxious weeds by the USDA, species listed by the CDFA, and invasive plants identified by Cal-IPC. Invasive plants displace native species, change ecosystem processes, alter plant community structure, and lower wildlife habitat quality. Road, highway, and related construction projects are some of the principal dispersal pathways for invasive plants and their propagules (California Invasive Plant Council 2012). FHWA requires that state departments of transportation use the respective state's noxious weed list to identify invasive plant species that could be spread by construction of transportation projects. Table 3-5 in Chapter 3 lists the invasive plant species identified by CDFA and Cal-IPC that are known to occur in the BSA (Natural Resources Conservation Service 2003; California Invasive Plant Council 2018). No plant species designated as federal noxious weeds have been identified in the BSA (Natural Resources Conservation Service 2010).

4.5.4.1 Survey Results

Table 3-3 in Chapter 3 identifies the invasive plant species located in the BSA. Invasive plant species occur in riparian forest, ruderal, landscaped, and disturbed/graded areas. The infestation of the BSA by these species generally is limited; they occur primarily as scattered individuals.

4.5.4.2 Project Impacts

Construction impacts due to the potential introduction and spread of invasive plant species would be the same under both Alternatives B and C.

Permanent and Temporary Direct Impacts

The proposed project has the potential to create additional disturbed areas for a temporary period and to introduce and spread invasive plant species to uninfected areas within and adjacent to the BSA. This would be of particular concern for sensitive natural communities, where non-native invasive plants could outcompete and replace native vegetation. Implementation of Measures 1–3 and Measure 25 below would help to prevent the introduction and spread of invasive plants.

4.5.4.3 Avoidance and Minimization Efforts

Implementation of Measures 1–3 and Measure 25 would ensure that the proposed project minimizes effects due to the introduction and spread of invasive plants.

Measure 25: Avoid the Introduction and Spread of Invasive Plants

The project proponent or their contractor will be responsible for avoiding the introduction of new invasive plants and the spread of invasive plants previously documented in the study area. The following measures will be implemented during construction.

- Educate construction supervisors and managers on weed identification and the importance of controlling and preventing the spread of invasive weeds.

- Dispose of invasive species material removed during project construction offsite at an appropriate disposal facility to avoid the spread of invasive plants into natural areas.
- Minimize surface disturbance to the greatest extent feasible to complete the work.
- Use weed-free imported erosion-control materials (or rice straw in upland areas).
- Use locally grown native plant stock and native or naturalized (noninvasive) grass seed during revegetation.
- If feasible, remove black locust trees from the riparian forest in and adjacent to the impact area on the Sacramento side of the bridge.

4.5.4.4 Compensatory Mitigation

Implementation of avoidance and minimization efforts would minimize or prevent the spread of invasive plants; therefore, no compensatory mitigation for invasive plant species is required.

4.5.4.5 Cumulative Impacts

Cumulative impacts caused by the spread of invasive weed species would result from other projects in Yolo and Sacramento Counties. Construction of the proposed project has the potential to spread invasive weed species and contribute to the cumulative impact. For both alternatives, implementation of Measures 1–3 and 25 would reduce the project's contribution to a less than cumulatively considerable level.

Chapter 5 Conclusions and Regulatory Determinations

Permits for and compliance with the federal, state, and local regulations listed in Table 5-1 may be required prior to construction of the proposed project.

Table 5-1. Permits and Approvals Potentially Required for the Proposed Project

Permit/Approval	Approving Agency
Endangered Species Act Section 7: inter-agency consultation	U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS)
California Endangered Species Act and Section 2081(b) (Incidental Take Permit)	California Department of Fish and Wildlife (CDFW)
Magnuson-Stevens Fishery Conservation and Management Act	NMFS
Clean Water Act (CWA) Section 404: placement of fill	U.S. Army Corps of Engineers (USACE), Sacramento District
CWA Section 401: Water Quality Certification	Central Valley Regional Water Quality Control Board
Rivers and Harbors Act of 1899 (RHA) Section 9 and General Bridge Act of 1946: Bridge Permit	U.S. Coast Guard, District 11
RHA Section 10: Permit for Work in Navigable Waters	USACE, Sacramento District
Executive Order (EO) 11990: Protection of Wetlands	Federal Highway Administration (FHWA)
EO 12962: Recreational Fisheries	FHWA
EO 13112: Prevention and Control of Invasive Species	FHWA
EO 13186: Migratory Bird Treaty Act	FHWA
Senate Bill 857: Fish Passage Assessment	CDFW
California Fish and Game Code (CFGC) Section 1602	CDFW
CFGC Sections 3503 and 3503.5: protection of birds and raptors	CDFW
CFGC Sections 3511, 3513, 4700, and 5050: fully protected species	CDFW
California Code of Regulations Title 2 Section 2002: Land Use Lease	State Lands Commission
Encroachment Permit	Central Valley Flood Protection Board
Approval of changes to levee	Sacramento Area Flood Control Agency
Approval of changes to levee	West Sacramento Area Flood Control Agency
Formal notification prior to construction	Sacramento Metropolitan Air Quality Management District
Formal notification prior to construction	Yolo-Solano Air Quality Management District
Tree removal permit	City of West Sacramento, City of Sacramento

A summary of consultation and coordination efforts related to the listed permits and approvals is provided below.

5.1 Federal Endangered Species Act Consultation Summary

Inter-agency consultation with NMFS and USFWS under Section 7 of the ESA is required for potential effects of the proposed project on Sacramento River winter-run Chinook salmon (including designated critical habitat) (NMFS), CV spring-run Chinook salmon (including

designated critical habitat) (NMFS), CCV steelhead (including designated critical habitat) (NMFS), green sturgeon (including designated critical habitat) (NMFS), delta smelt (including designated critical habitat) (USFWS), and VELB (USFWS). To date, there has been no ESA consultation with USFWS or NMFS for the proposed project. A BA will be prepared and submitted to USFWS for VELB and delta smelt. A Biological Opinion from the USFWS will be required. A separate BA will be prepared and submitted to NMFS for the remaining federally listed anadromous fish species listed above.

Table 5-2 lists the effects determinations for federally listed species that were identified on the USFWS and NMFS lists.

Table 5-2. Effects Determinations for Federally Listed Species

Species	Effect Determination
Valley elderberry longhorn beetle	May affect, not likely to adversely affect
Vernal pool fairy shrimp	No effect
Vernal pool tadpole shrimp	No effect
California red-legged frog	No effect
California tiger salamander	No effect
Giant garter snake	No effect
Least Bell's vireo	No effect
Sacramento River winter-run Chinook salmon	May affect, likely to adversely affect
Central Valley spring-run Chinook salmon	May affect, likely to adversely affect
California Central Valley steelhead	May affect, likely to adversely affect
North American green sturgeon	May affect, likely to adversely affect
Delta smelt	May affect, likely to adversely affect
Sacramento River winter-run Chinook salmon critical habitat	May affect, likely to adversely affect
Central Valley spring-run Chinook salmon critical habitat	May affect, likely to adversely affect
California Central Valley steelhead critical habitat	May affect, likely to adversely affect
North American green sturgeon critical habitat	May affect, likely to adversely affect
Delta smelt critical habitat	May affect, likely to adversely affect

5.2 Essential Fish Habitat Consultation Summary

Consultation with NMFS is required for potential adverse effects of the project on EFH. An EFH assessment addressing adverse effects on EFH for Pacific Coast salmon (i.e., Chinook salmon) will be prepared jointly with the BA that is being prepared for submittal to NMFS. The effects determination for Chinook salmon EFH is *may adversely affect*.

5.3 California Endangered Species Act Consultation Summary

Five state-listed species, Swainson's hawk, Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, delta smelt, and longfin smelt, have the potential to occur in the BSA. To date, there has been no CESA consultation with CDFW for the proposed project. A Section 2081 Incidental Take Permit may be required for Swainson's hawk, Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, delta smelt, and longfin smelt

because of the potential for take of these species to occur. Based on timing restrictions for pile driving (must occur during the no-migration period for listed fish species), this activity may overlap with the nesting season of Swainson's hawks. Because the BSA is in an area with the potential to be occupied by nesting Swainson's hawk, there is a high likelihood that an active nest would be present within 0.25 mile of pile driving. Therefore, a Section 2081 Incidental Take Permit may be required by CDFW in order to conduct pile driving during the nesting season.

5.4 Wetlands and Other Waters Coordination Summary

To date, there has been no CWA, Porter-Cologne Act, or CFGC Section 1600 coordination for the project with the USACE, RWQCB, State Water Board, or CDFW. A delineation of aquatic resources has been conducted for the proposed project, and a delineation report (Appendix A) is pending submittal to the USACE for a preliminary jurisdictional determination. The proposed placement of temporary and permanent fill materials in the Sacramento River will require a CWA Section 404 Permit, CWA Section 401 Water Quality Certification, RHA Section 9 bridge permit and Section 10 permit, CFGC Section 1602 LSAA, and Land Use Lease. With implementation of the avoidance and minimization measures described in Chapter 4, the proposed project will comply with EO 11990 and will not result in a loss of wetland functions and values.

5.5 Invasive Species

Within the BSA, invasive plant species (listed in Table 3-5 of Chapter 3) were identified in landscaped, ruderal, disturbed/graded areas, and—to a lesser extent, riparian forest habitats. None of these species are designated as federal noxious weeds by the Natural Resources Conservation Service. With implementation of the avoidance and minimization measures described in Chapter 4, the proposed project will comply with EO 13112 and will not result in new, severe infestations of invasive plant species.

5.6 Other Regulations

5.6.1 Federal Migratory Bird Treaty Act

The BSA provides ground and tree nesting habitat for migratory birds. The project proponent will avoid violation of the MBTA by implementing measures identified in Chapter 4 for migratory birds, including preconstruction surveys and establishment of no-disturbance buffers around active nests.

5.6.2 Fish Passage Assessment (Senate Bill 857)

By order of Senate Bill 857, Caltrans is required to conduct a fish passage assessment for projects receiving state or federal transportation funds that affect stream crossings where

anadromous salmonids are, or historically were, present. A fish passage reconnaissance assessment for the BSA was conducted on August 24, 2017, by an ICF fish biologist. The results of the fish passage reconnaissance assessment are presented in Chapter 3.

5.6.3 California Fish and Game Code

Sections 1602, 3503, 3503.5, 3511, 3513, 4700, and 5050 of the CFGC apply to the proposed project and are described below.

5.6.3.1 Section 1602: Lake or Streambed Alteration Agreements

The project proponent will enter into an LSAA with CDFW for effects within the bed and bank of the Sacramento River.

5.6.3.2 Sections 3503 and 3503.5: Protection of Birds and Raptors

The project proponent will avoid violation of CFGC Sections 3503 and 3503.5 by implementing measures identified in Chapter 4 for birds and raptors, including preconstruction surveys and establishment of no-disturbance buffers around active nests.

5.6.3.3 Sections 3511, 3513, 4700, and 5050: Fully Protected Species

The project proponent will avoid violation of CFGC Section 3511 (fully protected birds) by implementing measures identified in Chapter 4 for white-tailed kite, including preconstruction surveys and establishment of no-disturbance buffers around active nests.

5.6.4 City of West Sacramento Tree Preservation Ordinance

The City of West Sacramento will comply with their Tree Preservation Ordinance by obtaining a tree permit prior to the removal or disturbance of any protected tree that would be affected within the City of West Sacramento's jurisdiction. The City of West Sacramento will implement all applicable permit conditions and comply with the required tree mitigation. Trees that will be preserved during project construction will be protected prior to ground-disturbing activities by installing and maintaining barrier fencing around the dripline of the tree. Removed protected trees in riparian habitat will be mitigated at a mitigation bank with riparian habitats, and removed protected trees in other habitats will be mitigated per the ordinance by planting replacement trees within the City of West Sacramento. With implementation of the avoidance and minimization measures described in Chapter 4, the proposed project will comply with the City of West Sacramento Tree Preservation Ordinance.

5.6.5 City of Sacramento Municipal Code

The City of Sacramento will comply with their municipal code relating to protection of landmark, heritage, and street trees during project construction. Trees that will be preserved

during project construction will be protected prior to ground-disturbing activities by installing and maintaining barrier fencing around the dripline of the tree. Removed protected trees will be mitigated at a mitigation bank with riparian habitats and by replanting in the city. With implementation of the avoidance and minimization measures described in Chapter 4, the proposed project will comply with the City of Sacramento municipal code relating to landmark, heritage, and street trees.

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Appendix A Figures

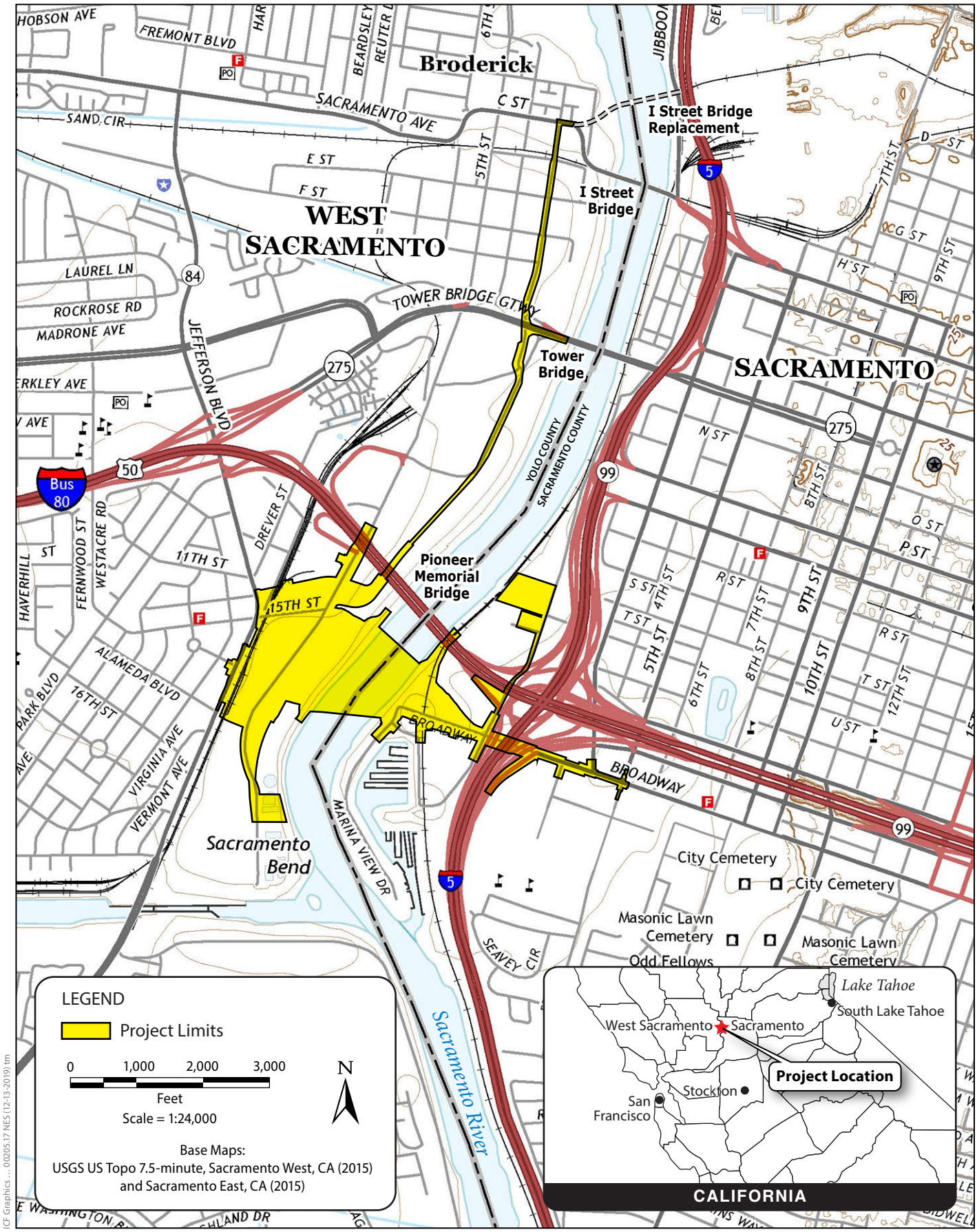

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Figure 1
Site Location

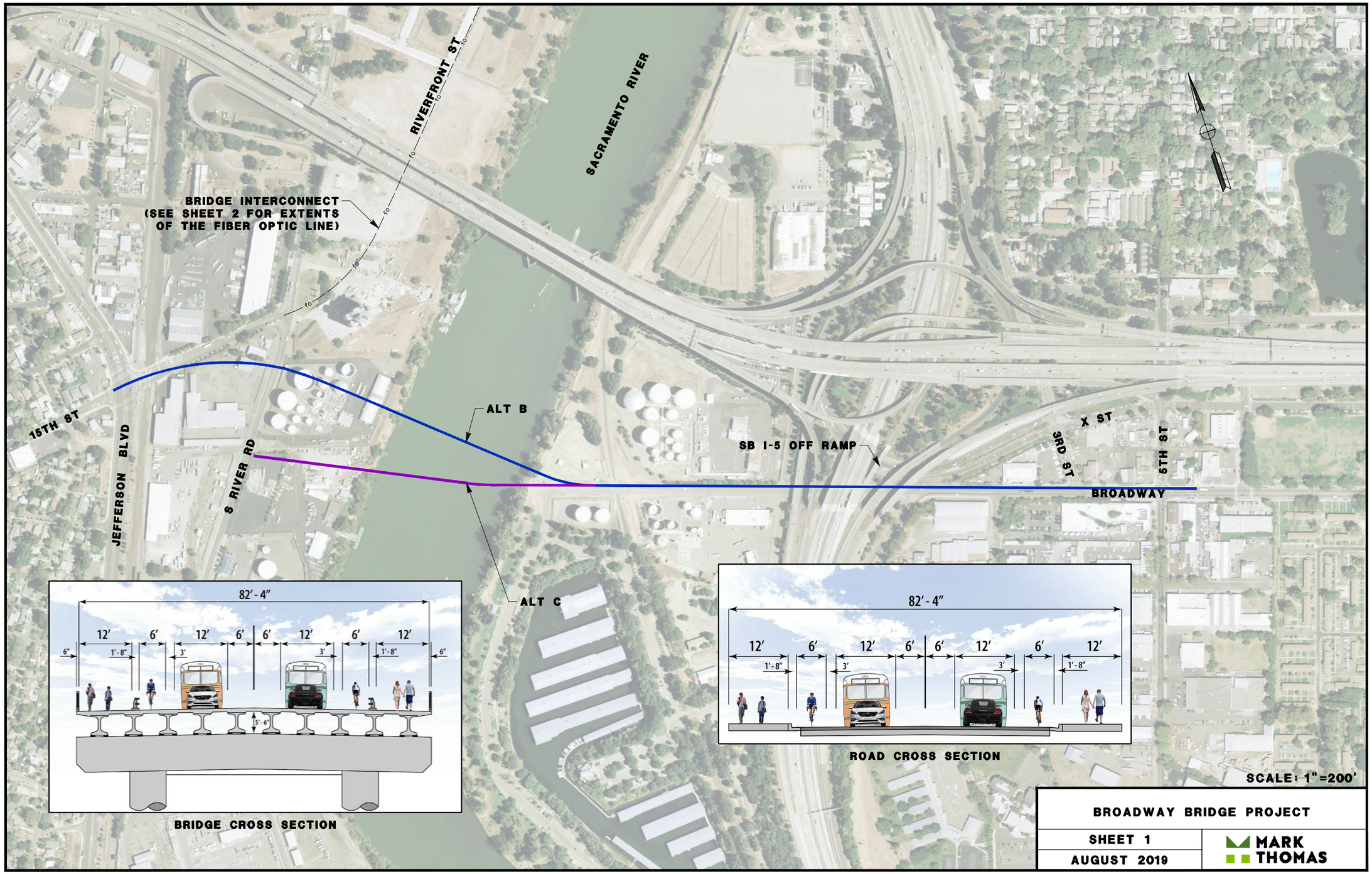

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Figure 2
Alternatives

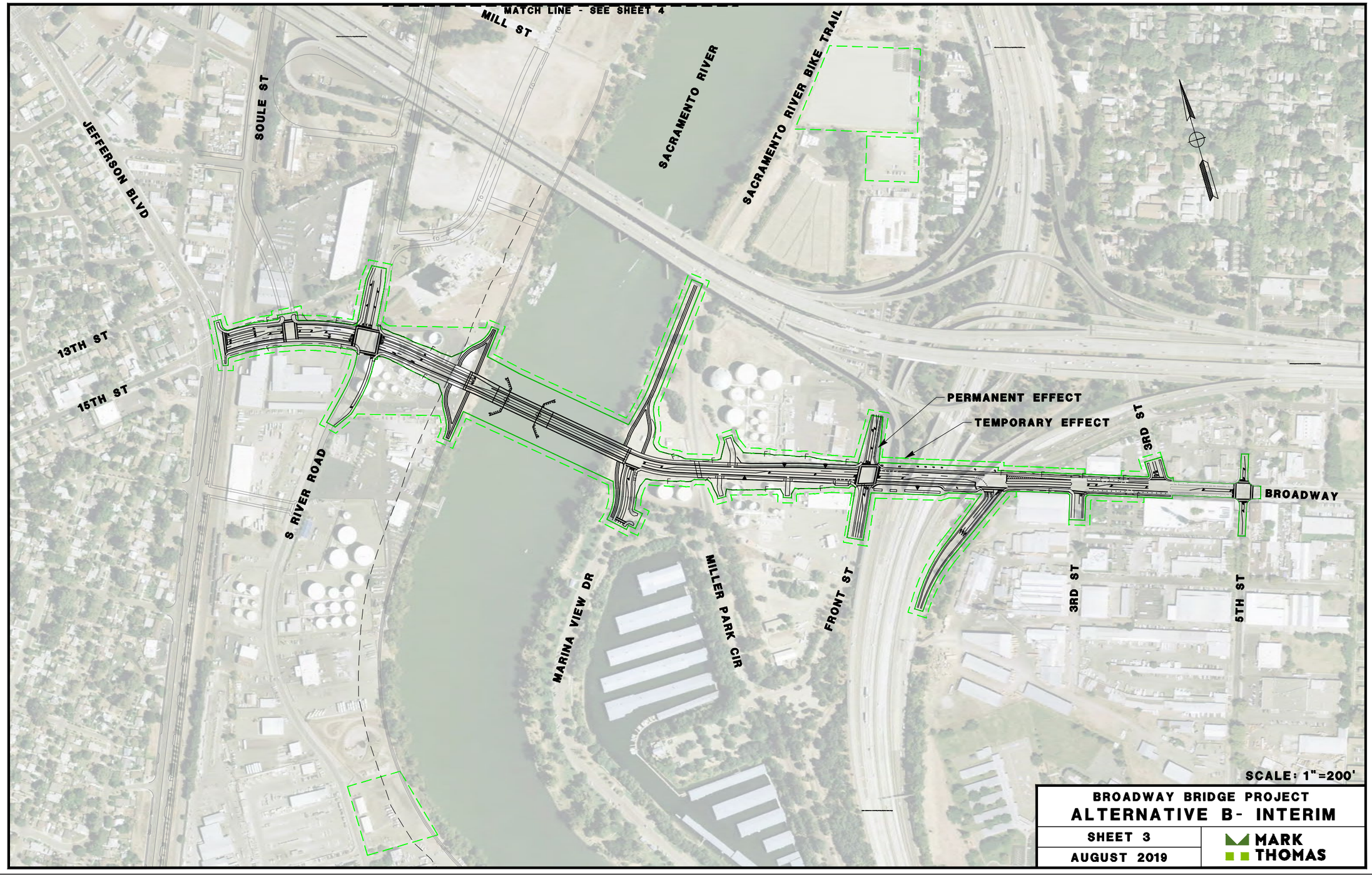

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Figure 3a
Alternative B

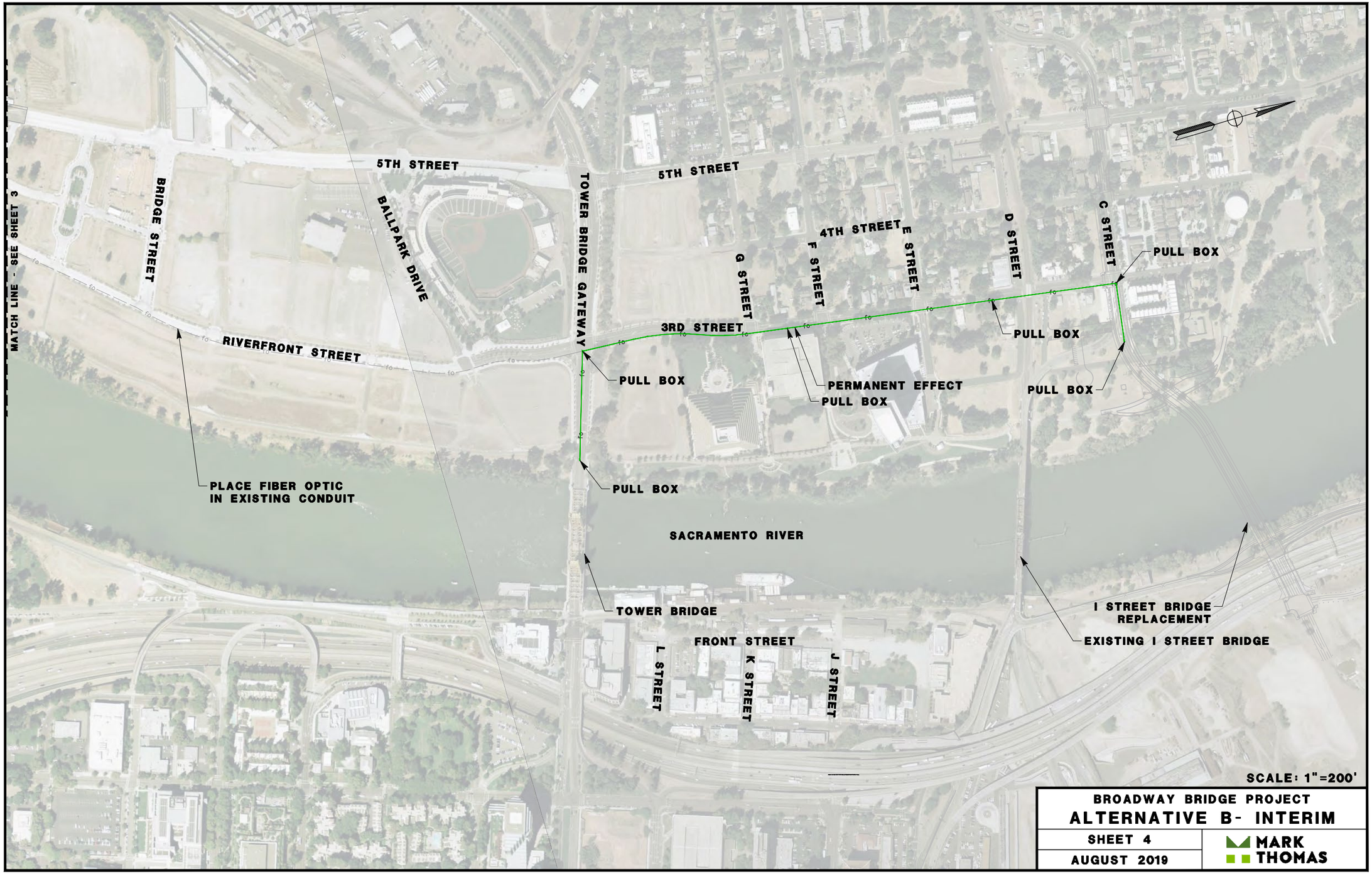

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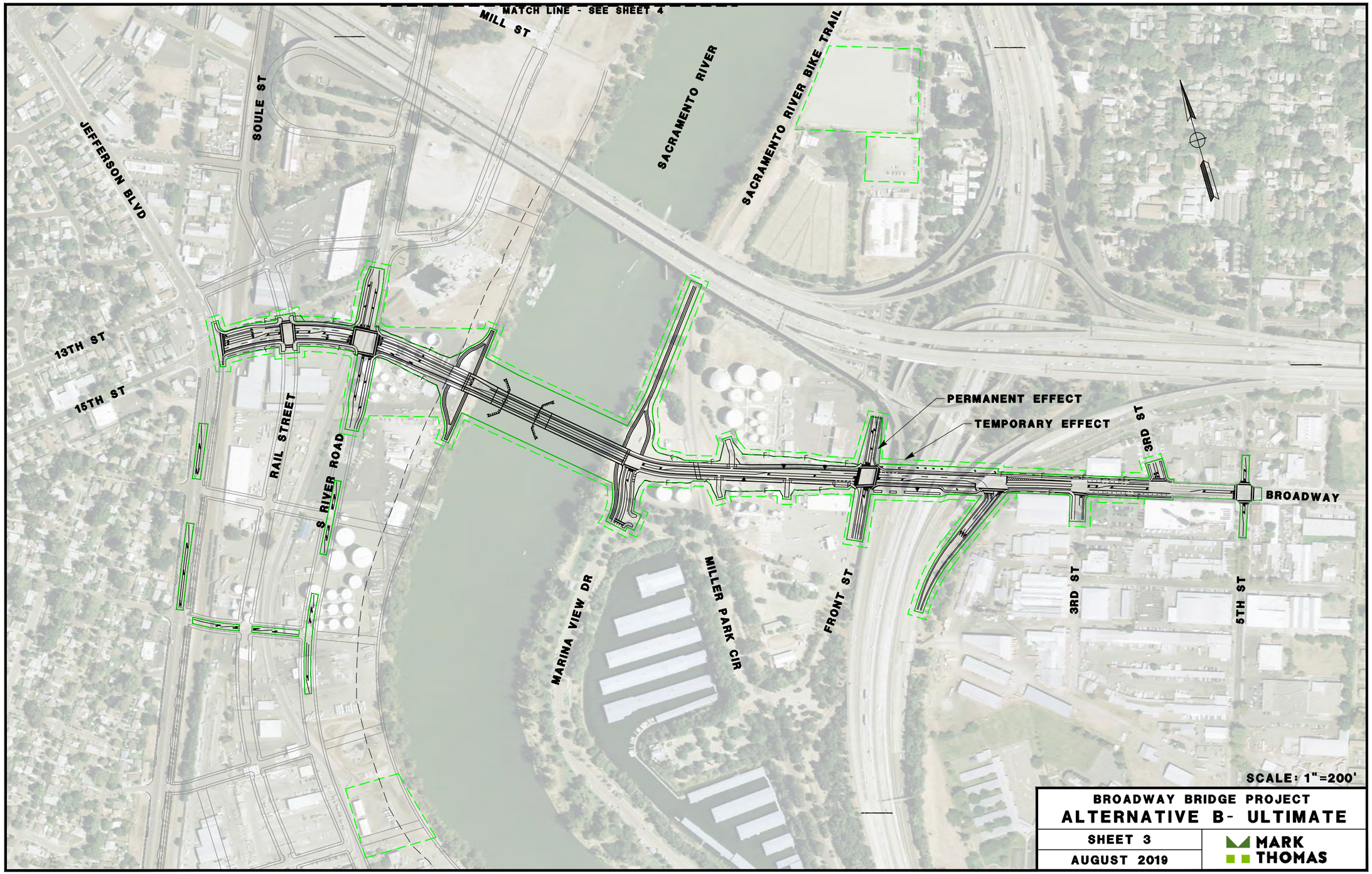
Figure 3b
Alternative B



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Alternative B

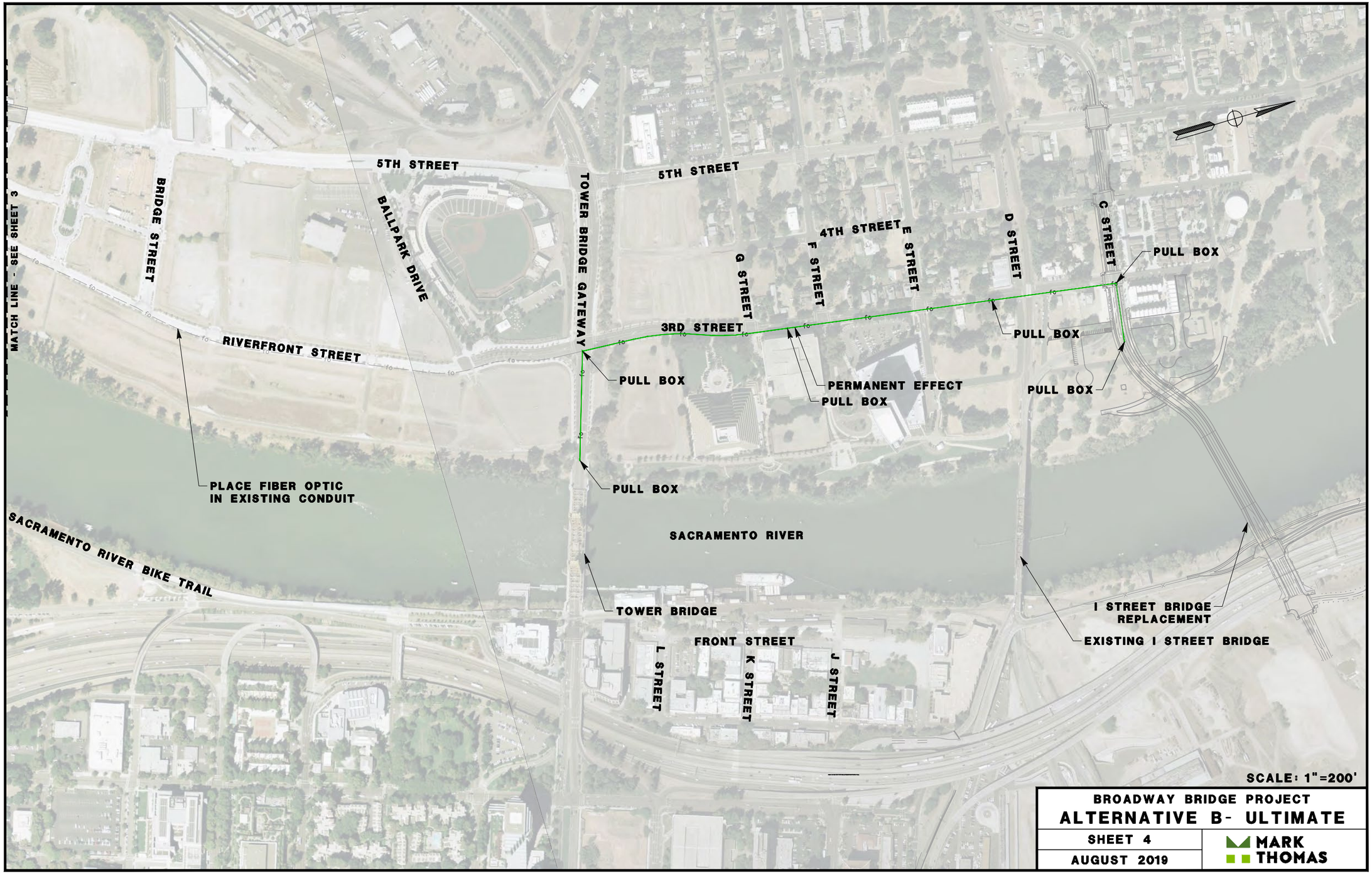

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Figure 3d
Alternative B

MATCH LINE - SEE SHEET 6

MILL ST

SOULE ST

JEFFERSON BLVD

SACRAMENTO RIVER

SACRAMENTO RIVER BIKE TRAIL

S. RIVER ROAD

13TH ST

15TH ST

PERMANENT EFFECT

TEMPORARY EFFECT

3RD ST

BROADWAY

MARINA VIEW DR

MILLER PARK CIR

FRONT ST

3RD ST

5TH ST

SCALE: 1"=200'

BROADWAY BRIDGE PROJECT

ALTERNATIVE C- INTERIM

SHEET 5

AUGUST 2019

MARK THOMAS

Graphics: ...\0020517.NE\513.23\2019\mm

Figure 4a
Alternative C

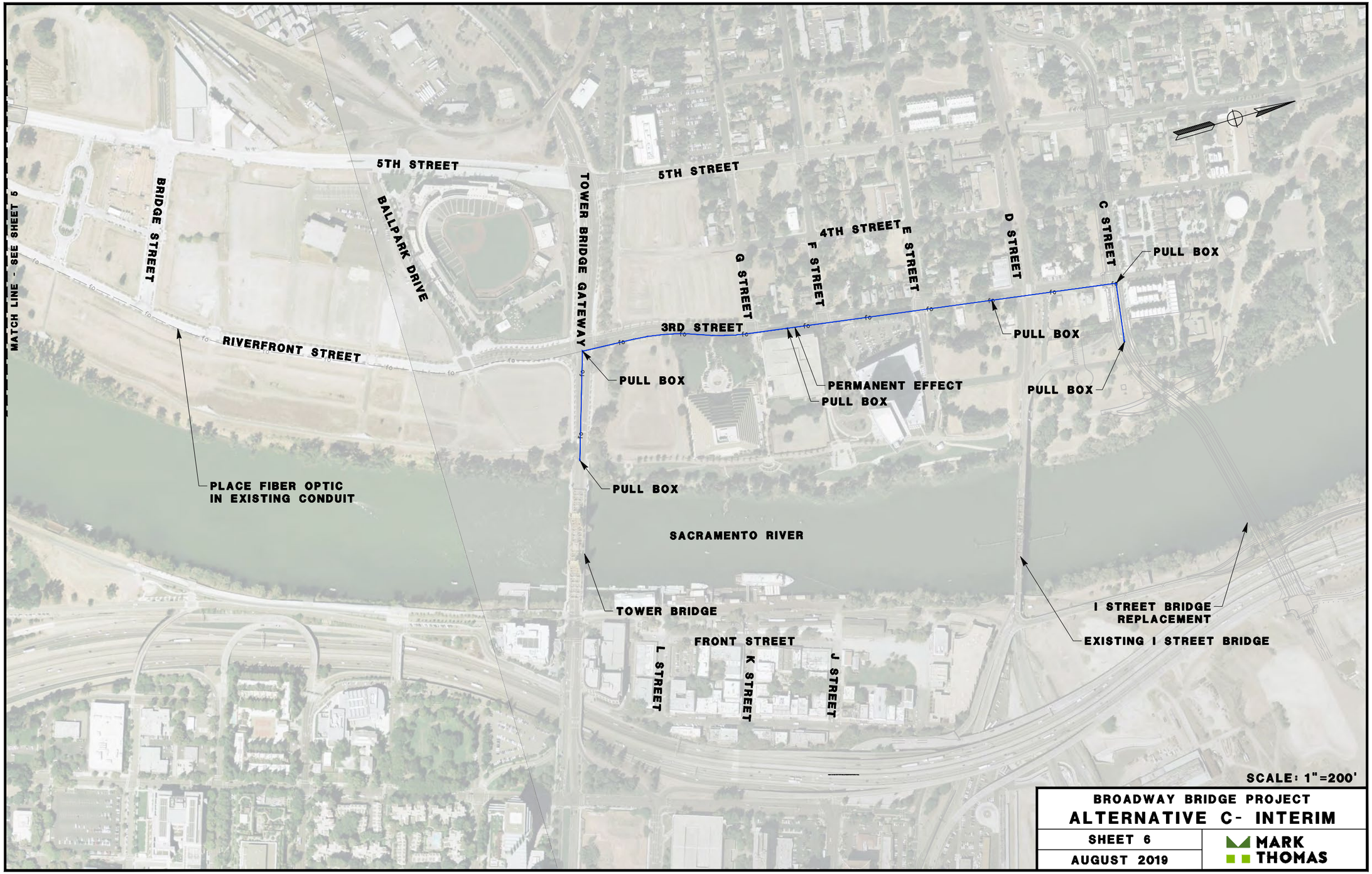

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Figure 4b
Alternative C

MATCH LINE - SEE SHEET 6

MILL ST

SOULE ST

JEFFERSON BLVD

S RIVER ROAD

SACRAMENTO RIVER

SACRAMENTO RIVER BIKE TRAIL

13TH ST

15TH ST

RAIL STREET

PERMANENT EFFECT

TEMPORARY EFFECT

3RD ST

BROADWAY

MARINA VIEW DR

MILLER PARK CIR

FRONT ST

3RD ST

5TH ST

SCALE: 1"=200'

BROADWAY BRIDGE PROJECT

ALTERNATIVE C- ULTIMATE

SHEET 5

AUGUST 2019

MARK THOMAS

Graphics: ...\0020517 NES\12-13-2019\Im

Figure 4c
Alternative C

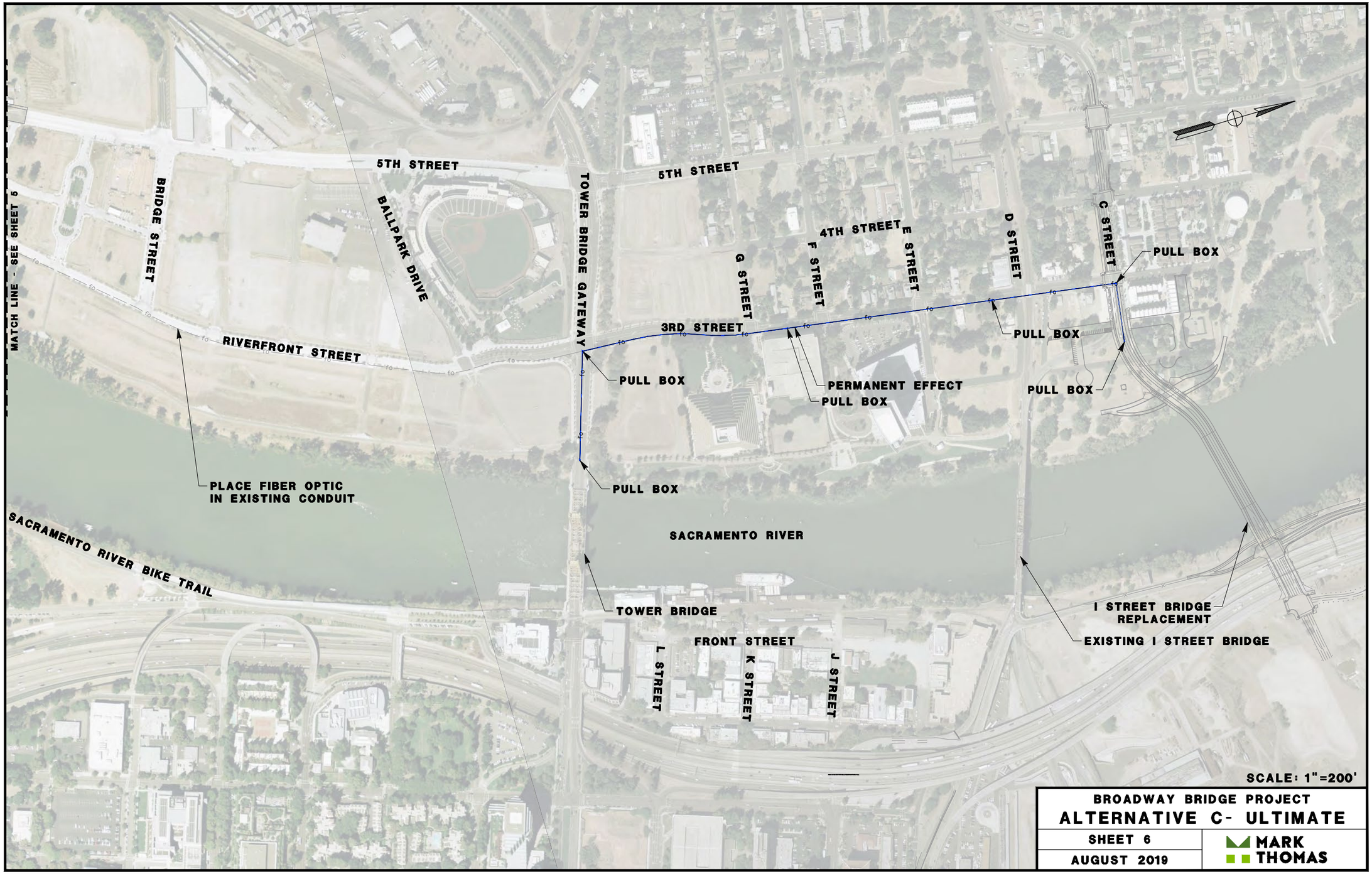

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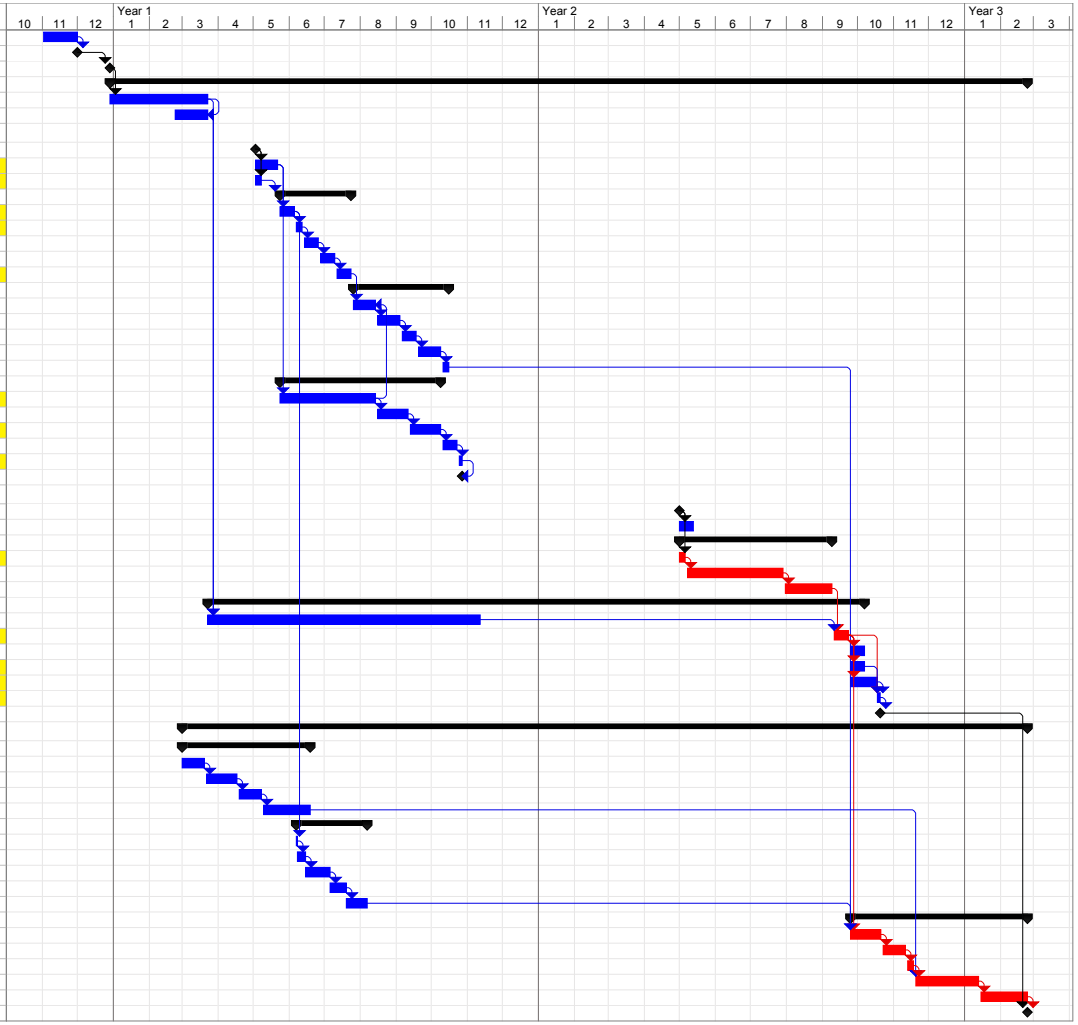
Figure 4d
Alternative C

Preliminary Bridge Construction Schedule

7-Day Work Week

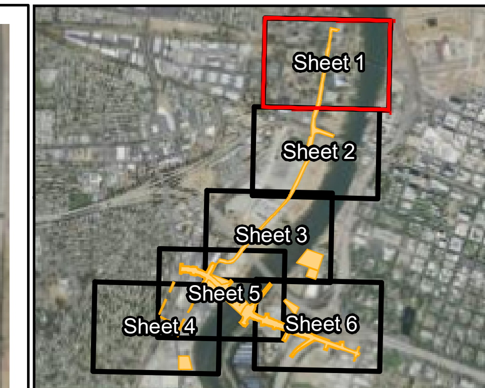
ID	Task Name	Duration	Start	Finish
1	Advertise	21 days	11/2	11/30
2	Bid Opening	0 days	11/30	11/30
3	Award	0 days	12/28	12/28
4	Working Days	564 days	12/29	2/23
5	Submittals/Shop Drawings	12 wks	12/29	3/22
6	Mobilize	4 wks	2/23	3/22
7	**In Water Work Season 1**	**127.5 days**	**5/3**	**10/27**
8	In Water Work Begins	0 days	5/3	5/3
9	Install Temp Constr Trestle From Bank to Piers	3 wks	5/3	5/21
10	Setup Barge	1 wk	5/3	5/7
11	Pier 4&5 Work (Fixed Span)	45 days	5/24	7/23
12	Cofferdam and Dewatering	2 wks	5/24	6/4
13	Pile Installation	1 wk	6/7	6/11
14	Form/Pour Pile Cap	2 wks	6/14	6/25
15	Column Construction	2 wks	6/28	7/9
16	Remove Cofferdam & Place Rock Slope Protection	2 wks	7/12	7/23
17	Approach Superstructure	60 days	7/26	10/15
18	Erect Precast Girders	3 wks	7/26	8/13
19	Form Overhangs & Diaphragms	3 wks	8/16	9/3
20	Deck Rebar & Pour	2 wks	9/6	9/17
21	Deck Cure	3 wks	9/20	10/8
22	Remove Overhang & Diaphragm formwork	1 wk	10/11	10/15
23	Pier 2&3 Work (Movable Span)	100 days	5/24	10/8
24	Vibrate/Drive Piles	12 wks	5/24	8/13
25	Set Cage & Cast Pile Shafts	4 wks	8/16	9/10
26	Form/Pour Cap for Shafts & Place Rock Slope Protection	4 wks	9/13	10/8
27	Remove Portion of Trestle (Leave Piles in Place)	2 wks	10/11	10/22
28	Remove Barges	0.5 wks	10/25	10/27
29	In Water Work Ends Season 1	0 days	10/27	10/27
30	**In Water Work Season 2**	**413.5 days**	**3/23**	**10/20**
31	In Water Work Begins	0 days	5/1	5/1
32	Install Temp Constr Trestle (except piling)	2 wks	5/1	5/12
33	Pier 3&4 Work	95 days	5/1	9/8
34	Setup Barges	1 wk	5/1	5/5
35	Erect Vertical Lift Towers	12 wks	5/8	7/28
36	Install and Test Bridge Operating Equipment	6 wks	7/31	9/8
37	Moveable Span	404 days	3/23	10/6
38	Construct Moveable Span (Offsite)	6 mons	3/23	11/11
39	Float in Moveable Span & Erect	2 wks	9/11	9/22
40	Make Moveable Span Operational	2 wks	9/25	10/6
41	Install Fender System & Piles	2 wks	9/25	10/6
42	Remove Trestle & Piles	17 days	9/25	10/17
43	Remove Barges	0.5 wks	10/18	10/20
44	In Water Work Ends Season 2	0 days	10/20	10/20
45	**Out of Water Work**	**520 days**	**3/1**	**2/23**
46	Approach Roadwork	80 days	3/1	6/18
47	Clearing and Grubbing	3 wks	3/1	3/19
48	Grading/Excavation	4 wks	3/22	4/16
49	Drainage, Utilities, Subgrade	3 wks	4/19	5/7
50	Paving	6 wks	5/10	6/18
51	Construct Abut 1/6	45 days	6/7	8/6
52	Excavate Abutment	0.2 wks	6/7	6/7
53	Drive Abut Piles	1 wk	6/8	6/14
54	Pour Abut	3 wks	6/15	7/5
55	Backfill Abutment	10 days	7/6	7/19
56	Approach Slabs	14 days	7/20	8/6
57	Approach Superstructure	110 days	9/25	2/23
58	Barriers, Median	4 wks	9/25	10/20
59	Lighting	3 wks	10/23	11/10
60	Joint Seals	1 wk	11/13	11/17
61	Finalize Roadway Conforms	8 wks	11/20	1/12
62	Punch List	6 wks	1/15	2/23
63	Bridge Construction Complete	0 days	2/23	2/23



Construction Activities with In-water Effects
Task
Critical Task
Milestone
Summary

ICF Graphics ... 00205.17 NES (12-13-2019)

Figure 5
Preliminary Construction Schedule



Biological Study Area

Project Footprint

Permanent Impacts

Temporary Impacts

Land Cover

Developed

Landscaped

Perennial Stream

Riparian

Riparian (Below OHWM)

Ruderal

Elderberry Shrub Location

Tree Locations*

Black Locust

Black Walnut

Box Elder

Fremont's Cottonwood

Goodding's Black Willow

Oregon Ash

Sycamore

Valley Oak

White Alder

Other

N

0 125 250 Feet

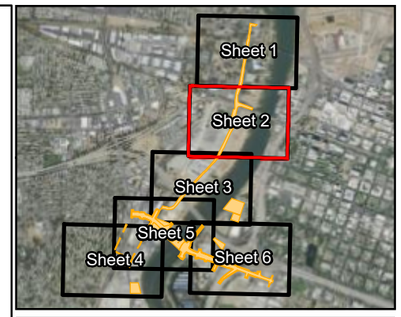
1:3,000

*Tree locations are approximate

Source: ICF (2019)

ICF

Figure 6
Alternative B Land Cover and Project Impacts



Biological Study Area

Project Footprint

- Permanent Impacts
- Temporary Impacts

Land Cover

- Developed
- Landscaped
- Perennial Stream
- Riparian
- Riparian (Below OHWM)
- Ruderal
- Elderberry Shrub Location

Tree Locations*

- Black Locust
- Black Walnut
- Box Elder
- Fremont's Cottonwood
- Goodding's Black Willow
- Oregon Ash
- Sycamore
- Valley Oak
- White Alder
- Other

N

0 125 250 Feet

1:3,000

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ICF

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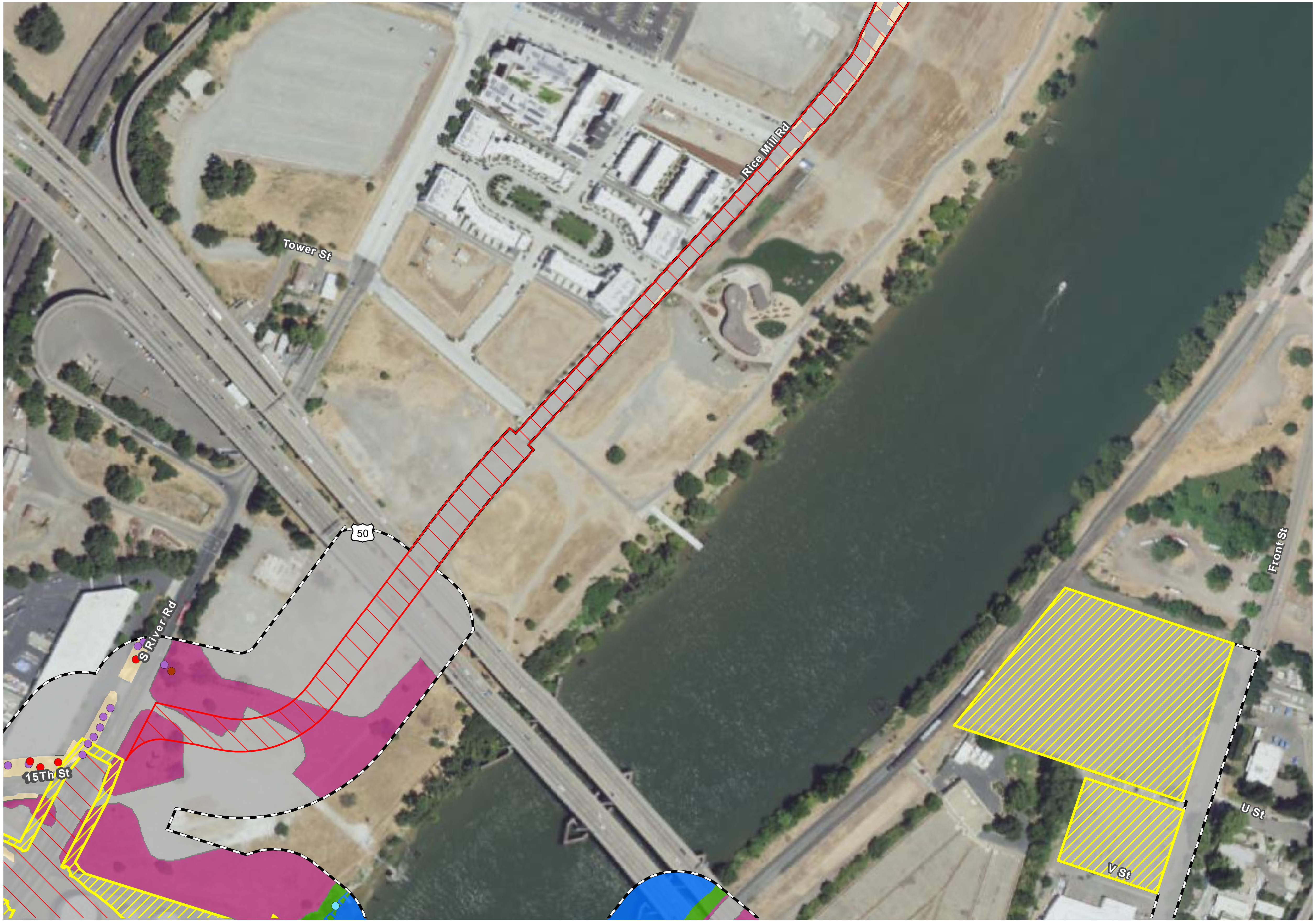

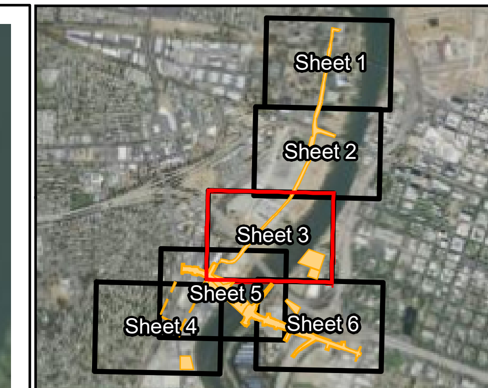

Biological Study Area

Project Footprint

Permanent Impacts

Temporary Impacts

Land Cover

Developed

Landscaped

Perennial Stream

Riparian

Riparian (Below OHWM)

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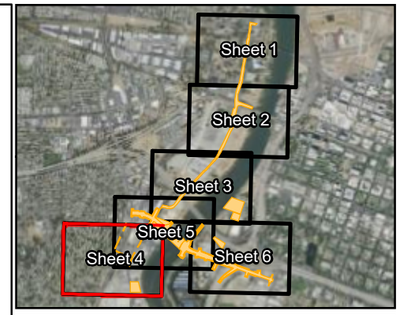

Biological Study Area

Project Footprint

- Permanent Impacts
- Temporary Impacts

Land Cover

- Developed
- Landscaped
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- Riparian
- Riparian (Below OHWM)
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ICF

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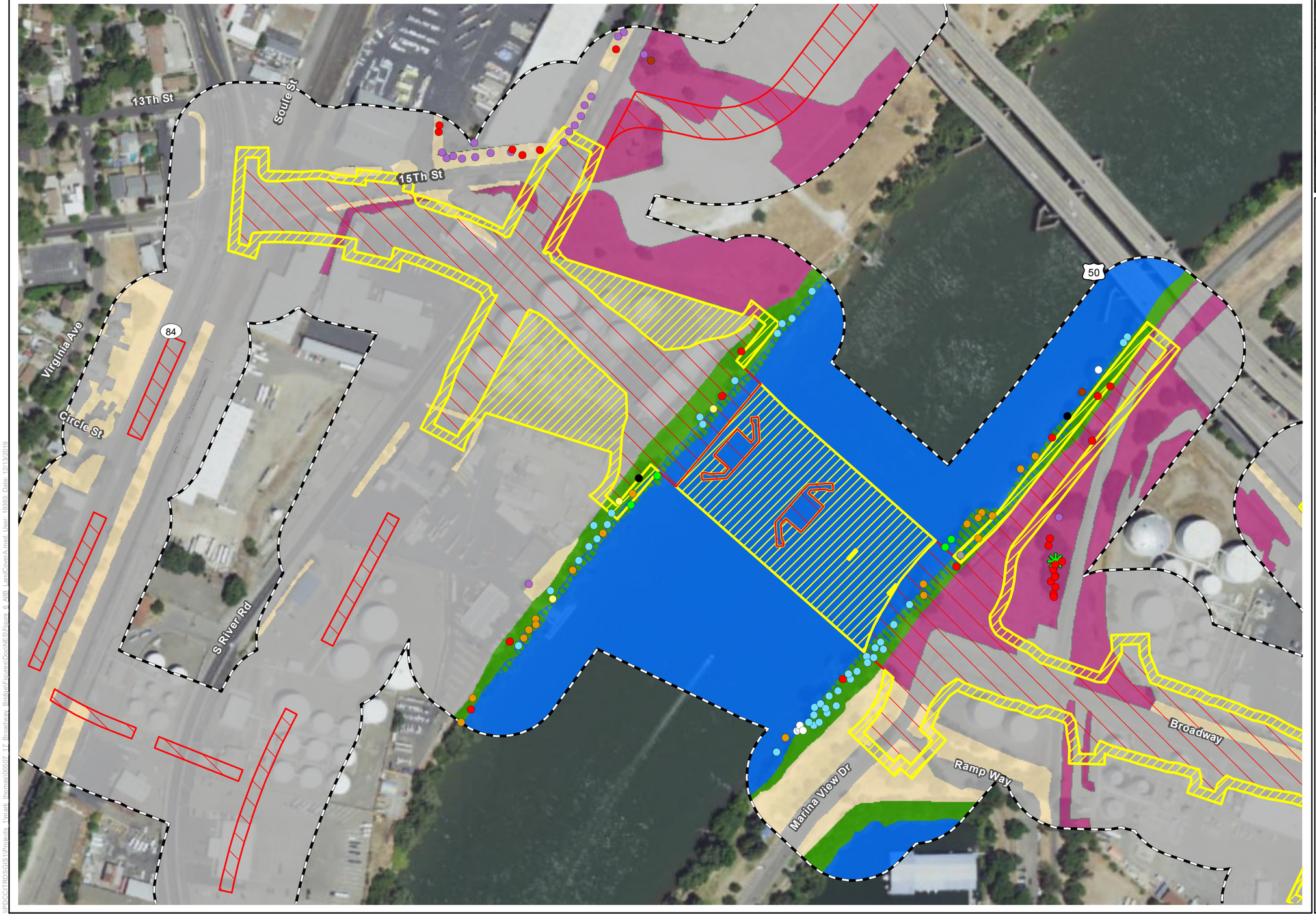
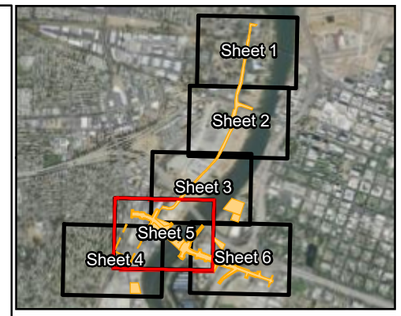
Alternative B Land Cover and Project Impacts





Biological Study Area

Project Footprint
- Permanent Impacts
- Temporary Impacts

Land Cover
- Developed
- Landscaped
- Perennial Stream
- Riparian
- Riparian (Below OHWM)
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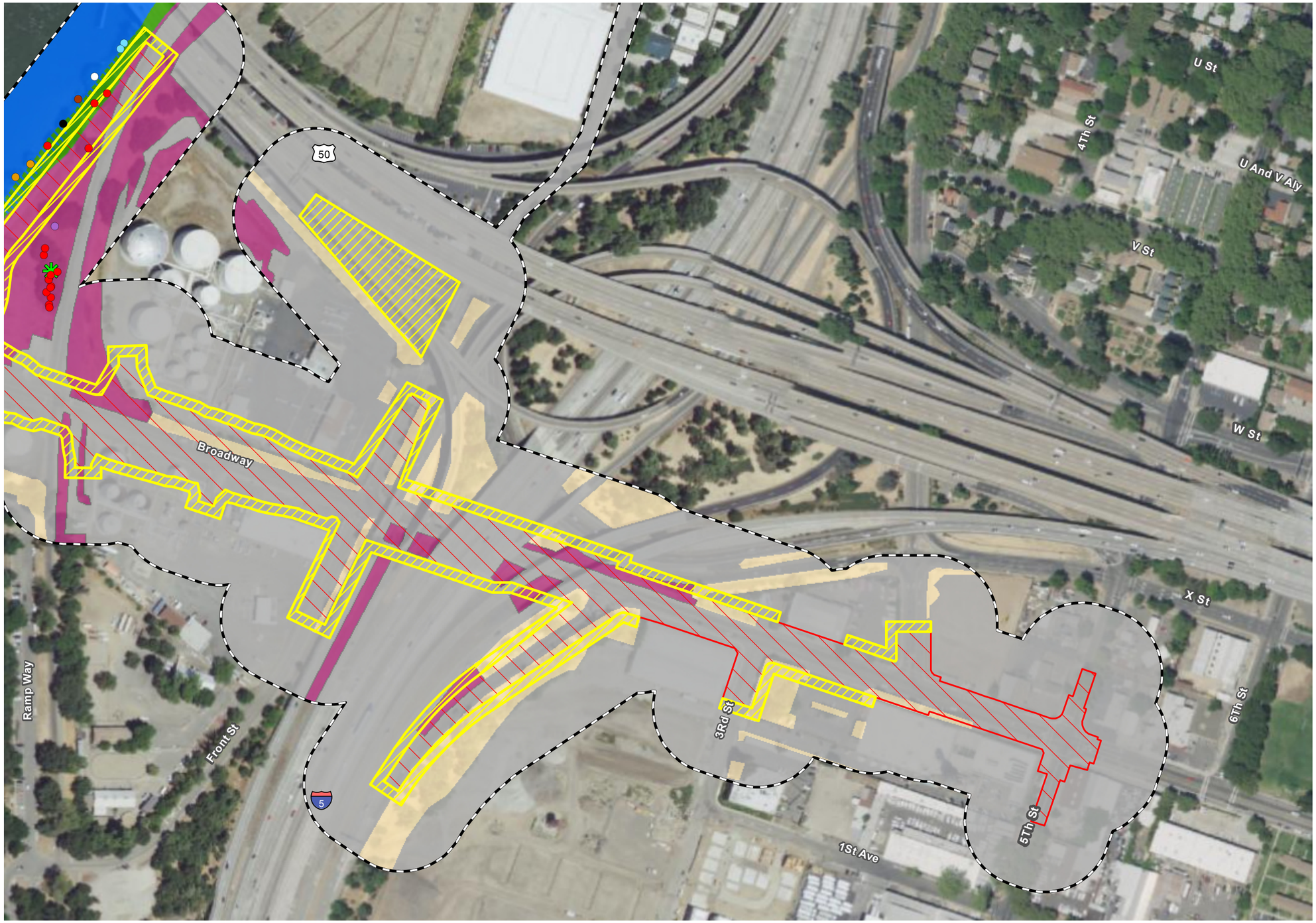
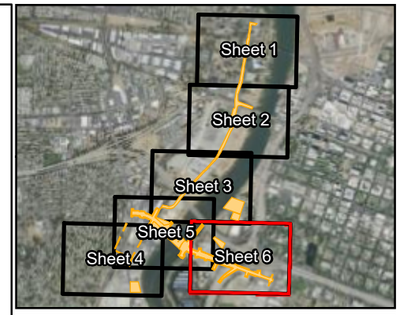
Source: ICF (2019)

Figure 6
Alternative B Land Cover and Project Impacts





Biological Study Area

Project Footprint

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- Temporary Impacts

Land Cover

- Developed
- Landscaped
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- Riparian
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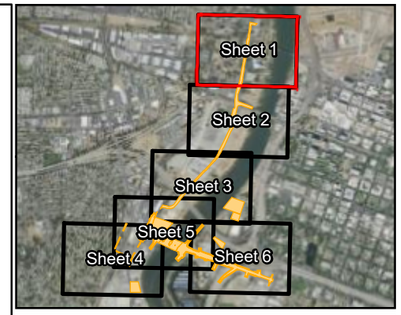
0 125 250 Feet

1:3,000

*Tree locations are approximate

Source: ICF (2019)

Figure 6
Alternative B Land Cover and Project Impacts



Biological Study Area

Project Footprint

- Permanent Impacts
- Temporary Impacts

Land Cover

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- Landscaped
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- Riparian
- Riparian (Below OHWM)
- Ruderal
- Elderberry Shrub Location

Tree Locations*

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- Oregon Ash
- Sycamore
- Valley Oak
- White Alder
- Other

N

0 125 250 Feet

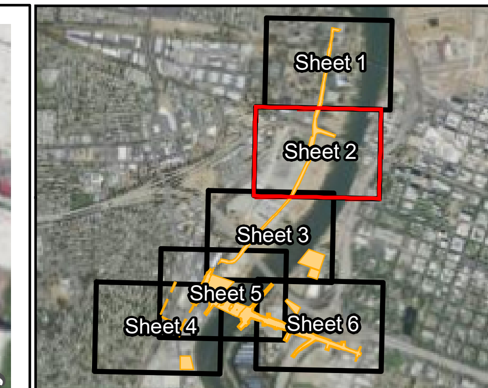
1:3,000

*Tree locations are approximate

Source: ICF (2019)

ICF

Figure 7
Alternative C Land Cover and Project Impacts



Biological Study Area

Project Footprint

Permanent Impacts

Temporary Impacts

Land Cover

Developed

Landscaped

Perennial Stream

Riparian

Riparian (Below OHWM)

Ruderal

Elderberry Shrub Location

Tree Locations*

Black Locust

Black Walnut

Box Elder

Fremont's Cottonwood

Goodding's Black Willow

Oregon Ash

Sycamore

Valley Oak

White Alder

Other

N

0 125 250 Feet

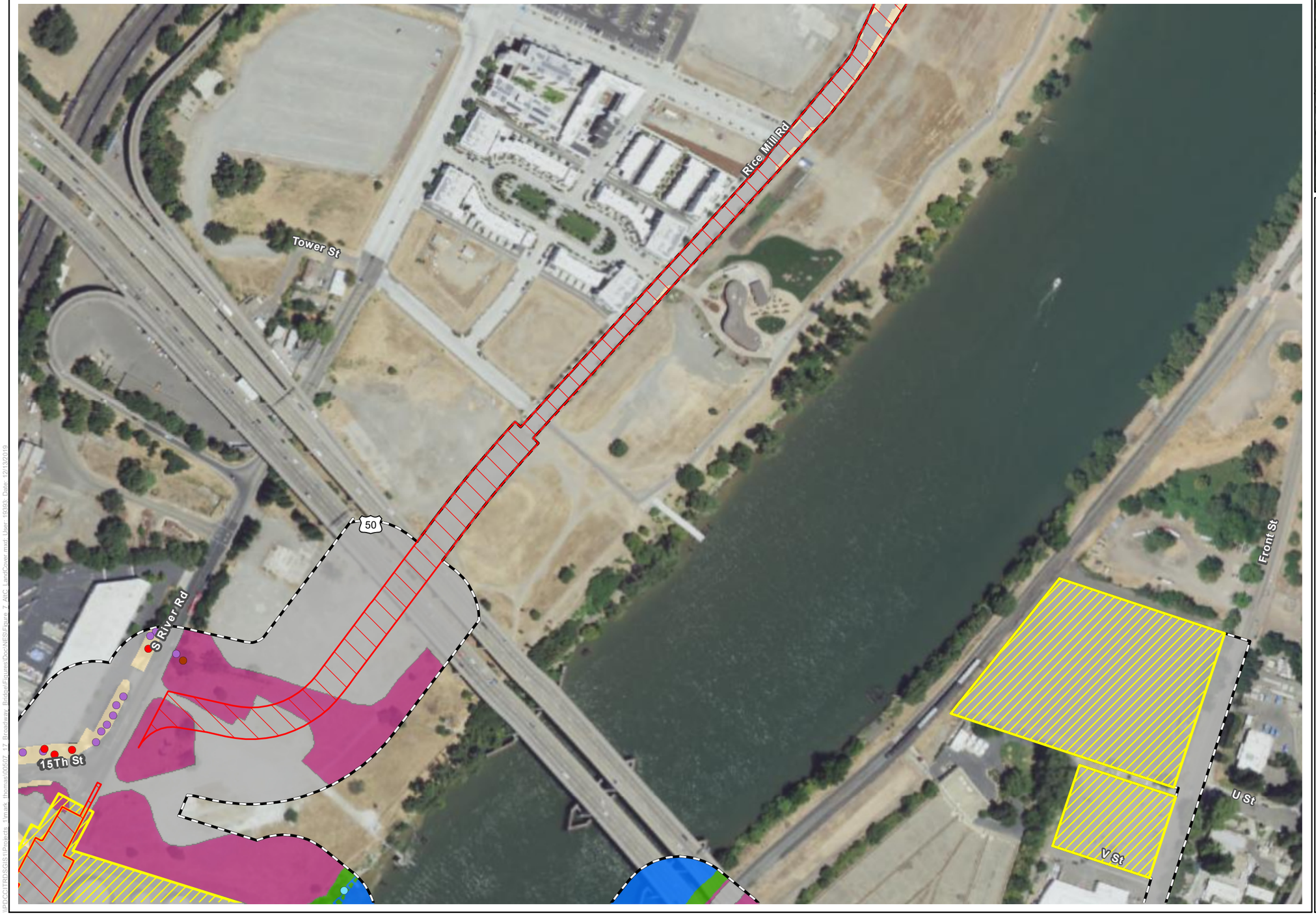
1:3,000

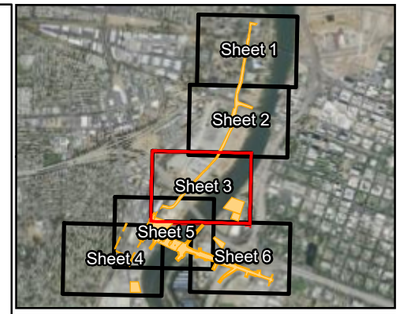
*Tree locations are approximate

Source: ICF (2019)

ICF

Figure 7
Alternative C Land Cover and Project Impacts





Biological Study Area

Project Footprint

- Permanent Impacts
- Temporary Impacts

Land Cover

- Developed
- Landscaped
- Perennial Stream
- Riparian
- Riparian (Below OHWM)
- Ruderal
- Elderberry Shrub Location

Tree Locations*

- Black Locust
- Black Walnut
- Box Elder
- Fremont's Cottonwood
- Goodding's Black Willow
- Oregon Ash
- Sycamore
- Valley Oak
- White Alder
- Other

N

0 125 250 Feet

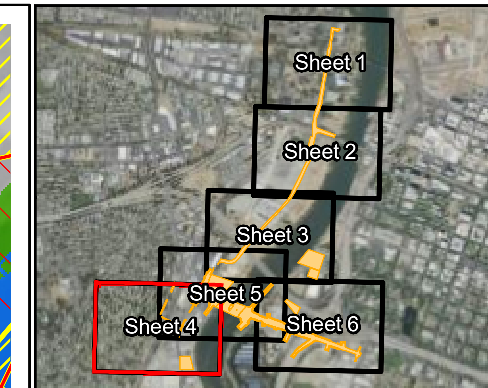
1:3,000

*Tree locations are approximate

Source: ICF (2019)

ICF

Figure 7
Alternative C Land Cover and Project Impacts



Biological Study Area

Project Footprint
- Permanent Impacts
- Temporary Impacts

Land Cover
- Developed
- Landscaped
- Perennial Stream
- Riparian
- Riparian (Below OHWM)
- Ruderal
- Elderberry Shrub Location

Tree Locations*
- Black Locust
- Black Walnut
- Box Elder
- Fremont's Cottonwood
- Goodding's Black Willow
- Oregon Ash
- Sycamore
- Valley Oak
- White Alder
- Other

N

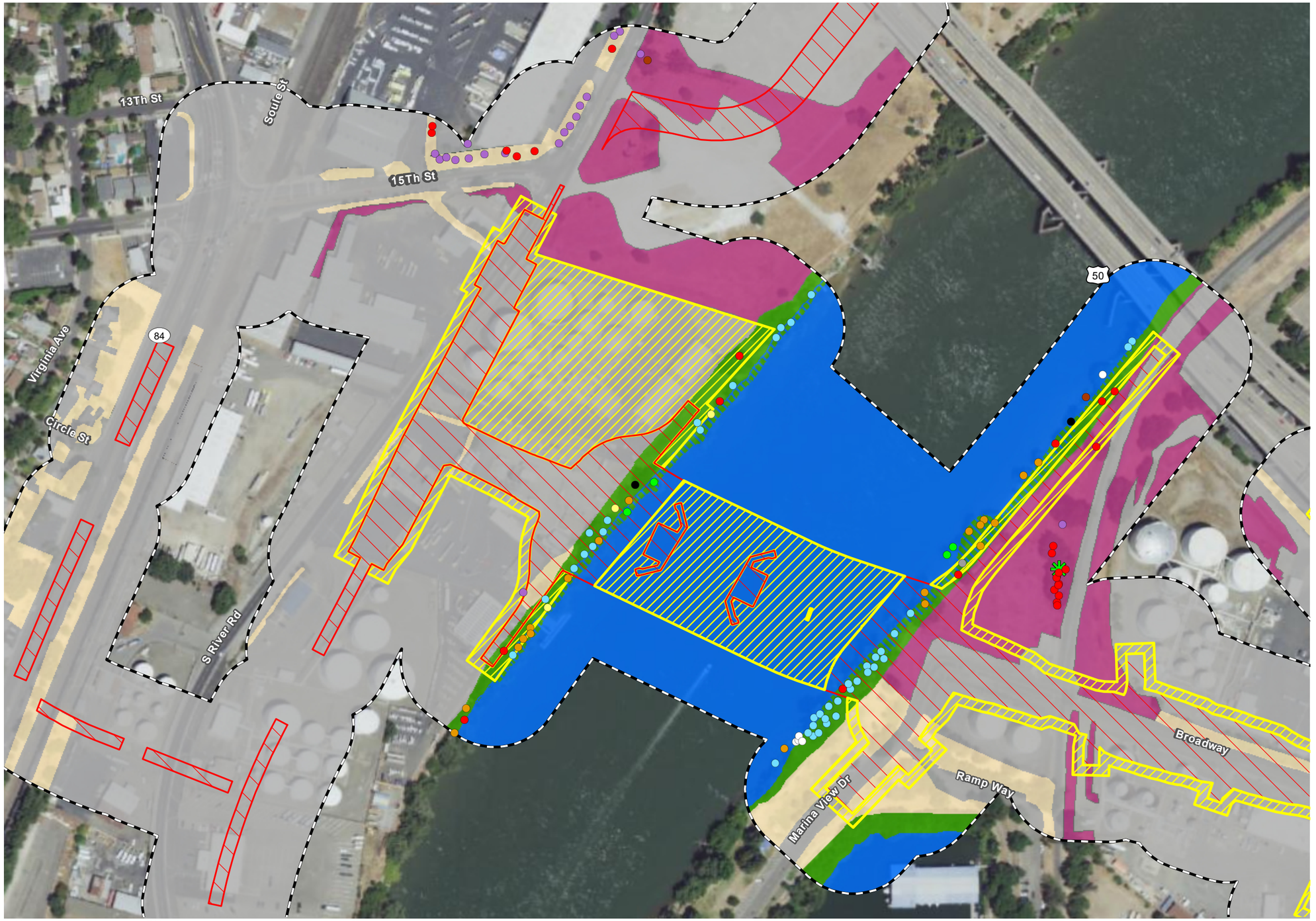
0 125 250 Feet
1:3,000

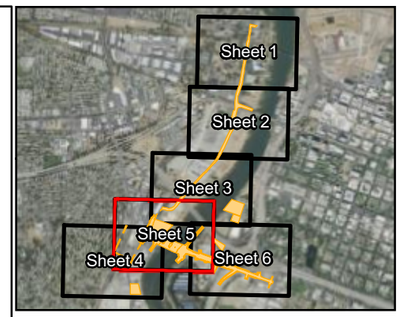
*Tree locations are approximate

Source: ICF (2019)

ICF

Figure 7
Alternative C Land Cover and Project Impacts





Biological Study Area

Project Footprint

- Permanent Impacts
- Temporary Impacts

Land Cover

- Developed
- Landscaped
- Perennial Stream
- Riparian
- Riparian (Below OHWM)
- Ruderal
- Elderberry Shrub Location

Tree Locations*

- Black Locust
- Black Walnut
- Box Elder
- Fremont's Cottonwood
- Goodding's Black Willow
- Oregon Ash
- Sycamore
- Valley Oak
- White Alder
- Other

N

0 125 250 Feet

1:3,000

*Tree locations are approximate

Source: ICF (2019)

ICF

Figure 7
Alternative C Land Cover and Project Impacts

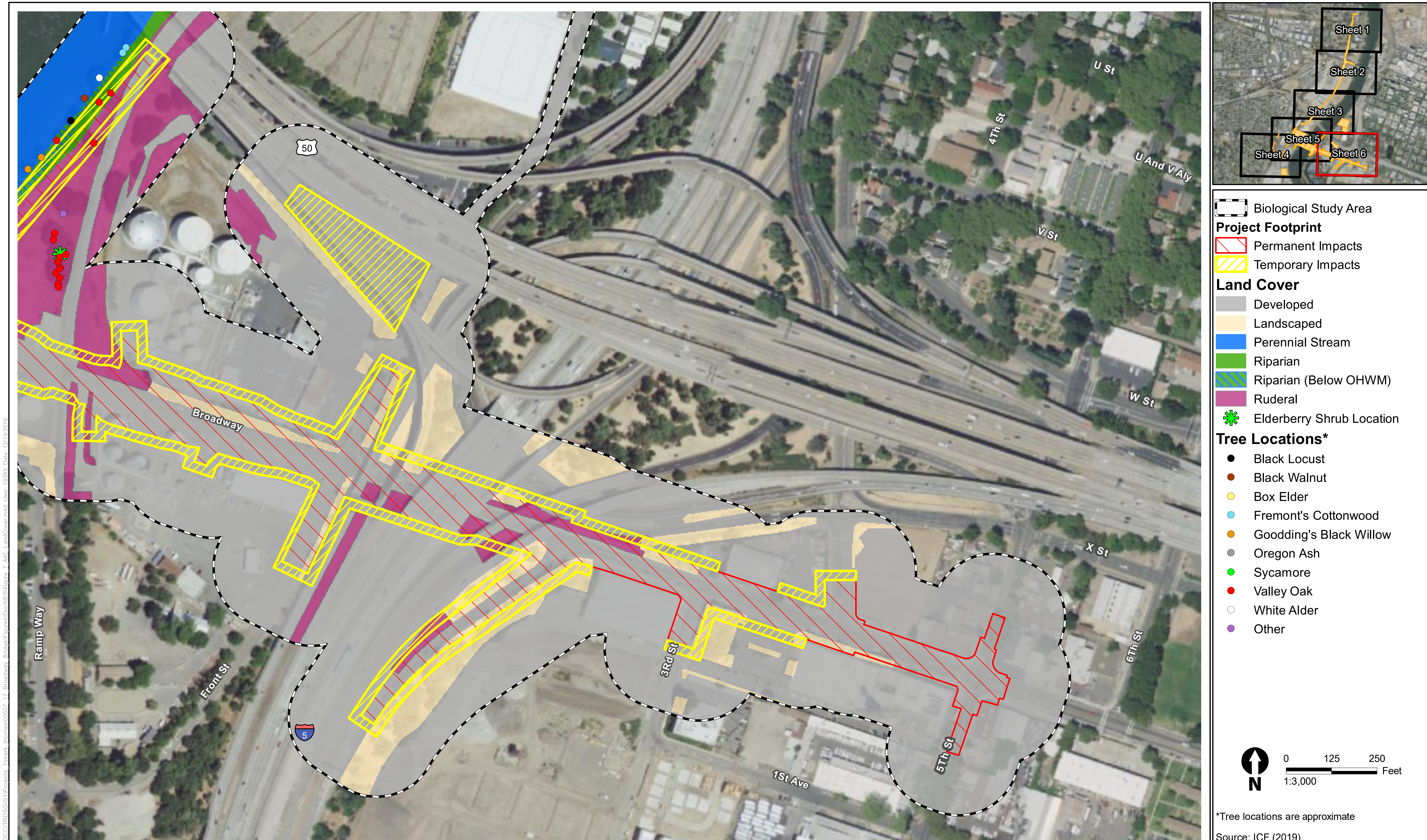
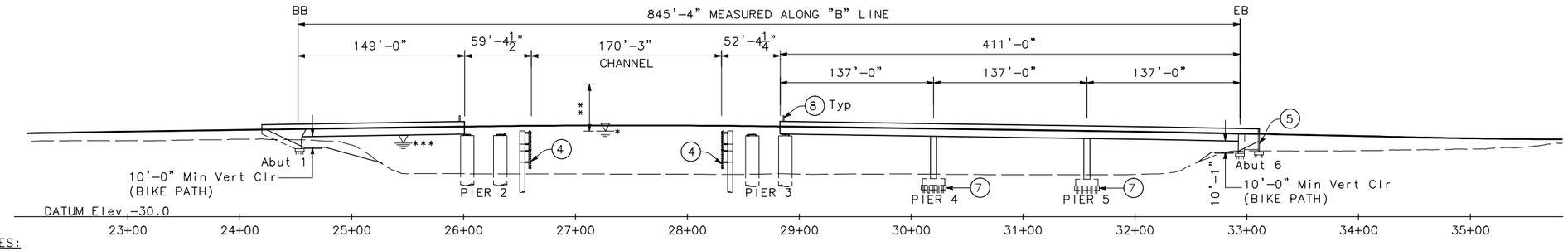


Figure 7
Alternative C Land Cover and Project Impacts

PROFILE GRADE
NO SCALE



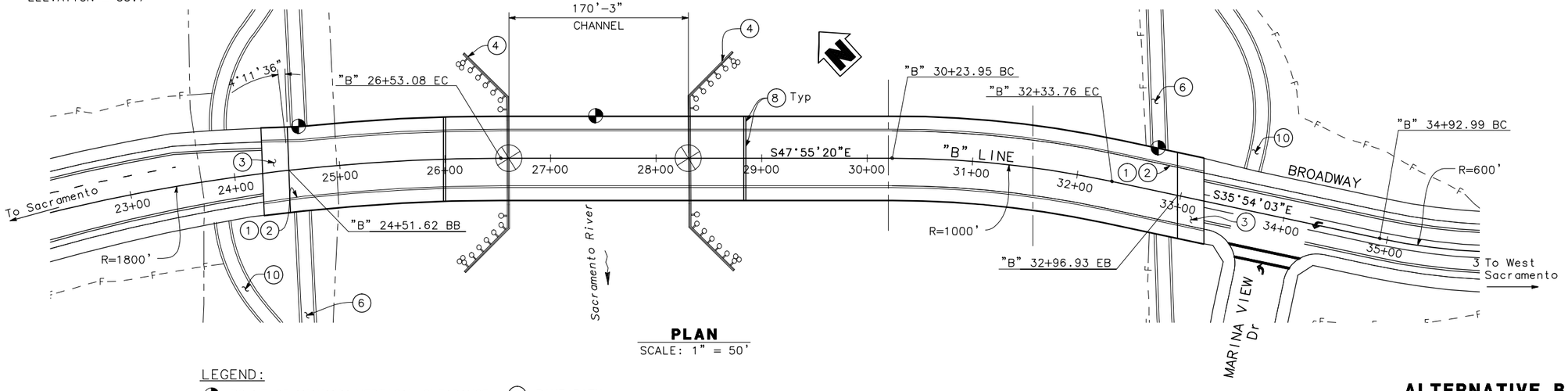
ELEVATION
SCALE: 1" = 50'

NOTES:

* – 200 YEAR WATER SURFACE ELEVATION = 36.4'

** – 3' Min Vert Clr LOWERED POSITION
55' Min Vert Clr RAISED POSITION

*** – SACRAMENTO RIVER FLOOD CONTROL PROJECT 1957 DESIGN FLOODPLAIN ELEVATION = 33.7'



PLAN
SCALE: 1" = 50'

LEGEND:

- POINT OF MINIMUM VERTICAL CLEARANCE
- (1) PAINT BRIDGE NAME
- (2) PAINT BRIDGE NUMBER
- (3) APPROACH SLAB
- (4) FENDER SYSTEM
- (5) RETAINING WALL
- (6) BIKE PATH
- (7) SEAL COURSE
- (8) TRAFFIC/PEDESTRIAN GATE & WARNING SIGNAL
- (9) LEVEE CUTOFF WALL
- (10) ACCESS ROAD
- (11) RSP

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT
03	YOL/SAC	"B"	N/A

CITY OF WEST SACRAMENTO
1110 WEST CAPITOL AVENUE
WEST SACRAMENTO, CA 95691

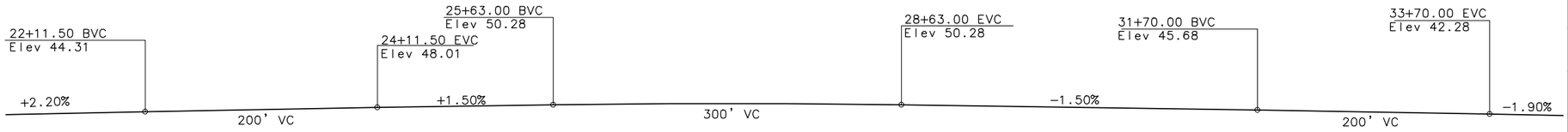
MARK THOMAS
701 UNIVERSITY AVE, SUITE 200
SACRAMENTO, CA 95825

MODJESKI AND MASTERS, INC.
100 STERLING PARKWAY, SUITE 302
MECHANICSBURG, PA 17050

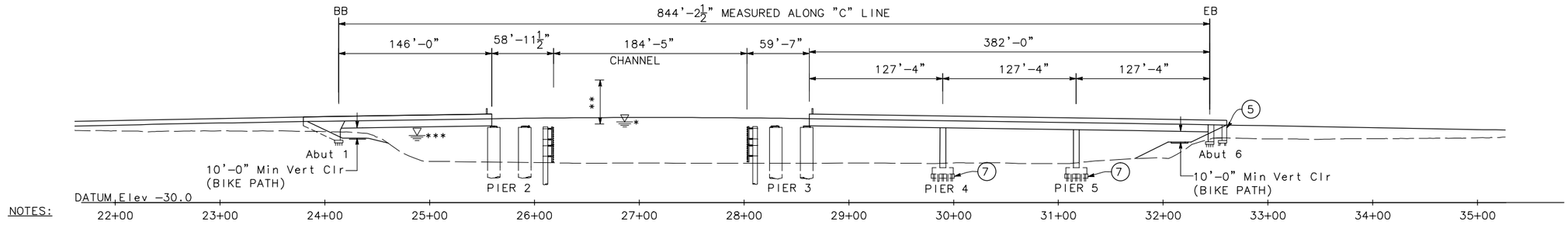
DESIGNED BY J. HICKEY	DATE 2-27-18	E. FREDRICKSON PROJECT ENGINEER	ALTERNATIVE B
DRAWN BY J. DOTY	DATE 2-27-18		BROADWAY BRIDGE PROJECT
CHECKED BY	DATE		GENERAL PLAN
APPROVED	DATE		BRIDGE NO. XXX / UNIT:
			SCALE: AS SHOWN / PROJECT NUMBER & PHASE: 03-XXXXXX

Graphics, : 00205.17 [12:22:20] AB

Figure 8
Proposed Broadway Bridge (Alternative B): Plan View, Profile, and Elevation



PROFILE GRADE
NO SCALE



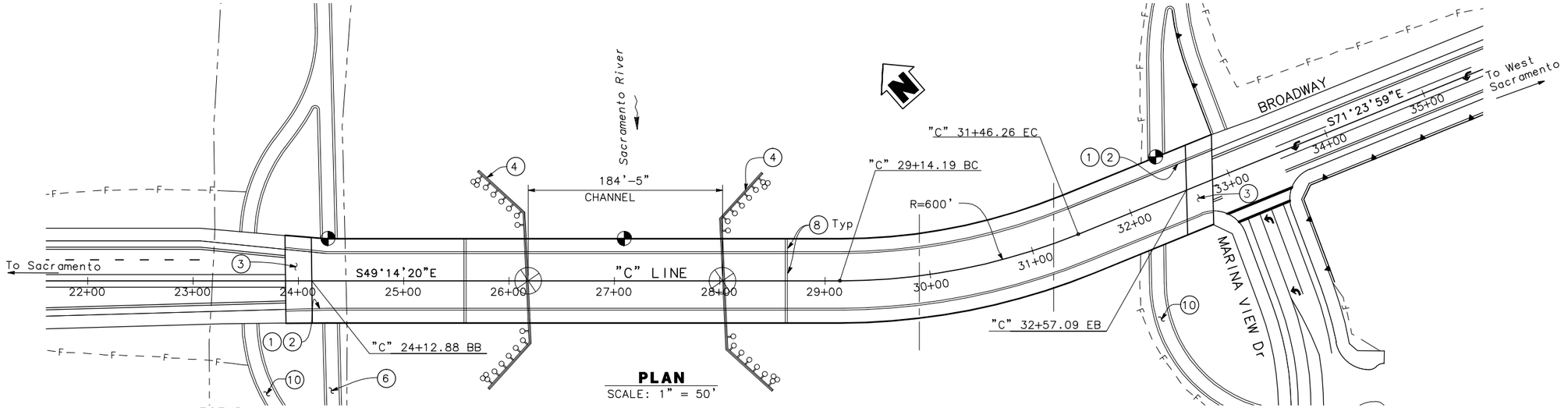
ELEVATION
SCALE: 1" = 50'

NOTES:

* – 200 YEAR WATER SURFACE ELEVATION = 36.4'

** – 3' Min Vert Clr LOWERED POSITION
55' Min Vert Clr RAISED POSITION

*** – SACRAMENTO RIVER FLOOD CONTROL PROJECT 1957 DESIGN FLOODPLAIN ELEVATION = 33.7'



PLAN
SCALE: 1" = 50'

LEGEND:

- POINT OF MINIMUM VERTICAL CLEARANCE
- (1) PAINT BRIDGE NAME
- (2) PAINT BRIDGE NUMBER
- (3) APPROACH SLAB
- (4) FENDER SYSTEM
- (5) RETAINING WALL
- (6) BIKE PATH
- (7) SEAL COURSE
- (8) TRAFFIC/PEDESTRIAN GATE & WARNING SIGNAL
- (9) LEVEE CUTOFF WALL
- (10) ACCESS ROAD
- (11) RSP

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT
03	YOL/SAC	"C"	N/A

CITY OF WEST SACRAMENTO
1110 WEST CAPITOL AVENUE
WEST SACRAMENTO, CA 95691

MARK THOMAS
701 UNIVERSITY AVE, SUITE 200
SACRAMENTO, CA 95825

MODJESKI AND MASTERS, INC.
100 STERLING PARKWAY, SUITE 302
MECHANICSBURG, PA 17050

DESIGNED BY J. HICKEY	DATE 2-27-18	E. FREDRICKSON PROJECT ENGINEER	ALTERNATIVE C BROADWAY BRIDGE PROJECT GENERAL PLAN
DRAWN BY J. DOTY	DATE 2-27-18		BRIDGE NO. XXX / UNIT:
CHECKED BY	DATE		SCALE: AS SHOWN / PROJECT NUMBER & PHASE: 03-XXXXXX
APPROVED	DATE		

Graphics ... 00205.17 (1-22-20) AB

Figure 9
Proposed Broadway Bridge (Alternative C): Plan View, Profile, and Elevation

Appendix B Database Search and Species Lists

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish And Wildlife Office
Federal Building
2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846
Phone: (916) 414-6600 Fax: (916) 414-6713

In Reply Refer To:
Consultation Code: 08ESMF00-2017-SLI-1773
Event Code: 08ESMF00-2019-E-09765
Project Name: Broadway Bridge

September 17, 2019

Subject: Updated list of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, under the jurisdiction of the U.S. Fish and Wildlife Service (Service) that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the Service under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Please follow the link below to see if your proposed project has the potential to affect other species or their habitats under the jurisdiction of the National Marine Fisheries Service:

http://www.nwr.noaa.gov/protected_species/species_list/species_lists.html

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Sacramento Fish And Wildlife Office
Federal Building
2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846
(916) 414-6600

This project's location is within the jurisdiction of multiple offices. Expect additional species list documents from the following office, and expect that the species and critical habitats in each document reflect only those that fall in the office's jurisdiction:

San Francisco Bay-Delta Fish And Wildlife
650 Capitol Mall
Suite 8-300
Sacramento, CA 95814
(916) 930-5603

Project Summary

Consultation Code: 08ESMF00-2017-SLI-1773

Event Code: 08ESMF00-2019-E-09765

Project Name: Broadway Bridge

Project Type: BRIDGE CONSTRUCTION / MAINTENANCE

Project Description: Construction of new bridge off of Broadway in Sacramento across the Sacramento River to West Sacramento.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/38.57704005752997N121.51308186662763W

Counties: Sacramento, CA | Yolo, CA

Endangered Species Act Species

There is a total of 8 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

---

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Birds

NAME	STATUS
Least Bell's Vireo *Vireo bellii pusillus*	Endangered

There is **final** critical habitat for this species. Your location is outside the critical habitat.
Species profile: https://ecos.fws.gov/ecp/species/5945

Reptiles

NAME	STATUS
Giant Garter Snake *Thamnophis gigas*	Threatened

No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/4482

Amphibians

NAME	STATUS
California Red-legged Frog *Rana draytonii*	Threatened

There is **final** critical habitat for this species. Your location is outside the critical habitat.
Species profile: https://ecos.fws.gov/ecp/species/2891
Species survey guidelines:
https://ecos.fws.gov/ipac/guideline/survey/population/205/office/11420.pdf

California Tiger Salamander *Ambystoma californiense*	Threatened

Population: U.S.A. (Central CA DPS)
There is **final** critical habitat for this species. Your location is outside the critical habitat.
Species profile: https://ecos.fws.gov/ecp/species/2076

Fishes

NAME	STATUS
Delta Smelt *Hypomesus transpacificus*	Threatened

There is **final** critical habitat for this species. Your location overlaps the critical habitat.
Species profile: https://ecos.fws.gov/ecp/species/321

Insects

NAME	STATUS
Valley Elderberry Longhorn Beetle *Desmocerus californicus dimorphus*	Threatened

There is **final** critical habitat for this species. Your location is outside the critical habitat.
Species profile: https://ecos.fws.gov/ecp/species/7850
Habitat assessment guidelines:
https://ecos.fws.gov/ipac/guideline/assessment/population/436/office/11420.pdf

Crustaceans

NAME	STATUS
Vernal Pool Fairy Shrimp *Branchinecta lynchi*	Threatened

There is **final** critical habitat for this species. Your location is outside the critical habitat.
Species profile: https://ecos.fws.gov/ecp/species/498

Vernal Pool Tadpole Shrimp *Lepidurus packardi*	Endangered

There is **final** critical habitat for this species. Your location is outside the critical habitat.
Species profile: https://ecos.fws.gov/ecp/species/2246

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
San Francisco Bay-Delta Fish And Wildlife
650 Capitol Mall
Suite 8-300
Sacramento, CA 95814
Phone: (916) 930-5603 Fax: (916) 930-5654
http://kim_squires@fws.gov

In Reply Refer To:
Consultation Code: 08FBDT00-2017-SLI-0152
Event Code: 08FBDT00-2019-E-00713
Project Name: Broadway Bridge

September 17, 2019

Subject: Updated list of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

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Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

San Francisco Bay-Delta Fish And Wildlife
650 Capitol Mall
Suite 8-300
Sacramento, CA 95814
(916) 930-5603

This project's location is within the jurisdiction of multiple offices. Expect additional species list documents from the following office, and expect that the species and critical habitats in each document reflect only those that fall in the office's jurisdiction:

Sacramento Fish And Wildlife Office
Federal Building
2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846
(916) 414-6600

Project Summary

Consultation Code: 08FBDT00-2017-SLI-0152

Event Code: 08FBDT00-2019-E-00713

Project Name: Broadway Bridge

Project Type: BRIDGE CONSTRUCTION / MAINTENANCE

Project Description: Construction of new bridge off of Broadway in Sacramento across the Sacramento River to West Sacramento.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/38.57704005752997N121.51308186662763W

Counties: Sacramento, CA | Yolo, CA

Endangered Species Act Species

There is a total of 8 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

---

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Birds

NAME	STATUS
Least Bell's Vireo *Vireo bellii pusillus*	Endangered

There is **final** critical habitat for this species. Your location is outside the critical habitat.
Species profile: https://ecos.fws.gov/ecp/species/5945

Reptiles

NAME	STATUS
Giant Garter Snake *Thamnophis gigas*	Threatened

No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/4482

Amphibians

NAME	STATUS
California Red-legged Frog *Rana draytonii* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/2891	Threatened
California Tiger Salamander *Ambystoma californiense* Population: U.S.A. (Central CA DPS) There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/2076	Threatened

Fishes

NAME	STATUS
Delta Smelt *Hypomesus transpacificus* There is **final** critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/321	Threatened

Insects

NAME	STATUS
Valley Elderberry Longhorn Beetle *Desmocerus californicus dimorphus* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/7850	Threatened

Crustaceans

NAME	STATUS
Vernal Pool Fairy Shrimp *Branchinecta lynchi* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/498	Threatened
Vernal Pool Tadpole Shrimp *Lepidurus packardi* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/2246	Endangered

Critical habitats

There is 1 critical habitat wholly or partially within your project area under this office's jurisdiction.

NAME	STATUS
Delta Smelt *Hypomesus transpacificus* https://ecos.fws.gov/ecp/species/321#crithab	Final

From: Taylor, Brooks M@DOT
Sent: Monday, November 4, 2019 2:39 PM
To: nmfswcrca.specieslist@noaa.gov
Cc: jeff.koslowski@icf.com
Subject: Broadway Bridge Replacement 5447 (043)

Federal Agency: Federal Highway Administration – California Division
Federal Agency Address: 650 Capitol Mall, Suite 4-100, Sacramento, CA 95814-4708
Non-Federal Agency Representative: California Department of Transportation
Non-Federal Agency Representative Address: 703 B Street, Marysville, CA 95901
City of West Sacramento, Broadway Bridge Replacement 5447 (043)
Point-of-Contact Brooks Taylor, brooks_taylor@dot.ca.gov, (530) 741-4449

Quad Name **Sacramento West**
Quad Number **38121-E5**

ESA Anadromous Fish

SONCC Coho ESU (T) -
CCC Coho ESU (E) -
CC Chinook Salmon ESU (T) -
CVSR Chinook Salmon ESU (T) - **X**
SRWR Chinook Salmon ESU (E) - **X**
NC Steelhead DPS (T) -
CCC Steelhead DPS (T) -
SCCC Steelhead DPS (T) -
SC Steelhead DPS (E) -
CCV Steelhead DPS (T) - **X**
Eulachon (T) -
sDPS Green Sturgeon (T) - **X**

ESA Anadromous Fish Critical Habitat

SONCC Coho Critical Habitat -
CCC Coho Critical Habitat -
CC Chinook Salmon Critical Habitat -
CVSR Chinook Salmon Critical Habitat - **X**
SRWR Chinook Salmon Critical Habitat - **X**
NC Steelhead Critical Habitat -
CCC Steelhead Critical Habitat -
SCCC Steelhead Critical Habitat -
SC Steelhead Critical Habitat -

CCV Steelhead Critical Habitat - X
Eulachon Critical Habitat -
sDPS Green Sturgeon Critical Habitat - X

ESA Marine Invertebrates

Range Black Abalone (E) -
Range White Abalone (E) -

ESA Marine Invertebrates Critical Habitat

Black Abalone Critical Habitat -

ESA Sea Turtles

East Pacific Green Sea Turtle (T) -
Olive Ridley Sea Turtle (T/E) -
Leatherback Sea Turtle (E) -
North Pacific Loggerhead Sea Turtle (E) -

ESA Whales

Blue Whale (E) -
Fin Whale (E) -
Humpback Whale (E) -
Southern Resident Killer Whale (E) -
North Pacific Right Whale (E) -
Sei Whale (E) -
Sperm Whale (E) -

ESA Pinnipeds

Guadalupe Fur Seal (T) -
Steller Sea Lion Critical Habitat -

Essential Fish Habitat

Coho EFH -
Chinook Salmon EFH - X
Groundfish EFH - X
Coastal Pelagics EFH -

Highly Migratory Species EFH -

MMPA Species (See list at left)

ESA and MMPA Cetaceans/Pinnipeds
See list at left and consult the NMFS Long Beach office 562-980-4000

MMPA Cetaceans -
MMPA Pinnipeds -

Brooks Taylor
Associate Environmental Planner
530-741-4449
530-521-9343 (Cell)

.... if you take a three-hour walk through the forest and along the river, you're simply not the same as when you started out.

Jim Harrison

From: NMFSWCRCA Specieslist - NOAA Service Account <nmfswcrca.specieslist+canned.response@noaa.gov>
Sent: Monday, November 4, 2019 2:39 PM
To: Taylor, Brooks M@DOT <brooks.taylor@dot.ca.gov>
Subject: Re: Broadway Bridge Replacement 5447 (043)

Receipt of this message confirms that NMFS has received your email to nmfswcrca.specieslist@noaa.gov. If you are a federal agency (or representative) and have followed the steps outlined on the California Species List Tools web page (http://www.westcoast.fisheries.noaa.gov/maps_data/california_species_list_tools.html), you have generated an official Endangered Species Act species list.

Messages sent to this email address are not responded to directly. For project specific questions, please contact your local NMFS office.

Northern California/Klamath (Arcata) 707-822-7201

North-Central Coast (Santa Rosa) 707-387-0737

Southern California (Long Beach) 562-980-4000

California Central Valley (Sacramento) 916-930-3600

Selected Elements by Scientific Name

California Department of Fish and Wildlife

California Natural Diversity Database

Query Criteria: Quad IS (Sacramento East (3812154) OR Sacramento West (3812155) OR Clarksburg (3812145) OR Saxon (3812146) OR Rio Linda (3812164) OR Florin (3812144) OR Taylor Monument (3812165) OR Grays Bend (3812166) OR Davis (3812156))
 AND Taxonomic Group IS (Fish OR Amphibians OR Reptiles OR Birds OR Mammals OR Mollusks OR Arachnids OR Crustaceans OR Insects)

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Accipiter cooperii Cooper's hawk	ABNKC12040	None	None	G5	S4	WL
Agelaius tricolor tricolored blackbird	ABPBXB0020	None	Threatened	G2G3	S1S2	SSC
Ammodramus savannarum grasshopper sparrow	ABPBXA0020	None	None	G5	S3	SSC
Antrozous pallidus pallid bat	AMACC10010	None	None	G5	S3	SSC
Archoplites interruptus Sacramento perch	AFCQB07010	None	None	G2G3	S1	SSC
Ardea alba great egret	ABNGA04040	None	None	G5	S4	
Ardea herodias great blue heron	ABNGA04010	None	None	G5	S4	
Athene cunicularia burrowing owl	ABNSB10010	None	None	G4	S3	SSC
Bombus crotchii Crotch bumble bee	IIHYM24480	None	Candidate Endangered	G3G4	S1S2	
Bombus occidentalis western bumble bee	IIHYM24250	None	Candidate Endangered	G2G3	S1	
Branchinecta conservatio Conservancy fairy shrimp	ICBRA03010	Endangered	None	G2	S2	
Branchinecta lynchi vernal pool fairy shrimp	ICBRA03030	Threatened	None	G3	S3	
Branchinecta mesovallensis midvalley fairy shrimp	ICBRA03150	None	None	G2	S2S3	
Buteo regalis ferruginous hawk	ABNKC19120	None	None	G4	S3S4	WL
Buteo swainsoni Swainson's hawk	ABNKC19070	None	Threatened	G5	S3	
Charadrius alexandrinus nivosus western snowy plover	ABNNB03031	Threatened	None	G3T3	S2S3	SSC
Charadrius montanus mountain plover	ABNNB03100	None	None	G3	S2S3	SSC
Cicindela hirticollis abrupta Sacramento Valley tiger beetle	IICOL02106	None	None	G5TH	SH	

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Coccyzus americanus occidentalis western yellow-billed cuckoo	ABNRB02022	Threatened	Endangered	G5T2T3	S1	
Desmocerus californicus dimorphus valley elderberry longhorn beetle	IICOL48011	Threatened	None	G3T2	S2	
Egretta thula snowy egret	ABNGA06030	None	None	G5	S4	
Elanus leucurus white-tailed kite	ABNKC06010	None	None	G5	S3S4	FP
Emys marmorata western pond turtle	ARAAD02030	None	None	G3G4	S3	SSC
Falco columbarius merlin	ABNKD06030	None	None	G5	S3S4	WL
Lasionycteris noctivagans silver-haired bat	AMACC02010	None	None	G5	S3S4	
Lasiurus cinereus hoary bat	AMACC05030	None	None	G5	S4	
Laterallus jamaicensis coturniculus California black rail	ABNME03041	None	Threatened	G3G4T1	S1	FP
Lepidurus packardi vernal pool tadpole shrimp	ICBRA10010	Endangered	None	G4	S3S4	
Linderiella occidentalis California linderiella	ICBRA06010	None	None	G2G3	S2S3	
Melospiza melodia song sparrow ("Modesto" population)	ABPBXA3010	None	None	G5	S3?	SSC
Myrmosula pacifica Antioch multilid wasp	IIHYM15010	None	None	GH	SH	
Nycticorax nycticorax black-crowned night heron	ABNGA11010	None	None	G5	S4	
Oncorhynchus mykiss irideus pop. 11 steelhead - Central Valley DPS	AFCHA0209K	Threatened	None	G5T2Q	S2	
Oncorhynchus tshawytscha pop. 6 chinook salmon - Central Valley spring-run ESU	AFCHA0205A	Threatened	Threatened	G5	S1	
Oncorhynchus tshawytscha pop. 7 chinook salmon - Sacramento River winter-run ESU	AFCHA0205B	Endangered	Endangered	G5	S1	
Phalacrocorax auritus double-crested cormorant	ABNFD01020	None	None	G5	S4	WL
Plegadis chihi white-faced ibis	ABNGE02020	None	None	G5	S3S4	WL
Pogonichthys macrolepidotus Sacramento splittail	AFCJB34020	None	None	GNR	S3	SSC
Progne subis purple martin	ABPAU01010	None	None	G5	S3	SSC

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Riparia riparia bank swallow	ABPAU08010	None	Threatened	G5	S2	
Spirinchus thaleichthys longfin smelt	AFCHB03010	Candidate	Threatened	G5	S1	
Taxidea taxus American badger	AMAJF04010	None	None	G5	S3	SSC
Thamnophis gigas giant gartersnake	ARADB36150	Threatened	Threatened	G2	S2	
Vireo bellii pusillus least Bell's vireo	ABPBW01114	Endangered	Endangered	G5T2	S2	
Xanthocephalus xanthocephalus yellow-headed blackbird	ABPBXB3010	None	None	G5	S3	SSC

Record Count: 45

Selected Elements by Scientific Name

California Department of Fish and Wildlife

California Natural Diversity Database

Query Criteria: Quad IS (Sacramento East (3812154) OR Sacramento West (3812155) OR Clarksburg (3812145) OR Saxon (3812146) OR Rio Linda (3812164) OR Florin (3812144) OR Taylor Monument (3812165) OR Grays Bend (3812166) OR Davis (3812156))
 AND Taxonomic Group IS (Ferns OR Gymnosperms OR Monocots OR Dicots OR Lichens OR Bryophytes)

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Astragalus tener var. ferrisiae Ferris' milk-vetch	PDFAB0F8R3	None	None	G2T1	S1	1B.1
Astragalus tener var. tener alkali milk-vetch	PDFAB0F8R1	None	None	G2T1	S1	1B.2
Atriplex cordulata var. cordulata heartscale	PDCHE040B0	None	None	G3T2	S2	1B.2
Atriplex depressa brittlescale	PDCHE042L0	None	None	G2	S2	1B.2
Carex comosa bristly sedge	PMCYP032Y0	None	None	G5	S2	2B.1
Centromadia parryi ssp. parryi pappose tarplant	PDAST4R0P2	None	None	G3T2	S2	1B.2
Chloropyron palmatum palmate-bracted bird's-beak	PDSCR0J0J0	Endangered	Endangered	G1	S1	1B.1
Cuscuta obtusiflora var. glandulosa Peruvian dodder	PDCUS01111	None	None	G5T4?	SH	2B.2
Downingia pusilla dwarf downingia	PDCAM060C0	None	None	GU	S2	2B.2
Eryngium jepsonii Jepson's coyote-thistle	PDAPI0Z130	None	None	G2	S2	1B.2
Extriplex joaquinana San Joaquin spearscale	PDCHE041F3	None	None	G2	S2	1B.2
Fritillaria agrestis stinkbells	PMLIL0V010	None	None	G3	S3	4.2
Gratiola heterosepala Boggs Lake hedge-hyssop	PDSCR0R060	None	Endangered	G2	S2	1B.2
Hibiscus lasiocarpos var. occidentalis woolly rose-mallow	PDMAL0H0R3	None	None	G5T3	S3	1B.2
Legenere limosa legenere	PDCAM0C010	None	None	G2	S2	1B.1
Lepidium latipes var. heckardii Heckard's pepper-grass	PDBRA1M0K1	None	None	G4T1	S1	1B.2
Lilaeopsis masonii Mason's lilaeopsis	PDAPI19030	None	Rare	G2	S2	1B.1
Navarretia leucocephala ssp. bakeri Baker's navarretia	PDPLM0C0E1	None	None	G4T2	S2	1B.1

Selected Elements by Scientific Name

California Department of Fish and Wildlife

California Natural Diversity Database

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Neostapfia colusana Colusa grass	PMPOA4C010	Threatened	Endangered	G1	S1	1B.1
Plagiobothrys hystriculus bearded popcornflower	PDBOR0V0H0	None	None	G2	S2	1B.1
Puccinellia simplex California alkali grass	PMPOA53110	None	None	G3	S2	1B.2
Sagittaria sanfordii Sanford's arrowhead	PMALI040Q0	None	None	G3	S3	1B.2
Sidalcea keckii Keck's checkerbloom	PDMAL110D0	Endangered	None	G2	S2	1B.1
Symphyotrichum lentum Suisun Marsh aster	PDASTE8470	None	None	G2	S2	1B.2
Trifolium hydrophilum saline clover	PDFAB400R5	None	None	G2	S2	1B.2
Tuctoria mucronata Crampton's tuctoria or Solano grass	PMPOA6N020	Endangered	Endangered	G1	S1	1B.1

Record Count: 26

CNPS California Native Plant Society

Inventory of Rare and Endangered Plants

*The database used to provide updates to the Online Inventory is under construction. View updates and changes made since May 2019 here.

Plant List

31 matches found. *Click on scientific name for details*

Search Criteria

Found in Quads 3812166, 3812165, 3812164, 3812156, 3812155, 3812154, 3812146 3812145 and 3812144;

Modify Search Criteria Export to Excel Modify Columns Modify Sort Display Photos

Scientific Name	Common Name	Family	Lifeform	Blooming Period	CA Rare Plant Rank	State Rank	Global Rank
Astragalus pauperculus	depauperate milk-vetch	Fabaceae	annual herb	Mar-Jun	4.3	S4	G4
Astragalus tener var. ferrisiae	Ferris' milk-vetch	Fabaceae	annual herb	Apr-May	1B.1	S1	G2T1
Astragalus tener var. tener	alkali milk-vetch	Fabaceae	annual herb	Mar-Jun	1B.2	S1	G2T1
Atriplex cordulata var. cordulata	heartscale	Chenopodiaceae	annual herb	Apr-Oct	1B.2	S2	G3T2
Atriplex depressa	brittlescale	Chenopodiaceae	annual herb	Apr-Oct	1B.2	S2	G2
Brodiaea rosea ssp. vallicola	valley brodiaea	Themidaceae	perennial bulbiferous herb	Apr-May (Jun)	4.2	S3	G5T3
Carex comosa	bristly sedge	Cyperaceae	perennial rhizomatous herb	May-Sep	2B.1	S2	G5
Centromadia parryi ssp. parryi	pappose tarplant	Asteraceae	annual herb	May-Nov	1B.2	S2	G3T2
Centromadia parryi ssp. rudis	Parry's rough tarplant	Asteraceae	annual herb	May-Oct	4.2	S3	G3T3
Chloropyron palmatum	palmate-bracted bird's-beak	Orobanchaceae	annual herb (hemiparasitic)	May-Oct	1B.1	S1	G1
Cuscuta obtusiflora var. glandulosa	Peruvian dodder	Convolvulaceae	annual vine (parasitic)	Jul-Oct	2B.2	SH	G5T4?
Downingia pusilla	dwarf downingia	Campanulaceae	annual herb	Mar-May	2B.2	S2	GU
Eryngium jepsonii	Jepson's coyote thistle	Apiaceae	perennial herb	Apr-Aug	1B.2	S2?	G2?
Extriplex joaquinana	San Joaquin spearscale	Chenopodiaceae	annual herb	Apr-Oct	1B.2	S2	G2
Fritillaria agrestis	stinkbells	Liliaceae	perennial bulbiferous herb	Mar-Jun	4.2	S3	G3

Gratiola heterosepala	Boggs Lake hedge-hyssop	Plantaginaceae	annual herb	Apr-Aug	1B.2	S2	G2
Hesperevax caulescens	hogwallow starfish	Asteraceae	annual herb	Mar-Jun	4.2	S3	G3
Hibiscus lasiocarpos var. occidentalis	woolly rose-mallow	Malvaceae	perennial rhizomatous herb (emergent)	Jun-Sep	1B.2	S3	G5T3
Juglans hindsii	Northern California black walnut	Juglandaceae	perennial deciduous tree	Apr-May	1B.1	S1	G1
Legenere limosa	legenere	Campanulaceae	annual herb	Apr-Jun	1B.1	S2	G2
Lepidium latipes var. heckardii	Heckard's pepper-grass	Brassicaceae	annual herb	Mar-May	1B.2	S1	G4T1
Lilaeopsis masonii	Mason's lilaeopsis	Apiaceae	perennial rhizomatous herb	Apr-Nov	1B.1	S2	G2
Myosurus minimus ssp. apus	little mousetail	Ranunculaceae	annual herb	Mar-Jun	3.1	S2	G5T2Q
Navarretia leucocephala ssp. bakeri	Baker's navarretia	Polemoniaceae	annual herb	Apr-Jul	1B.1	S2	G4T2
Neostapfia colusana	Colusa grass	Poaceae	annual herb	May-Aug	1B.1	S1	G1
Plagiobothrys hystriculus	bearded popcornflower	Boraginaceae	annual herb	Apr-May	1B.1	S2	G2
Puccinellia simplex	California alkali grass	Poaceae	annual herb	Mar-May	1B.2	S2	G3
Sagittaria sanfordii	Sanford's arrowhead	Alismataceae	perennial rhizomatous herb (emergent)	May-Oct (Nov)	1B.2	S3	G3
Symphyotrichum lentum	Suisun Marsh aster	Asteraceae	perennial rhizomatous herb	(Apr)May-Nov	1B.2	S2	G2
Trifolium hydrophilum	saline clover	Fabaceae	annual herb	Apr-Jun	1B.2	S2	G2
Tuctoria mucronata	Crampton's tuctoria or Solano grass	Poaceae	annual herb	Apr-Aug	1B.1	S1	G1

Suggested Citation

California Native Plant Society, Rare Plant Program. 2019. Inventory of Rare and Endangered Plants of California (online edition, v8-03 0.39). Website http://www.rareplants.cnps.org [accessed 23 September 2019].

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The Jepson Flora Project
The Consortium of California Herbaria
CalPhotos

Questions and Comments
rareplants@cnps.org

Appendix C Representative Photographs

Photo 1. Cottonwood riparian forest, West Sacramento, facing north.

Photo 2. Cottonwood riparian forest (red sesbania in foreground), West Sacramento, facing north.

Photo 3. Cottonwood riparian forest, Sacramento, facing north.

Photo 4. Cottonwood riparian forest, Sacramento, facing southeast.

Photo 5. Ruderal habitat, West Sacramento, facing east.

Photo 6. Ruderal habitat, Sacramento, facing north.

Photo 7. Ruderal habitat, Sacramento, facing east.

Photo 8. Landscaped habitat, West Sacramento, facing east.

Photo 9. Landscaped habitat, Sacramento, facing south.

Photo 10. Landscaped habitat, Sacramento, facing southeast.

Photo 11. Elderberry shrub, Sacramento, facing north.

Appendix D Aquatic Resources Delineation Letter

November 5, 2019

Ms. Nancy Haley
U.S. Army Corps of Engineers
Sacramento District, Regulatory Division
1325 J Street, Room 1350
Sacramento, CA 95814-2922

Subject: **Request for preliminary jurisdictional determination of the delineation of the proposed Broadway Bridge Project, Sacramento County and Yolo County, California**

Dear Ms. Haley:

On behalf of the Cities of West Sacramento and Sacramento (Cities), and the California Department of Transportation (Caltrans), ICF is submitting a Request for Preliminary Jurisdictional Determination (PJD) for the Sacramento River at Broadway Bridge project. The City of West Sacramento, in cooperation with the City of Sacramento and Caltrans, proposes to construct a new bridge over the Sacramento River south of the Pioneer Bridge (US 50) to provide local interconnectivity across the river and between neighborhoods (Attachment A). The new connection would serve multiple modes of transportation and comply with current design standards for the American Association of State Highway and Transportation Officials, Caltrans, and local agencies.

The Cities plan to submit a permit application for any work below OHWM. At this time, the Cities are requesting a PJD of the OHWM of the Sacramento River based on the discussion provided below and the attached delineation map (Attachment B) and photographs (Attachment C).

Survey Area

The survey area comprises approximately 220 acres surrounding the four proposed bridge and approaches alternatives (Attachment B). The proposed bridge alternatives are located over the Sacramento River between the Cities of West Sacramento and Sacramento, varying between approximately 430 feet and 1,170 feet south of the existing Pioneer Bridge. The survey area consists of the Sacramento River and the associated riparian woodland, local roads, railroad tracks, and commercial and industrial development. The survey area includes the locations of the four proposed bridge alternatives, realignment of local roads associated with each alternative, a fiber optic line that would connect the Broadway Bridge with the proposed replacement for the I Street Bridge and the existing Tower Bridge, and proposed construction staging areas. The survey area has a relatively high level of historical and ongoing disturbance, including petroleum storage tank farms. Elevations in the survey area range from approximately 10 to 35 feet above mean sea level.

According to soil data from the Natural Resources Conservation Service[1], the survey area contains the following five soil map units and water:

- Lang sandy loam (Yolo County)
- Lang sandy loam, deep (Yolo County)
- Sycamore silt loam, 0 to 1 percent slopes, MLRA 17 (Yolo County)
- Columbia sandy loam, drained, 0 to 2 percent slopes, occasionally flooded (Sacramento County)
- Urban land (Sacramento County)

Of these, hydric map units include minor components within the Lang sandy loam; Lang sandy loam, deep; Sycamore silt loam, 0 to 1 percent slopes, MLRA 17; and Columbia sandy loam, drained, 0 to 2 percent slopes, occasionally flooded. The soil profile has been disturbed by development on both sides of the river.

Methods

ICF wetland ecologist/botanist Lisa Webber conducted the field study on August 24, 2017 and February 6 and 9, 2018 on behalf of the Cities in support of the proposed Broadway Bridge project. The field study included investigations to identify areas that could be subject to jurisdiction by the U.S. Army Corps of Engineers (USACE) under Section 404 of the Clean Water Act (CWA) and the California Department of Fish and Wildlife (CDFW) and to evaluate possible environmental constraints. Not all parcels in the survey area had permissions to enter, and some parcels were viewed from roadside with binoculars. The investigation consisted of walking the accessible parts of the survey area and accessing parts of the survey area by boat from the river. The wetland ecologist/botanist identified the OHWM of the Sacramento River in the field using the guidance provided in Regulatory Guidance Letter 05-05. This boundary was confirmed using LiDAR to identify the location of the 19-foot elevation, which has been identified as the OHWM for the Sacramento River at the existing I Street bridge located approximately 1.3 miles upstream of the survey area. Aerial and ground-view photographs of the survey area were reviewed prior to the field study.

Results

The survey area in the City of West Sacramento west of the levee and the City of Sacramento east of the levee is developed, graded, or landscaped. One non-wetland water (the Sacramento River) was identified in the survey area and is further described below. No wetlands were observed in the survey area.

[1] Natural Resources Conservation Service. 2019. United States Department of Agriculture, Soil Survey Staff. Web Soil Survey. Available: http://websoilsurvey.nrcs.usda.gov/. Accessed: October 8, 2019. Last updated: September 16, 2019 (Sacramento County and Yolo County).

Non-Wetland Waters—Sacramento River

The location of the OHWM in the Sacramento River was based on observations in the field of shelving, silt deposition, and wracking. The average width of the Sacramento River at the OHWM is approximately 720 feet, and the survey area encompasses 27.759 acres of the river. The channel bottom is a natural substrate, presumably sand and sediment, but water turbidity prevented visual confirmation of the composition. The riverbanks are mostly steeply sloped and support riparian forest vegetation above and below the OHWM, with riprap near the bottom of the slope (Photos 1–7).

The cottonwood riparian community on the Sacramento River banks is predominantly mature Fremont cottonwood (*Populus fremontii*) [FAC] and black willow (*Salix gooddingii*) [FACW] trees associated with valley oak (*Quercus lobata*) [FACU] and black locust (*Robinia pseudoacacia*) [FACU]. Other riparian tree species observed include boxelder (*Acer negundo* var. *californicum*) [FACW], Oregon ash (*Fraxinus latifolia*) [FACW], and northern California black walnut (*Juglans californica* var. *hindsii*) [FAC]. The riparian understory on the waterside of the levee is primarily rip-rap with nonnative annual grasses and forbs, however, there are also patches of more typical riparian species, such as narrow-leaf willow (*Salix exigua*) [FACW] and Himalayan blackberry (*Rubus armeniacus*) [FACU]. The invasive red sesbania (*Sesbania punicea*) [FACW] shrub was observed in the riparian forest on both sides of the river.

The Cities request verification of the OHWM of the Sacramento River within the survey area and a preliminary jurisdictional determination according to RGL 16-01. If you require additional information or have any questions regarding this request, please contact me at lisa.webber@icf.com or Claire Bromund at claire.bromund@icf.com or either of us by phone at (916) 737-3000.

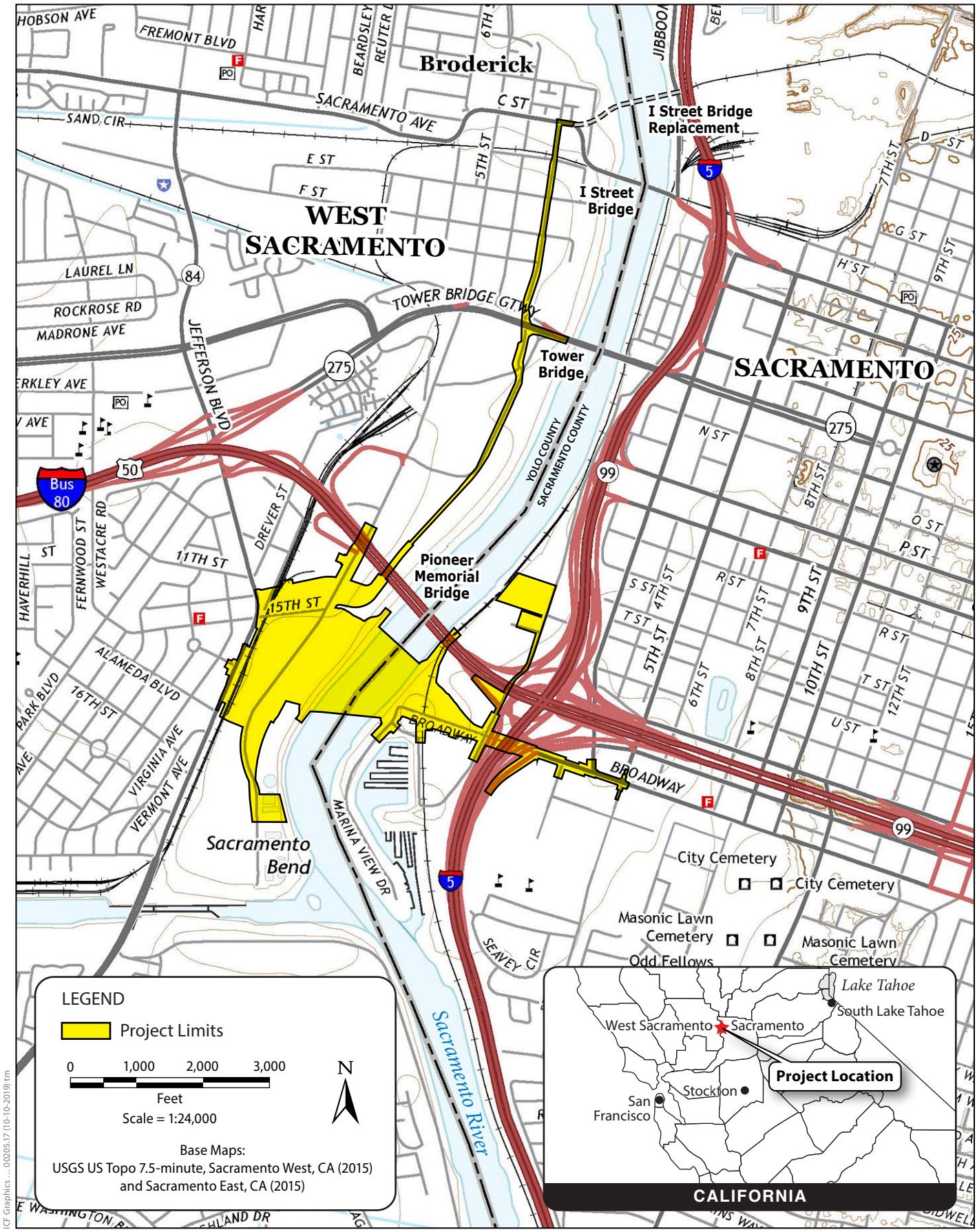
Thank you for your assistance with this project.

Sincerely,

Lisa Webber
Wetland Ecologist

Attachments: Attachment A (Project Location Map)
Attachment B (Delineation of Aquatic Resources in the Survey Area)
Attachment C (Representative Photographs)

cc: Jason McCoy, City of West Sacramento
Jesse Gothan, City of Sacramento



ICF Graphics ... 00205.17 (10-10-2019) tm

Attachment A
Location Map

121°30'50"W
121°30'40"W
121°30'30"W
121°30'20"W
38°35'20"N
38°35'10"N
38°35'0"N

Broadway Bridge
October 2019

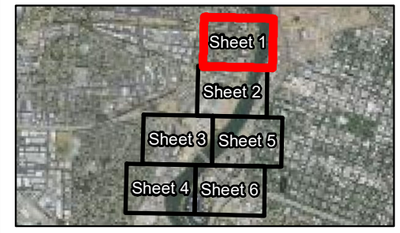
Legend

- Biological Study Area (220 acres)
- Contours (5 foot interval)
- Parcels with Permission to Enter
- Ordinary High Water Mark

Non-Wetland Waters

- Perennial Stream (27.759 acres)

W = Average Width



N

0 50 100 200
Feet

1 inch = 250 feet

Notes:

Base Map Source: ICF
Imagery Source: NAIP 2018
USGS Topo Quad: Sacramento West and Sacramento East
PLSS: New Helvetia Landgrant and Wetlands Landgrant

Prepared By: ICF 2019
Delineated By: L. Webber
Delineation Date: August 24th, 2017 and February 6th and 9th, 2018
Drawn By: A. Angier

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Attachment B
Delineation of Aquatic Resources

121°31'0"W
121°30'50"W
121°30'40"W
121°30'30"W
121°30'20"W
38°34'50"N
38°34'40"N

Broadway Bridge
October 2019

Legend

- Biological Study Area (220 acres)
- Contours (5 foot interval)
- Parcels with Permission to Enter
- Ordinary High Water Mark

Non-Wetland Waters

- Perennial Stream (27.759 acres)

W = Average Width

0 50 100 200
Feet

1 inch = 250 feet

Notes:

Base Map Source: ICF
Imagery Source: NAIP 2018
USGS Topo Quad: Sacramento West and Sacramento East
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Attachment B
Delineation of Aquatic Resources

121°31'30"W
121°31'20"W
121°31'10"W
121°31'0"W
38°34'30"N
38°34'20"N

Broadway Bridge
October 2019

Legend

- Biological Study Area (220 acres)
- Contours (5 foot interval)
- Parcels with Permission to Enter
- Ordinary High Water Mark

Non-Wetland Waters

- Perennial Stream (27.759 acres)

W = Average Width

N

0 50 100 200
Feet

1 inch = 250 feet

Notes:

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Imagery Source: NAIP 2018
USGS Topo Quad: Sacramento West and Sacramento East
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Delineation Date: August 24th, 2017 and February 6th and 9th, 2018
Drawn By: A. Angier

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Attachment B
Delineation of Aquatic Resources

121°31'40"W
121°31'30"W
121°31'20"W
121°31'10"W
38°34'10"N
38°34'0"N

Broadway Bridge
October 2019

Legend

- Biological Study Area (220 acres)
- Contours (5 foot interval)
- Parcels with Permission to Enter
- Ordinary High Water Mark

Non-Wetland Waters

- Perennial Stream (27.759 acres)

W = Average Width

N

0 50 100 200
Feet

1 inch = 250 feet

Notes:

Base Map Source: ICF
Imagery Source: NAIP 2018
USGS Topo Quad: Sacramento West and Sacramento East
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Attachment B
Delineation of Aquatic Resources

121°30'50"W
121°30'40"W
121°30'30"W
121°30'20"W
38°34'30"N
38°34'20"N

Broadway Bridge
October 2019

Legend

- Biological Study Area (220 acres)
- Contours (5 foot interval)
- Parcels with Permission to Enter
- Ordinary High Water Mark

Non-Wetland Waters

- Perennial Stream (27.759 acres)

W = Average Width

N

0 50 100 200
Feet

1 inch = 250 feet

Notes:

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Imagery Source: NAIP 2018
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Attachment B
Delineation of Aquatic Resources

121°31'0"W 121°30'50"W 121°30'40"W 121°30'30"W

38°34'10"N

38°34'0"N

Broadway Bridge
October 2019

Legend

- Biological Study Area (220 acres)
- Contours (5 foot interval)
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- Perennial Stream (27.759 acres)

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0 50 100 200
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USGS Topo Quad: Sacramento West and Sacramento East
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Attachment B
Delineation of Aquatic Resources

Attachment C. Representative Photographs

Photo 1. West bank of Sacramento River, facing north.

Photo 2. West bank of Sacramento River, facing north.

Photo 3. West bank of Sacramento River, facing north.

Photo 4. East bank of Sacramento River, facing north.

Photo 5. East bank of Sacramento River, facing east.

Photo 6. East bank of Sacramento River, facing southeast.

Photo 7. East bank of Sacramento River, facing south.

Appendix E Plant Species Observed in the Biological Study Area

Scientific Name	Common Name
Acer negundo var. *californicum*	Box elder
*Ailanthus altissima**	Tree of heaven
Agave americana	American century plant
Alnus rhombifolia	White alder
Amaranthus retroflexus	Green amaranth
*Brassica nigra**	Black mustard
*Bromus diandrus**	Ripgut brome
*Bromus hordeaceus**	Soft chess
Capsella bursa-pastoris	Shepherd's purse
Cedrus deodara	Deodar cedar
Cephalanthus occidentalis var. *californicus*	Common buttonbush
Cerastium fontanum	Mouse ear chickweed
Chenopodium album	Lambs quarters
Cinnamomum camphora	Camphor tree
*Cirsium vulgare**	Bull thistle
Claytonia perfoliata	Miner's lettuce
Crassula connata	Pygmy weed
Cupressus sempervirens	Italian cypress
*Cynodon dactylon**	Bermuda grass
Cyperus sp.	Flatsedge
Epilobium ciliatum	Fringed willowherb
Equisetum arvense	Horsetail
Erigeron canadensis	Horseweed
Erodium botrys	Big heronbill
Erodium moschatum	White stemmed filaree
Eschscholzia californica	California poppy
Festuca myuros [*Vulpia myuros*]*	Rattail six weeks grass
Fraxinus latifolia	Oregon ash
Galium aparine	Common bedstraw
Geranium molle	Crane's bill geranium
Glycyrrhiza lepidota	American licorice
*Hedera helix**	English ivy
Helianthus annuus	Common sunflower
Heterotheca grandiflora	Telegraph weed
Hordeum murinum ssp. *leporinum**	Foxtail barley
Juglans californica var. *hindsii*	Black walnut
Juncus effusus ssp. *pacificus*	Pacific rush
Lactuca serriola	Prickly lettuce
Lamium amplexicaule	Giraffe head
Leontodon taraxicoides	Dandelion
Lupinus bicolor	Bicolor lupine
Malva parviflora	Cheeseweed
Matricaria discoidea	Pineapple weed

Scientific Name	Common Name
Medicago polymorpha	Burclover
Melilotus sp.	Sweetclover
Morus alba	Mulberry
Nerium oleander	Oleander
Nicotiana acuminata var. *multiflorum*	Many flowered tobacco
Persicaria maculosa	Spotted lady's thumb
Persicaria punctata	Dotted smartweed
Pinus sp.	Pine
Pittosporum toriba	Mock orange
Platanus x *hispanica*	London plane tree
Platanus racemosa	Western sycamore
Poa annua	Annual bluegrass
Populus fremontii ssp. *fremontii*	Fremont cottonwood
Portulaca oleracea	Common purslane
Quercus lobata	Valley oak
*Raphanus sativus**	Wild radish
*Robinia pseudoacacia**	Black locust
Rubus armeniacus [*discolor*]*	Himalayan blackberry
Salix exigua	Sandbar willow
Salix gooddingii	Black willow
*Salsola tragus**	Russian thistle
Sambucus nigra ssp. *caerulea* [*mexicana*]	Blue elderberry
Senecio vulgaris	Old man of spring
*Sesbania punicea**	Red sesbania
*Silybum marianum**	Milk-thistle
Solanum americanum	Common nightshade
Sonchus oleraceus	Common sow thistle
*Sorghum halepense**	Johnsongrass
Spergularia macrotheca	Sticky sandspurry
Stipa miliacea [*Piptatherum miliaceum*]*	Smilo grass
*Torilis arvensis**	Field hedge parsley
Trifolium repens	White clover
Ulmus sp.	Elm
Vicia villosa ssp. *varia*	Winter vetch
Vitis californica	California wild grape
Washingtonia filifera	California fan palm

* Invasive species on CalIPC and/or CDFA lists (Natural Resources Conservation Service 2003; California Invasive Plant Council 2018).

Appendix F Protected Trees in the Broadway Bridge Project Impact Areas

Tree Species	Estimated Diameter at Breast Height (inches)[a]	Community Type
West Sacramento Impact Areas		
Valley oak	36	Riparian
Fremont's cottonwood	60	Riparian
Valley oak	18	Riparian
Box elder	8 + 6	Riparian
Fremont's cottonwood	48 + 60	Riparian
Western sycamore	12 + 8	Riparian
Fremont's cottonwood	48 + 24	Riparian
Fremont's cottonwood	48 + 60	Riparian
Black willow	48	Riparian
Fremont's cottonwood	24 + 24	Riparian
Camphor	11 + 7 + 7 + 8 + 9 + 9 + 9	Riparian
Fremont's cottonwood	36	Riparian
Fremont's cottonwood	48 + 12	Riparian
Sacramento Impact Areas		
Valley oak	18	Riparian
Valley oak	18	Riparian
Valley oak	24 + 24 +16	Ruderal
Valley oak	36	Riparian
Elm	46 + 58	Ruderal
Fremont's cottonwood	36	Riparian
Fremont's cottonwood	24	Riparian
Oregon ash	36	Riparian
Valley oak	24	Riparian
Black willow	36 + 12 + 18	Riparian
Black willow	36	Riparian
Fremont's cottonwood	36	Riparian
Fremont's cottonwood	40	Riparian
Fremont's cottonwood	40	Riparian
Fremont's cottonwood	36	Riparian
Fremont's cottonwood	36	Riparian
Fremont's cottonwood	24	Riparian
Fremont's cottonwood	24	Riparian
Fremont's cottonwood	30	Riparian
Fremont's cottonwood	36	Riparian

Note: The definition of protected trees is based on the City of Sacramento and City of West Sacramento heritage tree ordinances. The appropriate definition was applied based on the tree's location. Black locust, an invasive species, is included in the table.

[a] A "+" between numbers indicates the individual trunk diameters of a multi-trunked tree. Tree size was visually estimated, not measured.