California High-Speed Rail Authority

Merced to Fresno Section: Central Valley Wye

Draft Supplemental Record of Decision

September 2020

CALIFORNIA High-Speed Rail Authority

The environmental review, consultation, and other actions required by applicable federal environmental laws for this project are being or have been carried out by the State of California pursuant to 23 U.S.C. 327 and a Memorandum of Understanding dated July 23, 2019, and executed by the Federal Railroad Administration and the State of California.

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ACRONYMS AND ABBREVIATIONS

Acronym	Definition
Authority	California High-Speed Rail Authority
BA	Biological Assessment
BO	Biological Opinion
BMP	best management practices
CEQA	California Environmental Quality Act
C.F.R.	Code of Federal Regulations
Checkpoint B Summary Report	*Supplemental Checkpoint B Summary Report in Support of the Merced to Fresno Section: Wye Alternatives*
DOT	U.S. Department of Transportation
Draft Supplemental EIR/EIS	*California High Speed Rail Project Merced to Fresno Section: Central Valley Wye Draft Supplemental Environmental Impact Report/Environmental Impact Statement*
EFH	Essential Fish Habitat
EINU	electrical interconnections and network upgrades
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
FESA	Federal Endangered Species Act
FHWA	Federal Highway Administration
Final Supplemental EIR/EIS	*California High Speed Rail Project Merced to Fresno Section: Central Valley Wye Final Supplemental Environmental Impact Report/Environmental Impact Statement*
FRA	Federal Railroad Administration
GCD	General Conformity Determination
GHG	greenhouse gas
HSR	California High-Speed Rail
KV	kilovolt
LEDPA	Least Environmentally Damaging Practicable Alternative
Merced to Fresno Final EIR/EIS	*Merced to Fresno Section California High-Speed Rail Final Environmental Impact Report/Environmental Impact Statement*
Merced Fresno MOA	*California High-Speed Train Merced to Fresno Section: Memorandum of Agreement for the Treatment of Adverse Effects on Historic Properties under Section 106 of the National Historic Preservation Act*
MMEP	Mitigation Monitoring and Enforcement Plan
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act

Acronym	Definition
NEPA Assignment MOU	Memorandum of Understanding dated July 23, 2019, and executed by the Federal Railroad Administration (FRA) and the State of California delegating NEPA lead agency status to the Authority
NMFS	National Marine Fisheries Service
NOx	nitrogen oxides
OSHA	Occupational Safety and Health Administration
PA	*Programmatic Agreement among the Federal Railroad Administration, the Advisory Council on Historic Preservation, the California State Historic Preservation Officer, and the California High-Speed Rail Authority Regarding Compliance with Section 106 of the National Historic Preservation Act as it Pertains to the California High-Speed Train Project*
PM	particulate matter
Project	Central Valley Wye Project
Reclamation	U.S. Bureau of Reclamation
Revised/Second Draft Supplemental EIR/EIS, Biological Resources Analysis	*California High-Speed Rail Project Merced to Fresno Section: Central Valley Wye Revised Draft Supplemental EIR/Second Draft Supplemental EIS, Biological Resources Analysis*
ROD	Record of Decision
RSA	Resource Study Area
SHPO	State Historic Preservation Officer
SJVAPCD	San Joaquin Valley Air Pollution Control District
STB	Surface Transportation Board
Supplemental Alternatives Analysis Report	*Merced to Fresno Section: Central Valley Wye Alternatives Supplemental Alternatives Analysis Report*
Supplemental ROD	Supplemental Record of Decision
TPSS	traction power substation
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VERA	Voluntary Emissions Reduction Agreement
VOC	volatile organic compounds

CALIFORNIA HIGH-SPEED RAIL
MERCED TO FRESNO PROJECT SECTION
CENTRAL VALLEY WYE

EXPLANATORY COVER NOTE
SUPPLEMENTAL RECORD OF DECISION

CALIFORNIA HIGH-SPEED RAIL AUTHORITY

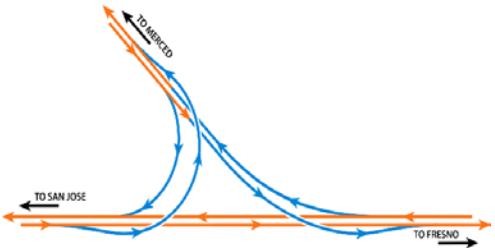
Under the National Environmental Policy Act (NEPA), the California High-Speed Rail Authority (Authority) is issuing a Supplemental Record of Decision (ROD) for the Central Valley Wye portion of the Merced to Fresno Project Section (referred to as the Project). This Supplemental ROD identifies the SR 152 (North) to Road 11 Wye Alternative as the Selected Alternative for the Project.

The Authority takes these actions under a program generally known as NEPA Assignment. More specifically, the environmental review, consultation, and other actions required by applicable federal environmental laws for this Project are being or have been carried out by the State of California pursuant to 23 U.S.C. 327 and a Memorandum of Understanding dated July 23, 2019, and executed by the Federal Railroad Administration (FRA) and the State of California (NEPA Assignment MOU). Accordingly, the Authority is now the NEPA lead agency. The Authority therefore is issuing this Supplemental ROD as the NEPA lead agency.

In 2012, the Authority and FRA completed the *Merced to Fresno Section California High-Speed Rail Final EIR/EIS,* the California Environmental Quality Act (CEQA) and NEPA project-level analysis of high-speed rail alignments and associated facilities from Merced to Fresno. The Authority Board of Directors certified the Merced to Fresno Final EIR/EIS under CEQA on May 3, 2012 and filed a Notice of Determination on May 4, 2012. The FRA issued a ROD on September 18, 2012, and the Surface Transportation Board (STB) issued a ROD on June 13, 2013. Although approvals by the Authority Board of Directors and FRA identified the Merced to Fresno Section: Hybrid Alternative as the Selected Alternative for the north-south alignment of the high-speed rail, each of these approvals deferred a decision on the Central Valley Wye portion of that alternative for additional environmental analysis. The Merced to Fresno Final EIR/EIS had analyzed two alternative alignments for the wye connection, one paralleling Avenue 21 and another paralleling Avenue 24. As stated in FRA's 2012 ROD:

> *Based on input from regulatory agencies, FRA and the Authority have determined that a previously studied SR 152 east-west alignment and related wyes merit detailed study as well. Although the Final EIS identifies the possibility of the SR152 wye, full environmental analysis of this wye option as well as additional analysis on the Ave 24 and Ave 21 options, where necessary, will occur in the San Jose to Merced Project EIR/EIS* (FRA, 2012, p. 19).

What Is a "Wye"?



The term wye refers to the Y-like formation that is created at the point where the train tracks branch off the mainline to continue in different directions.

Following consultation with the public and with agencies of interest, the Authority and FRA

eventually decided to carry forward four alignment alternatives for analysis in a supplement to the 2012 Merced to Fresno Final EIR/EIS.[1]

The Authority issued the *California High-Speed Rail Project Merced to Fresno Section: Central Valley Wye Draft Supplemental EIR/EIS* (Draft Supplemental EIR/EIS) for a 48-day review period pursuant to CEQA between May 3, 2019, and June 20, 2019. The Authority subsequently issued the same document for a 45-day review period pursuant to NEPA between September 13, 2019, and October 28, 2019. The Draft Supplemental EIR/EIS consisted of three volumes:

- Volume I – "Report"
- Volume II – "Technical Appendices"
- Volume III – "Alignment Plans"

The Draft Supplemental EIR/EIS identified the SR 152 (North) to Road 11 Wye Alternative as the Preferred Alternative.

After issuing the Draft Supplemental EIR/EIS, the Authority learned of the California Department of Fish and Wildlife's new listing of a bumble bee species that may be present in the relevant resource study area for the Central Valley Wye alternatives. The Authority duly issued the *California High-Speed Rail Project Merced to Fresno Section: Central Valley Wye Revised Draft Supplemental EIR/Second Draft Supplemental EIS, Biological Resources Analysis* (Revised/Second Draft Supplemental EIR/EIS, Biological Resources Analysis) pursuant to both CEQA and NEPA for a 45-day public review period between March 13, 2020, and April 27, 2020, reflecting updates associated with a newly listed bumble bee candidate species for State of California special status. The Revised/Second Draft Supplemental EIR/EIS, Biological Resources Analysis consisted of revisions to Draft Supplemental EIR/EIS Section 3.7, Biological Resources and Wetlands and a related technical appendix, regarding background information, impacts, and mitigation measures concerning this species. This document also included an unrevised excerpt from section 3.19.6.6 of the Draft Supplemental EIR/EIS concerning cumulative impacts.

On August 7, 2020, the Authority issued the *California High-Speed Rail Project Merced to Fresno Section: Central Valley Wye Final Supplemental EIR/EIS* (Final Supplemental EIR/EIS). The Final Supplemental EIR/EIS included the text of the Draft Supplemental EIR/EIS, including revisions from the Revised/Second Draft Supplemental EIR/EIS, Biological Resources Analysis, as well as in response to comments received during the 2019 and 2020 public review periods associated with the earlier distributions of these documents. Accordingly, the Final Supplemental EIR/EIS included an additional volume, Volume IV – "Response to Comments." The Final Supplemental EIR/EIS reaffirmed the Draft Supplemental EIR/EIS's identification of the SR 152 (North) to Road 11 Wye Alternative as the Preferred Alternative.

This Supplemental ROD is the Authority's approval under NEPA, as NEPA lead agency, of the SR 152 (North) to Road 11 Wye Alternative for the Central Valley Wye portion. This is separate from and independent of the Authority's CEQA decision-making.

This Supplemental ROD approves for implementation the SR 152 (North) to Road 11 Wye Alternative to connect the Merced to Fresno Project Section to the San Francisco Bay Area via the wye connection and, therefore, help complete the California HSR System Phase 1 for travel between San Francisco and Los Angeles/Anaheim. This Supplemental ROD does not change any determinations made in FRA's 2012 ROD and in STB's 2013 ROD for the Merced to Fresno Final EIR/EIS. This Supplemental ROD establishes that the SR 152 (North) to Road 11 Wye Alternative best serves the purpose and need for the Merced to Fresno project and minimizes economic, social, and environmental impacts. In addition to a summary of potential effects, this Supplemental ROD includes the findings for:

[1] For more on this decision-making process, refer to the *Supplemental Checkpoint B Summary Report in Support of the Merced to Fresno Section: Wye Alternatives Section 404(b)(1) Analysis and Draft Subsequent Environmental Impact Report/Supplemental Environmental Impact Statement* (FRA and Authority 2013).

- Section 106 of the National Historic Preservation Act
- Section 4(f) of the Department of Transportation Act of 1966
- Clean Air Act General Conformity Determination
- Section 7 of the Endangered Species Act
- Section 404 Clean Water Act Least Environmentally Damaging Practicable Alternative
- Wetlands pursuant to Executive Order 11990
- Floodplains pursuant to Executive Order 11988
- Environmental Justice pursuant to Executive Order 12898

This Supplemental ROD consists of the following:

- Supplemental ROD
- Appendices to the Supplemental ROD:
  - Appendix A: General Conformity Determination Memorandum
  - Appendix B: U.S. Fish and Wildlife Service Biological Opinion, September 27, 2019
  - Appendix C: National Marine Fisheries Service Biological Opinion, September 3, 2019
  - Appendix D: Mitigation Monitoring and Enforcement Plan (MMEP)
  - Appendix E: State Historic Preservation Officer Concurrence Letter (April 2018)
  - Appendix F: Least Environmentally Damaging Practicable Alternative Concurrence Letter (September 2018)

CALIFORNIA HIGH-SPEED RAIL AUTHORITY
MERCED TO FRESNO PROJECT SECTION
CENTRAL VALLEY WYE
SUPPLEMENTAL RECORD OF DECISION

APPROVAL OF SR 152 (NORTH) TO ROAD 11 WYE ALTERNATIVE

1 INTRODUCTION

This document is the California High-Speed Rail Authority's (Authority) Supplemental Record of Decision (ROD), under the National Environmental Policy Act (NEPA) for the California High-Speed Rail (HSR) Central Valley Wye portion (referred to as the Project), which is part of the Merced to Fresno Project Section of the statewide High-Speed Rail Program. The Authority is the NEPA lead agency under what is generally known as NEPA Assignment. More specifically, the environmental review, consultation, and other actions required by federal environmental laws for this Project are being or have been carried out by the State of California pursuant to 23 United States Code (U.S.C.) 327 and a Memorandum of Understanding dated July 23, 2019, and executed by the Federal Railroad Administration (FRA) and the State of California (NEPA Assignment MOU). The Authority is also the lead agency for state environmental reviews under the California Environmental Quality Act (CEQA).

This Supplemental ROD approves the SR 152 (North) to Road 11 Wye Alternative as described in the *California High Speed Rail Project Merced to Fresno Section: Central Valley Wye Final Supplemental Environmental Impact Report/Environmental Impact Statement* (Final Supplemental EIR/EIS) dated August 7, 2020. As set forth in this Supplemental ROD, the SR 152 (North) to Road 11 Wye Alternative best serves the purpose and need for this project and minimizes economic, social, and environmental impacts and is therefore the Selected Alternative.

The Authority proposes to construct and operate the Project after receiving the required approvals from the appropriate federal agencies. These agencies include the federal cooperating agencies—the U.S. Army Corps of Engineers (USACE); the U.S. Bureau of Reclamation (Reclamation); and the Surface Transportation Board (STB). Other federal agencies with specific review or permitting roles include the U.S. Environmental Protection Agency (USEPA), the U.S. Fish and Wildlife Service (USFWS), the National Marine Fisheries Service (NMFS), and the Advisory Council on Historic Preservation (ACHP). Refer to Table 1 on page 11 for a list of major NEPA milestones.

To comply with NEPA, the Authority issued the *California High-Speed Rail Project Merced to Fresno Section: Central Valley Wye Draft Supplemental Environmental Impact Report/Environmental Impact Statement* (Draft Supplemental EIR/EIS) in September 2019. The Authority had previously issued this document in May 2019 pursuant to CEQA.

In March 2020, the Authority issued the *California High-Speed Rail Project Merced to Fresno Section: Central Valley Wye Revised Draft Supplemental EIR/Second Draft Supplemental EIS, Biological Resources Analysis* (Revised/Second Draft Supplemental EIR/EIS, Biological Resources Analysis) concerning the addition of a wildlife species as a candidate for protected status by the California Department of Fish and Wildlife. The Draft Supplemental EIR/EIS and the Revised/Second Draft Supplemental EIR/EIS, Biological Resources Analysis each covered both state and federal environmental requirements.

This Supplemental ROD provides the decision of the Authority under its assigned responsibilities for NEPA. This Supplemental ROD is specific to the Central Valley Wye, which is the portion of the Merced to Fresno Project Section located in Merced and Madera Counties, with some supporting electrical interconnections and network upgrades (EINU) located in Fresno and Stanislaus Counties. The Central Valley Wye will connect the Merced to Fresno Section of the HSR system to the San Jose to Merced Project Section at Carlucci Road. This decision

document outlines all relevant information used by the Authority, as the NEPA lead agency, for approval of the Selected Alternative, the SR 152 (North) to Road 11 Wye Alternative.

The Authority considered the following alternatives:

- SR 152 (North) to Road 13 Wye Alternative
- 152 (North) to Road 19 Wye Alternative
- Avenue 21 to Road 13 Wye Alternative
- SR 152 (North) to Road 11 Wye Alternative

As depicted in Figure 1 below and described in further detail in Chapter 2, Alternatives, of the Final Supplemental EIR/EIS, the Selected Alternative spans approximately 51 miles, mostly at-grade on raised embankment, although its design includes several aerial structures over roads and waterways.

The wye configuration of this alternative is located west-southwest of the city of Chowchilla, with the east-west axis along the north side of State Route (SR) 152 and the north-south axis on the east side of Road 11.

The alignment of the Selected Alternative begins at the intersection of Henry Miller Road and Carlucci Road in Merced County and continues east, crossing the San Joaquin River, Eastside Bypass, and SR 59. The alignment continues east at-grade along the north side of SR 152 toward Chowchilla, splitting into two legs (four tracks) near Road 10. Two tracks turn north towards Merced and two continue west toward SR 99 and then south towards Fresno.

The Authority considered all other Central Valley Wye alternatives in the Draft Supplemental EIR/EIS, the Revised/Second Draft Supplemental EIR/EIS, Biological Resources Analysis, and the Final Supplemental EIR/EIS. In making its decision, the Authority considered the information and analysis contained in these documents and the associated administrative record, information presented in the Merced to Fresno Final EIR/EIS (2012), and input received from the public and other agencies. The Authority also considered public and agency comments received during the public comment period for the Draft Supplemental EIR/EIS, the Revised/Second Draft Supplemental EIR/EIS, Biological Resources Analysis, and the 30-day period following the publication of the Final Supplemental EIR/EIS. The Final Supplemental EIR/EIS evaluates impacts of the full extent of the Central Valley Wye alignment and its corresponding Resource Study Area (RSA), and proposes mitigation to reduce such impacts if necessary.

The Authority has prepared this Supplemental ROD in accordance with the NEPA Assignment MOU, the Council on Environmental Quality regulations implementing NEPA (40 Code of Federal Regulations [C.F.R.] 1505.2 and 1506.10), and FRA's Procedures for Considering Environmental Impacts (64 Federal Register 28545, May 26, 1999), as modified by 78 Federal Register 2713 (January 14, 2013) (FRA Environmental Procedures).

Specifically, this Supplemental ROD:

- Provides background on the NEPA process leading to the Final Supplemental EIR/EIS, including a summary of public involvement and agency coordination.
- States and reaffirms the Project's purpose and need.
- Summarizes the process that led to the development of the alternatives considered in the Draft Supplemental EIR/EIS, the Revised/Second Draft Supplemental EIR/EIS, Biological Resources Analysis, and the Final Supplemental EIR/EIS.
- Discusses agency roles and responsibilities.
- Identifies the alternatives considered but not carried forward in the Final Supplemental EIR/EIS.

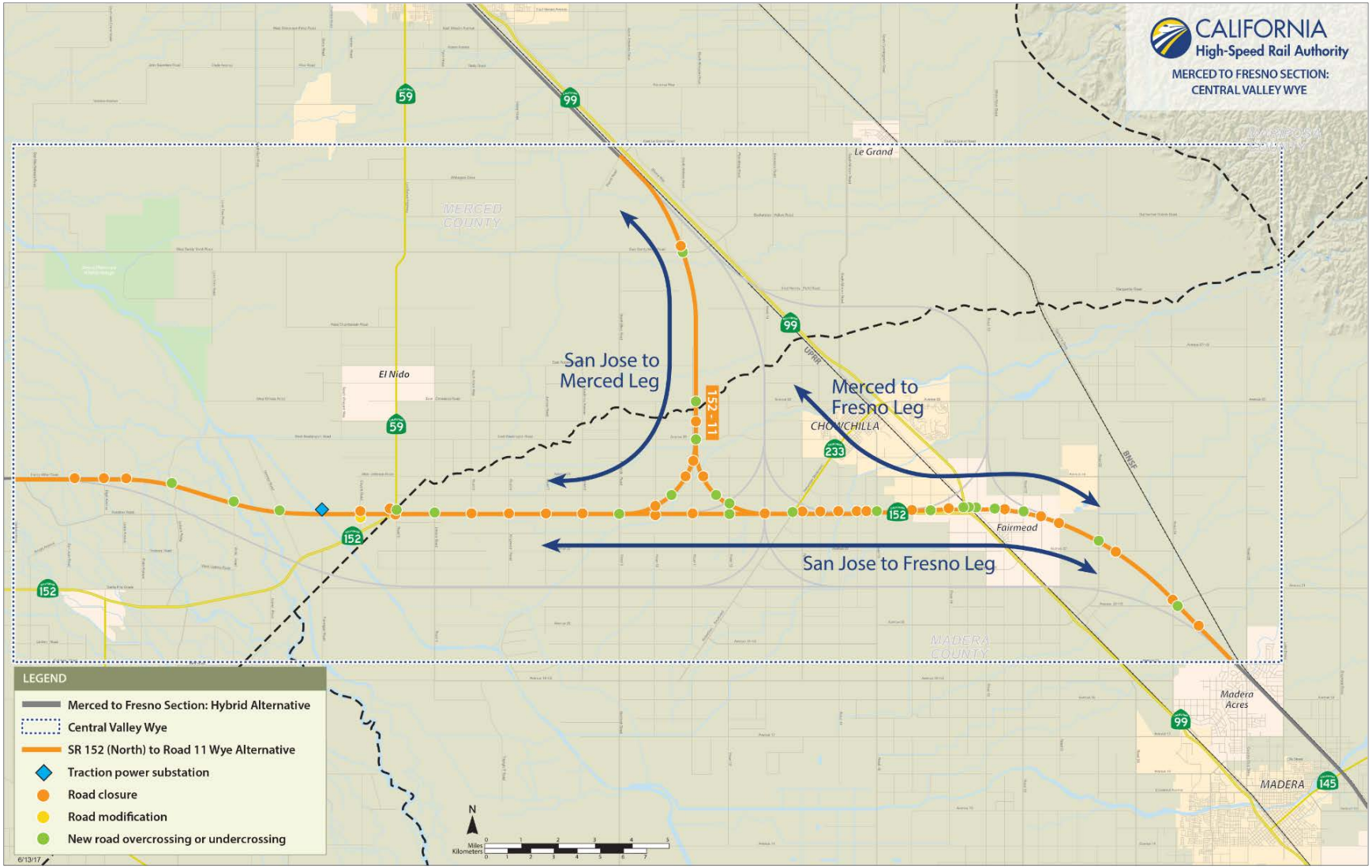


Figure 1 Selected Alternative for the Central Valley Wye (SR 152 [North] to Road 11 Wye Alternative)

- Identifies SR 152 (North) to Road 11 Wye as the Selected Alternative.
- Identifies the Environmentally Preferable Alternative.
- Summarizes environmental benefits and adverse effects.
- Discusses and makes determinations required under other relevant laws and guidance, including:
  - The National Historic Preservation Act of 1966, as amended, 54 U.S.C. 306101-307106 et seq.
  - Section 4(f) of the Department of Transportation Act of 1966, 49 U.S.C. 303
  - Section 7 of the Endangered Species Act of 1973, 16 U.S.C. 1531-1544
  - Section 404 of the Clean Water Act, 33 U.S.C. 1251-1387
  - United States Executive Order 12898 (Environmental Justice)
  - FRA's General Conformity Determination pursuant to the Clean Air Act, 42 U.S.C. 7401-7671q
- Imposes impact avoidance and minimization features (IAMFs) and mitigation measures that will be implemented to avoid and minimize environmental harm and sets forth a binding monitoring and enforcement program for all such features and measures.
- Presents the Authority's Decision, determinations, and findings on the Selected Alternative and discusses the factors that were balanced by the Authority in making its decision.
- Summarizes the status of compliance with permitting and other environmental requirements.

1.1 California HSR System

The Authority is responsible for planning, designing, constructing, and operating the California HSR System. Its state statutory mandate is to develop an HSR system that coordinates with the state's existing transportation network, which includes intercity rail and bus lines, regional commuter rail lines, urban rail and bus transit lines, highways, and airports. As shown in Figure 2, the California HSR System will provide intercity, high-speed service on more than 800 miles of track, connecting the major population centers of Sacramento, the San Francisco Bay Area, the Central Valley, Los Angeles, the Inland Empire, Orange County, and San Diego.

Previously, the Authority and FRA prepared three programmatic (Tier 1) EIR/EIS documents:

- *Final Program EIR/EIS for the Proposed California High-Speed Train System* (2005) (Statewide Program EIR/EIS)
- *Bay Area to Central Valley High-Speed Train Program EIR/EIS* (2008)
- *Bay Area to Central Valley High-Speed Train Partially Revised Final Program EIR* (2012)

These Tier 1 documents were intended to select preferred alignments and station locations to advance for project-level analysis in Tier 2 EIR/EISs. Refer to Chapter 1 of the Final Supplemental EIR/EIS for a detailed description of the California HSR System and the history of the three programmatic EIR/EIS documents. The HSR system will use state-of-the-art, electrically powered, high-speed, steel-wheel-on-steel-rail technology, including contemporary safety, signaling, and automatic train-control systems that will incorporate positive train control infrastructure and be compliant with the requirements of 49 C.F.R. Part 236 Subpart I, with trains capable of operating up to 220 miles per hour.

Figure 2 Statewide California High-Speed Rail System

The Authority plans two phases of California HSR System development. The *California High-Speed Rail Program 2018 Business Plan* describes in detail how the California HSR System will be implemented and recognizes current budgetary and funding realities, and it describes ridership forecasts, which take population and employment into consideration. The Authority released a Draft 2020 Business Plan in February 2020 for public review and comment. The Authority Board is expected to approve the Draft 2020 Business Plan later in 2020 and deliver the 2020 Business Plan to the California legislature.

The Draft 2020 Business Plan forecasts were developed using the same travel forecasting model as the 2016 and 2018 Business Plans, updated for more recent population and employment forecasts. Under the Draft 2020 Business Plan, the Phase 1 medium ridership forecast for 2040 is 38.6 million, and the high ridership forecast is 50.0 million. The Draft 2020 Business Plan describes in detail how the California HSR System will be implemented in light of current budgetary and funding realities.

The California HSR System Phase 1, as approved through the Tier 1 2005 Statewide Program EIR/EIS, has been divided into eight individual Project Sections for project-specific, Tier 2 analyses. The Authority and FRA defined HSR Project Sections such that they would have independent utility or independent significance (i.e., be usable even if later sections of the HSR system are not completed). As of September 2020, Tier 2 environmental reviews have been completed for the following Project Sections:

- Fresno to Bakersfield (completed April 2012)
- Merced to Fresno (completed May 2012)

Beginning in August 2013, the Authority commenced construction with the execution of the first four (to date) construction packages that span portions of both the Fresno to Bakersfield and Merced to Fresno project sections.

As of September 2020, the Authority has issued draft Tier 2 environmental documents for the following sections:

- Bakersfield to Palmdale (issued February 2020)
- San Jose to Merced (issued April 2020)
- Burbank to Los Angeles (issued May 2020)
- San Francisco to San Jose (issued July 2020)

1.2 Central Valley Wye

The Central Valley Wye is part of the Merced to Fresno Project Section of the California High-Speed Rail System, and this Supplemental ROD is a supplement to FRA's 2012 ROD for the Merced to Fresno Project Section.

The FRA issued a ROD concerning the Merced to Fresno Final EIR/EIS on September 18, 2012. On June 13, 2013, STB issued its ROD concerning the Merced to Fresno Final EIR/EIS. These RODs identified the Hybrid Alternative as the Selected Alternative for the north-south HSR alignment of the Merced to Fresno Project Section and deferred identification of a Selected Alternative for the Central Valley Wye. In other words, these earlier RODs approved portions of the Hybrid Alternative outside the wye for the north-south HSR alignment and the Downtown Merced and Downtown Fresno Mariposa Street station locations, but they deferred a decision on the area known as the "wye connection." The "wye connection" is the east-west HSR connection between the San Jose to Merced Project Section to the west and the north-south Merced to Fresno Project Section to the east. FRA's 2012 and STB's 2013 ROD deferred the decision in order to allow for additional environmental analysis of that area. The Central Valley Wye Final Supplemental EIR/EIS provided that analysis.

Public and agency involvement for the Draft Supplemental EIR/EIS started in 2012 following publication of the Merced to Fresno Final EIR/EIS and continued through publication of the Draft Supplemental EIR/EIS. During this period from 2012 to 2018, public and agency involvement was focused on the development and refinement of wye alignment alternatives. During the preparation

of the Draft Supplemental EIR/EIS, questions were received from members of the public and interested parties via email, phone calls, public information meetings, and one-on-one discussions with stakeholders including landowners, farmers, residents, organizations, public agencies, and elected officials. Some of the most frequently asked questions were related to impacts on property, homes, agricultural lands and operations, and local road circulation and access, as well as about the process for selecting the final alignment. Other commonly asked questions included impacts on school transportation and the tax base, as well as impacts from noise and vibration during construction and future rail operations.

The Authority conducted specific outreach efforts to potentially affected minority and/or low-income populations in order to gain input and obtain their comments as part of the public record, and to accurately reflect the setting and potential impacts of the Central Valley Wye alternatives on these communities. These meetings were advertised in both Spanish and English; materials were available in both Spanish and English on the website; and Spanish-speaking interpreters were available at the meetings.

As detailed in Chapter 9, Public and Agency Involvement, of the Final Supplemental EIR/EIS, public outreach meetings, briefings, presentations, workshops, and webinars were held in the vicinity of the Central Valley Wye throughout the process to determine the Central Valley Wye alternatives. These engagement efforts were attended by stakeholders, including landowners, farmers, residents, organizations, public agencies, and elected officials, who expressed opinions on the selection of a wye alternative. The key themes specific to selection of alternatives, as expressed by these stakeholders, included:

- Preference for an alignment along existing transportation corridors
- Minimization of impacts on the City of Chowchilla
- Minimization of impacts on valuable agricultural land and irrigation facilities
- Minimization of impacts on road closures for transportation of farming equipment, school district buses, and general community circulation

The Draft Supplemental EIR/EIS was released for a 45-day public comment period from September 13 to October 28, 2019, under NEPA. A public hearing to receive public comments was held on October 1, 2019, at the Chowchilla Fairgrounds. This was in addition to an earlier public hearing the Authority convened in May 2019, pursuant to the CEQA-only issuance of the document for a 48-day public comment period. In March 2020, the Authority issued the Revised/Second Draft Supplemental EIR/EIS, Biological Resources Analysis, opening an additional 45-day public comment period between March 13, 2020 and April 27, 2020.

During the three public comment periods associated with the Draft Supplemental EIR/EIS and Revised/Second Draft Supplemental EIR/EIS, the Authority received 82 submissions, yielding a total of 731 discrete comments. The Authority provided responses to each of these comments in Volume IV of the Final Supplemental EIR/EIS.

Table 1. Major NEPA Milestones

Milestone	Date
Section 404/Section 408 Memorandum of Understanding	November 2010
Section 7 FESA Merced to Fresno Section Biological Opinion (NMFS)	April 17, 2012
Section 7 FESA Merced to Fresno Section Biological Opinion (USFWS)	September 14, 2012
Preliminary Jurisdictional Determination	October 31, 2016
Preliminary LEDPA Determination (USACE)	September 12, 2018
Section 7 FESA Central Valley Wye Biological Opinion (NMFS)	September 3, 2019
Issuance of the Draft Supplemental EIR/EIS pursuant to NEPA	September 13, 2019
Section 7 FESA Central Valley Wye Biological Opinion (USFWS)	September 27, 2019
Checkpoint C Closure	November 26, 2019
Issuance of the Revised/Second Draft Supplemental EIR/EIS, Biological Resources Analysis, pursuant to CEQA and NEPA	March 13, 2020
Issuance of the Final Supplemental EIR/EIS pursuant to CEQA and NEPA	August 7, 2020

CEQA = California Environmental Quality Act; EIR = Environmental Impact Report; EIS = Environmental Impact Statement; FESA = Federal Endangered Species Act; LEDPA = Least Environmentally Damaging Practicable Alternative; NEPA = National Environmental Policy Act; NMFS = National Marine Fisheries Service; USACE = U.S. Army Corps of Engineers; USFWS = U.S. Fish and Wildlife Service

2 AGENCY ROLE AND RESPONSIBILITIES

The Authority is the NEPA lead agency, pursuant to the NEPA Assignment MOU and as defined in the Final Supplemental EIR/EIS. Both the Draft Supplemental EIR/EIS and the Revised/Second Draft Supplemental EIR/EIS, Biological Resources Analysis were released to the public under the Authority as NEPA and CEQA lead agency. The Authority thus retains decision-making responsibility under both NEPA and CEQA as lead agency under both laws.

The STB, Reclamation, and the USACE are NEPA cooperating agencies.

2.1 Federal Railroad Administration

The FRA's responsibilities for environmental review, consultation, and other actions required by applicable federal environmental laws, including NEPA, for the Project are being carried out by the Authority, acting on behalf of the State of California pursuant to 23 U.S.C. 327 and the NEPA Assignment MOU. Under the NEPA Assignment MOU, FRA assigned federal environmental review responsibilities for the Project to the State of California. Since July 23, 2019, the Authority performs as the lead NEPA agency in this program, known as NEPA Assignment.

As required by law and the NEPA Assignment MOU, FRA has retained responsibility for making air quality conformity determinations under the Clean Air Act (42 U.S.C. 7506) and for government-to-government consultation with Indian tribes.

The NEPA Assignment MOU also requires the Authority to consult with FRA prior to making any proposed constructive use determinations under Section 4(f) of the Department of Transportation Act of 1966 (49 U.S.C. 303); however, there are no such determinations associated with the Selected Alternative.

Regarding a determination of general conformity under the Clean Air Act, the emissions associated with the construction of the Merced to Fresno Project Section of the HSR system were analyzed in the Merced to Fresno Section: Final General Conformity Determination (GCD). In 2012, FRA issued a Final Federal GCD for the Merced to Fresno Final EIR/EIS, which was found

to be in conformance with established standards. Because each of the Central Valley Wye alignment alternatives contain additional miles of track when compared to the Merced to Fresno Final EIR/EIS, and because the Central Valley Wye construction schedule, quantities, and emissions estimation methodologies differ from those analyzed in the Merced to Fresno Final EIR/EIS, revised emissions estimates have been developed. An analysis of the revised emissions estimates found that the approved GCD for the Merced to Fresno Project Section covers all estimated pollutants for all Central Valley Wye alternatives.

The Merced to Fresno GCD included a commitment from the Authority and FRA to reduce all criteria pollutant emissions through emission offsets using a Voluntary Emissions Reduction Agreement (VERA) with the San Joaquin Valley Air Pollution Control District (SJVAPCD). Accordingly, the Final Supplemental EIR/EIS stated that the Final GCD for the Merced to Fresno Project Section was adequate to cover the revised Central Valley Wye alignment. That is, regardless of the years in which the criteria pollutant emissions (nitrogen oxides [NOx], volatile organic compounds [VOCs], and particulate matter [PM]) exceed applicability rates, the Merced to Fresno Final GCD includes a commitment from the Authority and FRA to reduce all NOx, VOC, and PM emissions through a VERA with SJVAPCD. Upon comparing anticipated NOx, VOC, and PM emissions from the Central Valley Wye to the values presented in the Merced to Fresno Final GCD, the Authority determined that emissions estimates are consistent between the two sections. The FRA agreed with this conclusion in written correspondence provide on April 21, 2020. Accordingly, no further re-evaluation is needed for the Central Valley Wye. Therefore, the findings and recommendations contained with the Merced to Fresno GCD remain in place, and no further action is required. The GCD and the concurrence memorandum are included as Appendix A to this Supplemental ROD.

Additionally, FRA maintains authority over railroad safety under 49 U.S.C. 20103. As such, FRA may exercise certain regulatory authority over the Project. FRA also administers certain grant funds provided to the Authority under the American Recovery and Reinvestment Act of 2009 and oversees the Authority's compliance with a grant agreement for the HSR system.

2.2 Surface Transportation Board

The STB has authority over construction and operation of new rail lines (49 U.S.C. 10901); 49 U.S.C. 10501(a)(2)(A) gives the STB jurisdiction over transportation by rail carrier in one state, as long as that intrastate transportation is carried out "as part of the interstate rail network." The STB determined that the California HSR System will be constructed as part of the interstate rail network, and therefore concluded that it has jurisdiction over the California HSR System. Following completion of this process, the STB is expected to adopt the Authority's Final Supplemental EIR/EIS and issue its own Supplemental ROD authorizing the Project.

2.3 U.S. Bureau of Reclamation

The HSR alignment crosses Reclamation lands and facilities. Reclamation may issue rights of entry permits for pedestrian surveys and ground-disturbing investigations, such as geotechnical investigations, or other information-gathering activities. It may grant temporary construction permits for the relocation of facilities and equipment such as pipes, canals, and pumps. If the facilities are relocated outside of Reclamation's ownership, the Authority will acquire any needed land rights necessary for future operations and maintenance needs and/or relocated Reclamation features. After construction, the Authority will transfer necessary land rights to Reclamation. Reclamation will grant or transfer land rights as appropriate to the Authority. Final Supplemental EIR/EIS Appendix 3.6-C, Bureau of Reclamation Lands, depicts all Reclamation facilities within the footprint of the Central Valley Wye alternatives.

2.4 U.S. Army Corps of Engineers

USACE is responsible for issuing permits under the Clean Water Act Section 404 (33 U.S.C. 1344) (Section 404) and the Rivers and Harbors Act of 1899 Section 14 (33 U.S.C. 408) (Section 408).

As a first step in project permitting, the Authority, FRA, USACE, and USEPA executed an MOU (i.e., NEPA/404/408 MOU) in November 2010. The NEPA/404/408 MOU outlined a process to integrate the requirements of NEPA with the requirements of Section 404 and Section 408. The purpose of the NEPA/404/408 MOU was to ensure the analysis underlying the EIR/EIS documents for each California HSR System project section would be sufficient to support USACE's preliminary least environmentally damaging practicable alternative (LEDPA) determination and for USACE to issue a NEPA decision.

The Authority conducted wetland delineations of the Central Valley Wye RSA and prepared two reports that documented its findings: the Biological Resources and Wetlands Technical Report (2016) and the Second Supplemental Wetlands Delineation Report (2018). These reports were submitted to USACE for issuance of a preliminary jurisdictional determination. On October 31, 2016, USACE concurred with the findings of the wetlands reports and issued a preliminary jurisdictional determination letter. A jurisdictional determination and issuance of a permit for the discharge of fill material into waters of the United States associated with construction of the Project will be part of the Clean Water Act Section 404 permit process administered by USACE.

As noted above, USACE has concurred that the overall project purpose allows for a reasonable range of practicable alternatives to be analyzed and is acceptable as the basis for the USACE 404(b)(1) alternatives analysis. Pursuant to NEPA, Section 404, and Section 408, the USACE and USEPA concurred in July 2018 that the Authority's Selected Alternative is the preliminary LEDPA.

USACE is required to comply with NEPA and issue its own NEPA decision before it can issue a permit under Section 404 or Section 408. The USACE will use the Final Supplemental EIR/EIS to integrate requirements of NEPA and its permitting responsibilities (including USEPA's Section 404(b)(1) Guidelines). The information contained in the Final Supplemental EIR/EIS provides information that will facilitate USACE's consideration and issuance of any necessary permits and approvals. Furthermore, any USACE documents produced based in information from the Final Supplemental EIR/EIS can be used for alteration or modification of completed federal flood risk management facilities and any associated operation and maintenance, as well as real estate permissions or instruments (as applicable).

2.5 U.S. Fish and Wildlife Service and National Marine Fisheries Service

Concurrently with the NEPA process, the Authority initiated consultations under the federal Endangered Species Act (FESA) Section 7 (16 U.S.C. 1536), pursuant to 50 C.F.R. Part 402, and regarding Essential Fish Habitat (EFH) pursuant to 50 C.F.R. Part 600. Section 7 of FESA requires federal agencies to consult with USFWS and/or the NMFS, depending on the type of species or habitat affected, to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of threatened or endangered fish, wildlife, or plant species or result in the destruction or adverse modification of designated critical habitat for any such species. Impacts associated with threatened and endangered species and habitat are addressed through a consultation process with USFWS that is outlined under Section 7 of FESA. The Magnuson-Stevens Fisheries and Conservation Management Act (16 U.S.C. 1801 et seq.) requires federal agencies to consult with NMFS on activities that may adversely affect EFH for species that are managed under federal fishery management plans in United States waters. Impacts associated with EFH are addressed through a coordination process with NMFS that may be combined with FESA Section 7 consultation.

2.5.1 U.S. Fish and Wildlife Service

The Authority and FRA submitted the initial *Merced to Fresno Section Biological Assessment* to USFWS in November 2011. Between February and June 2012, the Authority and FRA provided the USFWS with supplemental memoranda containing revised analyses and new information about the effects of the Merced to Fresno Project Section on federally listed species. Information specific to the preferred Merced to Fresno Section: Hybrid Alternative was submitted to the USFWS in April 2012, and included a project description, wildlife crossing information, suggested conservation measures, and a cumulative effects analysis. The USFWS issued the 2012 Merced

to Fresno Biological Opinion (BO) in September 2012, which was amended five times to address various changes. While the 2012 Merced to Fresno BO presented the USFWS biological opinion on the effects of the entire Merced to Fresno Project Section (including the Wye alternatives at that time), the Incidental Take Statement covered only a specific portion of the Central Valley Wye alignment and not the entirety of the Selected Alternative. Therefore, the Authority prepared an additional Biological Assessment (BA) and reinitiated Section 7 consultation with USFWS in June 2019. USFWS issued an amended BO for the Central Valley Wye on September 27, 2019, concluding that the Central Valley Wye is not likely to jeopardize the continued existence of threatened or endangered species or result in the destruction or adverse modification of critical habitat. The BO includes an Incidental Take Statement that authorizes incidental take anticipated from Project activities. Appendix B of this Supplemental ROD contains the USFWS's 2019 amended BO.

2.5.2 National Marine Fisheries Service

On September 23, 2009, the Authority and FRA requested technical assistance from NMFS regarding potential effects of the Merced to Fresno Project Section on federally listed salmonids pursuant to Section 7 of the FESA and effects on EFH under the Magnuson-Stevens Act. On October 17, 2011, the Authority submitted a draft BA to NMFS for the Merced to Fresno Project Section, initiated formal consultation for the Merced to Fresno Project Section on December 1, 2011, and issued the *Biological and Conference Opinion, High Speed Train: Merced–Fresno* (NMFS 2012) on April 17, 2012.

The Authority submitted a supplemental BA addressing the effects of the Selected Alternative on federally listed fish species to NMFS in October 2018. NMFS issued its amended BO on September 3, 2019, which concluded that the Project is not likely to jeopardize the continued existence of threatened or endangered species or result in the destruction or adverse modification of critical habitat. The BO includes an Incidental Take Statement that authorizes incidental take anticipated from Project activities. The BO also includes Magnuson-Stevens conservation measures to offset adverse effects on EFH. Appendix C of this Supplemental ROD contains NMFS's 2019 amended BO.

3 PURPOSE AND NEED

As established in the 2005 Statewide Program EIR/EIS for the HSR, the purpose of the California HSR System is to provide a reliable high-speed electric-powered train system that links the major metropolitan areas of California, delivering predictable and consistent travel times. A further objective is to provide an interface with commercial airports, mass transit, and the highway network and to relieve capacity constraints of the existing transportation system as increases in intercity travel demand in California occur, in a manner sensitive to and protective of California's unique natural resources.

The Selected Alternative implements the Central Valley Wye portion of the Merced to Fresno Project Section of the California HSR System that will connect the San Jose to Merced Project Section to the Merced to Fresno Project Section's north-south alignment. As described above in Section 1, the Selected Alternative follows the existing Henry Miller Road from its intersection with Carlucci Road before running approximately adjacent to SR 152 to the extent feasible until its intersection with Road 11, and the SR 99 and BNSF Railway rights-of-way in the north-south direction (for a more detailed description of the full alignment, please refer to Section 4.4 below). Deviations from these existing transportation corridors are necessary to accommodate design requirements; specifically, wider curves are necessary to accommodate the speed of the HSR compared to lower-speed roadway alignments. The Selected Alternative does not follow existing transportation rights-of-way where it transitions from following one transportation corridor to another.

As part of the California HSR System and consistent with the goals established in the 2005 Statewide Program EIR/EIS, the SR 152 (North) to Road 11 Wye Alternative will provide the public with electric-powered HSR service that provides predictable and consistent travel times between major urban centers and connectivity to airports, mass transit, and the highway network in the north San Joaquin Valley, and that connects the system in the Central Valley to system

facilities in the Bay Area. The SR 152 (North) to Road 11 Wye Alternative therefore supports the purpose and need of the Project.

4 ALTERNATIVES

This section summarizes the alternatives analysis process and alternatives evaluated in the Supplemental EIS Documents and describes the Selected and Environmentally Preferable alternatives.

4.1 Consideration of Wye Alternatives as part of the Merced to Fresno Final EIR/EIS

The Authority and FRA initially considered five potential options for the wye connection in the April 2010 *Merced to Fresno Section Preliminary Alternatives Analysis Report*. This early alternatives analysis process evaluated the five potential wye connection design options, screening and refining each design option to avoid key environmental issues and improve performance. The preliminary evaluation of these design options balanced ecological, agricultural, and community impact issues as well as travel time.

The Authority and FRA prepared three subsequent alternatives analysis reports for the Merced to Fresno Project Section and the San Jose to Merced Project Section, including the 2010 *San Jose to Merced Section Preliminary Alternatives Analysis Report*, the 2011 *Merced to Fresno Section Supplemental Alternatives Analysis Report* and the 2011 *San Jose to Merced Section Supplemental Alternatives Analysis Report.* The Authority and FRA selected wye connection design options located along Avenue 21, Avenue 24, and SR 152, among others, to carry forward for further engineering and environmental analysis. Based on the results of the 2011 *Merced to Fresno Section Supplemental Alternatives Analysis Report*, the Authority and FRA carried forward two wye connection design options (the Avenue 24 Wye and the Avenue 21 Wye) into the Merced to Fresno Draft and Final EIR/EISs.

While the Merced to Fresno Final EIR/EIS identified a preferred alternative for the north-south HSR alignment (the Hybrid Alternative) and examined two design options for an east-west connection to the San Jose to Merced Project Section (the “wye connection” or the Central Valley Wye), it did not identify a preferred alternative for the Central Valley Wye.

The Authority certified the Merced to Fresno Final EIR/EIS under CEQA on May 3, 2012 and filed a Notice of Determination on May 4, 2012. As previously noted, FRA issued a ROD on the Merced to Fresno Final EIR/EIS on September 18, 2012.

Although the Authority approved the portions of the Hybrid Alternative for the Merced to Fresno Project Section outside the wye connection for the north-south HSR alignment and the Downtown Merced and Downtown Fresno Mariposa Street station locations, these approvals deferred a decision on the Central Valley Wye alignment alternatives. FRA’s September 2012 ROD came to similar conclusions.

Studying Central Valley Wye alignment alternatives in greater detail through the preparation of the Central Valley Wye Draft Supplemental EIR/EIS allowed the alternatives development process to be more fully informed by the key HSR system objective of aligning HSR tracks adjacent to existing transportation corridors where possible. Other objectives that helped shape inform the development of alternatives included minimizing impacts on farmland and communities, balancing environmental impacts with travel time and construction costs, including a variety of public and resource agency input obtained through extensive outreach.

4.2 Alternatives Development and Screening after the Merced to Fresno Final EIR/EIS

After its 2012 decisions on the Merced to Fresno Final EIR/EIS, in 2013, the Authority and FRA prepared the *Merced to Fresno Section: Central Valley Wye Alternatives Supplemental Alternatives Analysis Report* (Supplemental Alternatives Analysis Report). The Supplemental Alternatives Analysis Report evaluated 14 wye connection alternatives and selected four to carry forward for further evaluation.

Also in 2013, at the request of the USACE and USEPA, the Authority and FRA developed a *Supplemental Checkpoint B Summary Report in Support of the Merced to Fresno Section: Wye Alternatives* (Checkpoint B Summary Report). The Checkpoint B Summary Report considered a total of 17 wye connection alternatives: the 14 alternatives that were evaluated in the 2013 Supplemental Alternatives Analysis Report, plus three variations of other alternatives that had been previously considered but withdrawn from further consideration prior to the Merced to Fresno Final EIR/EIS. Based on the analysis in the Checkpoint B Summary Report, the Authority and FRA eliminated 13 of the 17 Central Valley Wye alternatives from further environmental review, based on consideration of the alternatives' consistency with the HSR system and Merced to Fresno Project Section Purpose and Need, impacts on aquatic resources, impacts on the environment, relative construction costs, logistics of implementation/construction, incompatibility with land use, and public/agency input.

Continued coordination between the Authority, FRA, USACE, and USEPA resulted in further refinements to the Central Valley Wye alternatives. This coordination led to the withdrawal of two of the four alternatives and the addition of an alternative to carry forward.

In August and September 2014, respectively, the USEPA and USACE concurred with the Authority and FRA on three alternatives to carry forward:

- SR 152 (North) to Road 13 Wye Alternative
- SR 152 (North) to Road 19 Wye Alternative
- Avenue 21 to Road 13 Wye Alternative

Between September 2014 and late 2017, the Authority and FRA continued to conduct public outreach with local stakeholders. This effort produced additional information about the Central Valley Wye alternatives and informed further refinements to the alternatives proposed to be carried forward. As a result of this additional stakeholder outreach and upon review of improved mapping documentation for the various alignments, an alternative that had been previously considered but dismissed, SR 152 (North) to Road 11 Wye Alternative, was ultimately carried forward for analysis.

The Authority and FRA documented this screening process through three addenda to the 2013 Checkpoint B Summary Report, arriving at four alternatives to carry forward for detailed environmental analysis. Figure 3 shows these four alternatives:

- SR 152 (North) to Road 13 Wye Alternative
- SR 152 (North) to Road 19 Wye Alternative
- Avenue 21 to Road 13 Wye Alternative
- SR 152 (North) to Road 11 Wye Alternative

These four alternatives were carried forward for analysis in the Draft Supplemental EIR/EIS, the Revised/Second Draft Supplemental EIR/EIS, Biological Resources Analysis, and the Final Supplemental EIR/EIS. In both the Draft Supplemental EIR/EIS and the Final Supplemental EIR/EIS, the SR 152 (North) to Road 11 Wye Alternative (now the Selected Alternative) was identified as the Preferred Alternative.

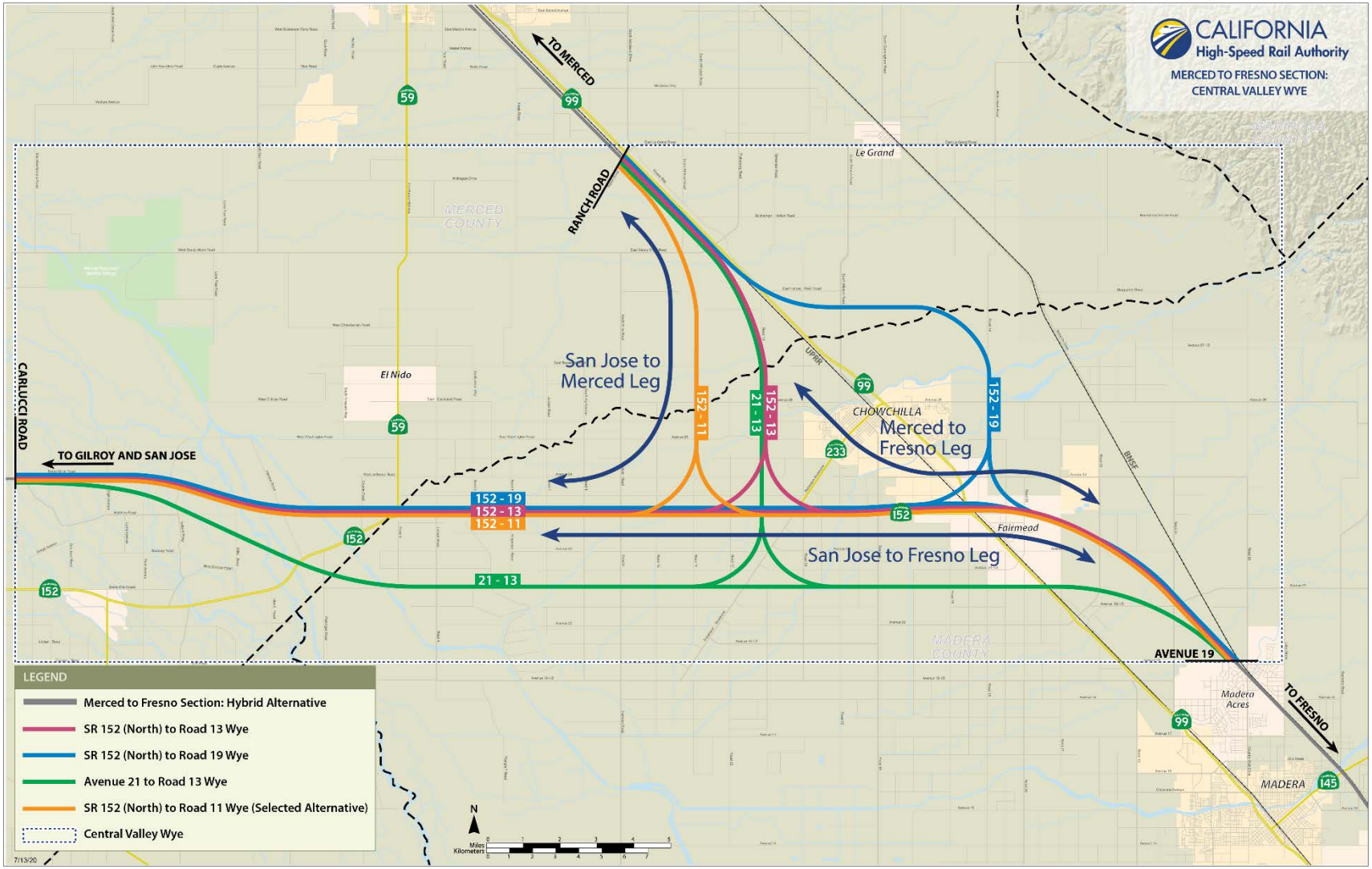


Figure 3 Central Valley Wye Alternatives Considered in the Final Supplemental EIR/EIS

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4.3 Alternatives Carried Forward for Study in the Draft Supplemental EIR/EIS and Revised/Second Draft Supplemental EIR/EIS, Biological Resources Analysis

4.3.1 SR 152 (North) to Road 13 Wye Alternative

The SR 152 (North) to Road 13 Wye Alternative would follow the existing Henry Miller Road and SR 152 rights-of-way as closely as possible in the east-west direction, and the Road 13, SR 99, Union Pacific Railroad (UPRR), and BNSF Railway rights-of-way in the north-south direction. It would extend approximately 52 miles, mostly at-grade on raised embankment, although it would also have aerial structures and a segment of retained cut (depressed alignment). This alternative would begin in Merced County at the intersection of Henry Miller Road and Carlucci Road. Wildlife undercrossing structures would be installed in at-grade embankments along this alternative where the alignment intersects wildlife corridors.

The SR 152 (North) to Road 13 Wye Alternative would require EINU to support railway infrastructure. Upgrades would include a 115-kilovolt (kV) and 230-kV traction power substation (TPSS), a switching station, and an approximately 2.5-mile double-circuit 230-kV transmission tie-line to the Wilson Substation.

Additionally, the SR 152 (North) to Road 13 Wye Alternative would require the permanent closure of 38 public roadways at selected locations and the construction of 24 overcrossings or undercrossings in lieu of closure. Fourteen of these permanent road closures would be located at SR 152 where roads currently cross at-grade; these roads would need to be closed to convert SR 152 to a fully access-controlled corridor.

4.3.2 SR 152 (North) to Road 19 Wye Alternative

The SR 152 (North) to Road 19 Wye Alternative would follow the existing Henry Miller Road and SR 152 rights-of-way as closely as practicable in the east-west direction and Road 19, SR 99, and BNSF Railway rights-of-way in the north-south direction. Beginning at the intersection of Henry Miller Road and Carlucci Road, this alternative would continue east toward Elgin Avenue, where it would curve southeast toward the San Joaquin River, crossing the river on an aerial structure. It would return to an at-grade embankment, then onto another aerial structure to cross the Eastside Bypass and continue east into Madera County. It would cross Ash Slough and Berenda Slough on aerial structures. At the Road 16 crossing, the alignment would transition to the Merced to Fresno Section: Hybrid Alternative. Wildlife undercrossing structures would be provided in at-grade embankments where the alignment intersects wildlife corridors.

The SR 152 (North) to Road 19 Wye Alternative would require EINU to support railway infrastructure. Upgrades would include two 115-kV TPSSs, a switching station, and reconductoring 38.4 miles of single-circuit 230-kV No. 1 transmission line and 11.3 miles of single-circuit (idle) 115-kV power line.

The SR 152 (North) to Road 19 Wye Alternative would require the permanent closure of 36 public roadways at selected locations and the construction of 29 overcrossings or undercrossings.

4.3.3 Avenue 21 to Road 13 Wye Alternative

The Avenue 21 to Road 13 Wye Alternative would follow the existing Henry Miller Road and Avenue 21 rights-of-way as closely as practicable in the east-west direction and the Road 13, SR 99, and BNSF Railway rights-of-way in the north-south direction. The alternative would extend approximately 53 miles mostly at-grade on an embankment, although it would also have aerial structures and a short segment of retained cut (depressed alignment). The wye configuration of this alternative would be located approximately 4 miles southwest of the city of Chowchilla, with the east-west axis along the north side of Avenue 21 and the north-south axis on the east side of Road 13.

Beginning at the intersection of Henry Miller Road and Carlucci Road (at the same point in Merced County as the SR 152 [North] to Road 13 Wye Alternative), west of Elgin Avenue this

alternative would curve southeast toward the San Joaquin River and Eastside Bypass. As the San Jose to Merced leg approaches SR 152, it would converge with the Merced to Fresno leg, requiring the northbound track of the San Jose to Merced leg to rise on an aerial structure and cross over the tracks of the Merced to Fresno leg. The San Jose to Merced leg would continue north on an elevated alignment crossing Ash Slough, the Chowchilla River, and Road 13 on aerial structures. As the leg returns to grade, it would curve northwest, cross Dutchman Creek on an aerial structure, and follow along the west side of the UPRR/SR 99 corridor. At Sandy Mush Road, the alternative would descend into a shallow cut (depressed) section for approximately 0.5 mile, with a retained cut-and-cover undercrossing tunnel segment at the Caltrans Sandy Mush Road Overhead. The alternative would return to grade and continue along the UPRR/SR 99 corridor, connecting to the Merced to Fresno Section: Hybrid Alternative at Ranch Road. Wildlife undercrossing structures would be provided along this alternative in at-grade embankment portions of the HSR corridor where the alignment intersects wildlife corridors.

The Avenue 21 to Road 13 Wye Alternative would require EINU to support railway infrastructure. Upgrades would include a 115-kV TPSS, a switching station, and relocation of the existing PG&E Dairyland Substation, which would require below- and above-grade construction components including but not limited to foundations, steel structures, transformer and fencing installation, and construction of new access roads. The Avenue 21 to Road 13 Wye Alternative would also require the permanent closure of 30 public roadways at selected locations and the construction of 28 overcrossings or undercrossings. Local roads paralleling the HSR alignment and used by small communities and farm operations may be shifted and reconstructed to maintain their function. Access easements would be provided to maintain access to properties severed by the HSR alignment.

4.3.4 SR 152 (North) to Road 11 Wye Alternative

The SR 152 (North) to Road 11 Wye Alternative is the Selected Alternative. It is discussed in greater detail below in Section 4.4, *Description of the Selected Alternative (the Environmentally Preferable Alternative*).

4.4 Description of the Selected Alternative (the Environmentally Preferable Alternative)

The basic purpose and need of the Central Valley Wye is to connect the San Jose to Merced Project Section to the Merced to Fresno Section of the HSR system.

The Selected Alternative, the SR 152 (North) to Road 11 Wye Alternative, approximately follows the existing Henry Miller Road from its intersection with Carlucci Road before running approximately adjacent to SR 152 to the extent feasible until its intersection with Road 11 to connect these two Project Sections. Along its alignment, it generally follows the Henry Miller Road and SR 152 rights-of-way as closely as practicable in the east-west direction, and the Road 11, SR 99, and BNSF Railway rights-of-way in the north-south direction. In total, the SR 152 (North) to Road 11 Wye Alternative extends approximately 51 miles mostly at-grade on raised embankment, although its design includes some aerial structures. Wildlife undercrossing structures will be installed in at-grade embankments along this alternative where the alignment passes through wildlife movement corridors.

The SR 152 (North) to Road 11 Wye Alternative also requires EINU to support railway infrastructure, including an option wherein the Site 6—El Nido TPSS could be constructed at the intersection of SR 152 and Lincoln Road. A 2.5-mile, 115-kV transmission line (115-kV tie-line) will be constructed along the west side of Lincoln Road to connect the expanded El Nido Substation to this TPSS. Fiber optic cables will also be trenched underground directly beneath the El Nido 115-kV Tie-Line and the Site 7—Wilson 230-kV Tie-Line. The SR 152 (North) to Road 11 Wye Alternative requires the permanent closure of 33 public roadways at selected locations and the construction of 24 overcrossings or undercrossings in lieu of closure. Between over- or undercrossings, 19 additional roads will be closed. Local roads paralleling the HSR alignment and used by small communities and farm operations may be shifted and reconstructed to maintain

their function. Access easements will be provided to maintain access to properties severed by the HSR alignment.

The Council on Environmental Quality NEPA regulations require that the ROD, including this Supplemental ROD, identify all alternatives that were considered, ". . . specifying the alternative or alternatives which were considered to be environmentally preferable" (40 C.F.R. 1505.2). As discussed in Section 2.4 above, in July 2018, the USACE and USEPA concurred that the SR 152 (North) to Road 11 Wye Alternative is the preliminary LEDPA, consistent with USACE's permit program (33 C.F.R. Part 320-331) and USEPA's Section 404(b)(1) Guidelines (40 C.F.R. 230-233). Additionally, as identified in Section 8.5 of the Draft Supplemental EIR/EIS, and in accordance with 40 C.F.R. 1505.2, the SR 152 (North) to Road 11 Wye Alternative is the environmentally Selected Alternative for the following reasons:

- The three SR 152 Central Valley Wye alternatives, including the Selected Alternative, would result in local and regional transportation benefits from improvements to SR 152 that would not occur with the Avenue 21 to Road 13 Wye Alternative. Grade-separating SR 152 would improve traffic flow and reduce the potential for accidents. The proposed roadway improvements are consistent with existing Caltrans plans for SR 152.
- Overall, the Selected Alternative will result in fewer impacts on key natural environmental factors than the other alternatives. Wetlands and other aquatic habitats provide a relatively high value for a diverse population of biological species and continue to be subject to severe development pressures. The Selected Alternative will have the least impact on high-value aquatic habitats compared to the other Central Valley Wye alternatives.
- Overall, the Selected Alternative will result in fewer impacts on community-based resources than the other Central Valley Wye alternatives. Compared to the other two SR 152 alternatives, the Selected Alternative will result in substantially fewer business and residential displacements and it will convert less Important Farmland (i.e., Prime Farmland, Farmland of Statewide Importance, Unique Farmland, and Farmland of Local Importance, as defined in Section 3.14, Agricultural Farmland, of the Final Supplemental EIR/EIS) than all other Central Valley Wye alternatives.
- One of the primary factors under consideration is the location of the SR 152 alternatives through the community of Fairmead. In coordination with the local community, the Authority identified and developed mitigation to offset impacts associated with the Selected Alternative. This mitigation provides an opportunity to maintain the quality of life in Fairmead and create local improvements that otherwise would not be realized without implementation of the HSR project.
- Extensive stakeholder outreach has not resulted in a clear community preference for a single alternative. Slightly more letters of support were received for the Selected Alternative.
- The Selected Alternative is estimated to cost the least to construct. Based on preliminary engineering estimates, the Selected Alternative will cost at least $150 million less than the estimated costs to construct the other three Central Valley Wye alternatives.

5 SUMMARY OF POTENTIAL IMPACTS

Construction and operation of the Selected Alternative, SR 152 (North) to Road 11 Wye Alternative, will affect a variety of environmental and social resources. Impacts on these resources could be adverse or beneficial.

To fully understand the potential range of impacts of the Selected Alternative, the Final Supplemental EIR/EIS analyzed all reasonably foreseeable environmental impacts resulting from

its construction and operation. Chapter 3 of the Final Supplemental EIR/EIS provides a full discussion of these impacts, organized by resource area.

The Selected Alternative will not result in impacts requiring mitigation in the resource areas listed below. However, certain design features, best management practices (BMP), and impact avoidance and minimization features (IAMF) will be implemented. IAMFs are documented in Appendix D to this Supplemental ROD. In reaching its decision in this Supplemental ROD, the Authority considered these resource area effects:

- Transportation
- Electromagnetic fields and electromagnetic interference
- Public utilities and energy
- Hydrology and water resources
- Geology, soils, seismicity, and paleontological resources
- Safety and security
- Parks and recreation

Regional growth Subsections 5.1 through 5.10 below summarize both the adverse and beneficial impacts of construction and operation of the Selected Alternative, with and without the implementation of mitigation. Please refer to Appendix D for the Mitigation Monitoring and Enforcement Program, which lists all IAMFs and mitigation measures referenced below that will be required for the Selected Alternative.

5.1 Air Quality and Global Climate Change

As discussed in Section 3.3, Air Quality and Global Climate Change, of the Final Supplemental EIR/EIS, the Selected Alternative (like all other Central Valley Wye alternatives) will generate direct and indirect greenhouse gas (GHG) emissions during construction that could contribute to global climate change. However, these emissions will be temporary and will be offset from the emissions benefit that will occur during the operations period. Construction of the Selected Alternative, as well as any of the other Central Valley Wye alternatives, will also have the potential to degrade air quality through exhaust emissions of NOx and fugitive dust generation, and will result in an exceedance of NOx thresholds outside of the San Joaquin Valley Air Basin during hauling of ballast and sub-ballast material.

However, the Selected Alternative will require less ballast and sub-ballast hauling than would be required to construct the other alternatives. Air quality modeling of construction of the Selected Alternative, as well as the other Central Valley Wye alternatives, has shown that no gaseous air pollutant emitted from construction activities will exceed the health-protective National Ambient Air Quality Standards or California Ambient Air Quality Standards, and that PM emissions will not exceed the SJVAPCD's significant impact level.

In addition to adhering to general BMPs and required air quality management and GHG reduction strategies, the Authority will implement mitigation measures to address the air quality impacts associated with construction of the Selected Alternative. The Authority will incorporate exhaust emissions requirements for construction equipment into contract specifications. The Authority will require that all heavy-duty off-road construction diesel equipment used during the construction phase uses the cleanest reasonably available equipment (including newer equipment or tailpipe retrofits). The contractor will document efforts undertaken to locate newer equipment (such as, in order of priority, Tier 4, Tier 3, or Tier 2 equipment) or tailpipe retrofit equivalents. All on-road trucks used to haul construction materials, including fill, ballast, rail ties, and steel, will consist of an average fleet mix of equipment model year 2010 or newer, but no less than the average fleet mix for the current calendar year as set forth in California Air Resources Board's EMFAC2014 database. Additionally, because the Selected Alternative (as well as the other Central Valley Wye alternatives) requires the construction of concrete batch plants (which can degrade localized air quality), batch plants will be required to be sited at least 1,000 feet from sensitive receptors and must use control measures to reduce fugitive dust emissions to the USEPA AP-42 controlled emission factor standards. Furthermore, the Authority and the SJVAPCD will enter into a VERA to cover the portion of the Project approved and funded for construction within the San Joaquin

Valley Air Basin, which will offset all emissions to net-zero. Lastly, the Authority will purchase offsets and implement off-site emission mitigation for emissions associated with hauling ballast material in the San Francisco Bay Area Air Basin.

Operation of the Selected Alternative will result in beneficial net reductions in regional emissions due to user redirection from airplanes and personal vehicles to HSR. Operation of the Selected Alternative will have a beneficial effect on (i.e., reduce) statewide emissions of carbon monoxide, NOx, reactive organic gas, sulfur oxide, and PM smaller than or equal to 10 microns in diameter and smaller than or equal to 2.5 microns in diameter by diverting trips from modes with higher emissions (e.g., commercial air flights and automobile trips) to HSR, which has lower emissions. Moreover, among the Central Valley Wye alternatives, the Selected Alternative will result in the least amount of dust emissions resulting from train movement. The Selected Alternative will result in a net reduction in GHG emissions statewide relative to both 2015 CEQA existing conditions and 2040 NEPA future conditions.

5.2 Noise and Vibration

As discussed in Section 3.4, Noise and Vibration, of the Final Supplemental EIR/EIS, construction of the Selected Alternative (as well as any of the other Central Valley Wye alternatives) will require the use of noise-generating mechanical equipment over a period of 1 to 3 years at any given location. In addition, construction of the Selected Alternative (or any of the SR 152-associated Central Valley Wye alternatives) will result in temporary and permanent closure of some local roads as well as temporary lane closures on SR 152 and SR 99. This will require rerouting traffic, which will affect existing noise levels in the vicinity.

Among the Central Valley Wye alternatives, the Selected Alternative will result in the fewest construction-related roadway modifications and closures and thus the least noise impacts related to traffic diversion. These noise impacts will not increase the ambient noise level above existing Federal Highway Administration (FHWA) Noise Abatement Criteria for most receptors. The Selected Alternative will result in the exposure of two sensitive receptors to an increase in ambient noise levels in exceedance of FHWA Noise Abatement Criteria; similar exposure will result from either of the other two Central Valley Wye alternatives paralleling SR 152.

While the Selected Alternative (or any of the other Central Valley Wye alternatives) will entail construction-related vibration that could result in human annoyance, vibration modeling has demonstrated that construction-related vibration will not reach levels with the potential to cause structural damage to buildings located outside of the project footprint. Because of the relative location of the Selected Alternative to existing single-family residences, construction vibration associated with the Selected Alternative will affect a smaller number of sensitive receptors than an alternative like the SR 152 (North) to Road 19 Alternative.

Operation of the Selected Alternative will generate noise levels above ambient levels from train passbys, resulting in adverse impacts from the exposure of sensitive receptors to severe noise. With implementation of the Selected Alternative, 61 single-family residences will experience moderate noise impacts and 35 will experience severe noise impacts. Among the Central Valley Wye alternatives, these are neither the highest nor the lowest numbers of affected residences. While operation-related noise of any of the Central Valley Wye alternatives could also place new stress on animals, the Selected Alternative will pass through the fewest miles of wildlife movement corridors and will pass by the fewest confined animal facilities.

To avoid or minimize potential noise and/or vibration effects associated with construction and operation, the Authority will adhere to all applicable state and federal regulations, including the following: FHWA and FRA guidelines for emissions of noise from transportation sources and for the abatement of excessive noise emissions; Occupational Safety and Health Administration (OSHA) regulations that protect workers from hazardous noise exposure; FHWA and OSHA guidelines regarding modeling and mitigating noise from construction sources for both construction workers and sensitive receptors in proximity to construction; and Caltrans' Traffic Noise Analysis Protocol, which provides a methodology for evaluating construction and traffic noise and for evaluating the effectiveness and feasibility of different sound abatement methods.

Additionally, the Authority has developed project-specific design strategies that will further reduce the potential for adverse effects associated with construction and operation of the Selected Alternative to levels below those that will be achieved through regulatory compliance alone. However, even with implementation of regulatory requirements and these project-specific design strategies, the Selected Alternative still has the potential to result in adverse impacts. To further reduce project-related construction and operation noise, the Authority has developed mitigation measures that include requiring preparation of and adherence to a construction noise mitigation and monitoring program, conducting subsequent noise and vibration environmental analysis during final design, and ensuring that train vehicle procurement meets pertinent federal noise regulations for locomotives and rail cars.

5.3 Biological Resources and Wetlands

As discussed in Section 3.7, Biological Resources and Wetlands, of the Final Supplemental EIR/EIS, construction of the Selected Alternative (as well as all other Central Valley Wye alternatives) has the potential to adversely affect biological resources through disturbance of habitats or natural communities or through direct or indirect impacts on sensitive resources, including special-status plant and wildlife species.

Relative to the other Central Valley Wye alternatives, the Selected Alternative has the least potential, or equal potential, for impacts on nine special-status plant species associated with vernal pools and three plant species associated with freshwater marsh, natural watercourses, open water, or seasonal wetlands.

Overall impacts on vernal pool plant communities would be similar across all three SR 152 alternatives, and impacts on the seasonal wetland plant community will be lowest with implementation of the Selected Alternative.

Moreover, among the Central Valley Wye alternatives, the Selected Alternative will have the least (or equal to the least) potential for impacts on the following species and their associated habitats:

- Valley elderberry longhorn beetle
- Vernal pool and wetland invertebrates (although the Avenue 21 to Road 13 Wye Alternative would have the least potential for impacts on Crotch bumble bee)
- Silvery legless lizard
- San Joaquin coachwhip
- Least Bell's vireo
- Western burrowing owl
- San Joaquin kit fox

Among the Central Valley Wye alternatives, the Selected Alternative will also result in the second-lowest level of impact on the following species and their habitats:

- California tiger salamander
- Western spadefoot
- Western pond turtle
- Blainville's horned lizard
- Giant garter snake
- Bats – roosting bats, pallid bat, Western red bat
- American badger

In addition, the Selected Alternative will result in the least acreage impact on wetlands and riparian/stream habitat. The Selected Alternative will also result in the lowest track mileage among the Central Valley Wye alternatives within established wildlife movement corridors.

Among the Central Valley Wye alternatives, the Selected Alternative will have the least potential for impacts on jurisdictional aquatic resources and on wildlife movement corridors, but it will potentially affect critical habitat associated with vernal pool invertebrates.

The Selected Alternative will result in direct impacts on EFH (the San Joaquin River), similar to the other Central Valley Wye alternatives, associated with the placement of piers and the bridge over the river.

Operations and maintenance activities would be identical or very similar for all of the Central Valley Wye alternatives; therefore, all four Central Valley Wye alternatives have similar potential for operations impacts on special-status plant species, special-status wildlife species, special-status plant communities, jurisdictional waters, critical habitats, EFH, and wildlife movement corridors.

To minimize potential effects on biological resources, the Authority will implement numerous strategies and design features (set forth in IAMFs) that will avoid or minimize effects and will comply with all biological permit requirements. In addition to these IAMFs, the Authority will require numerous mitigation measures that will further minimize and/or compensate for adverse effects of the Selected Alternative. These include broad mitigation strategies designed to minimize impacts through the establishment of environmentally sensitive areas and non-disturbance zones; installing wildlife exclusion fencing; conducting pre-construction surveys; preparing a Habitat Mitigation Plan; and implementing off-site habitat restoration, enhancement, and preservation strategies, including the opportunity to purchase credit from an agency-approved mitigation bank. Additional mitigation measures have been developed to minimize potential effects on specific special-status species or groups of species.

5.4 Hazardous Materials and Wastes

As discussed in Section 3.10, Hazardous Materials and Wastes, of the Final Supplemental EIR/EIS, construction and operation of the Selected Alternative (as well as any of the Central Valley Wye alternatives) will require the use of various types and quantities of hazardous materials. These materials would be similar across all Central Valley Wye alternatives and include the use of such materials within 0.25 mile of a school during the construction phase. However, no extremely hazardous substances will be permitted within 0.25 mile of schools. The Selected Alternative (and two of the three other alternatives) have an essentially equal potential to result in temporary effects associated with the transport, use, storage, inadvertent disturbance, and/or disposal of hazardous materials (including diesel fuel, lubricants, solvents, cement products, or other material containing strongly acidic or basic chemicals).

Additionally, because construction activities will often occur on agricultural properties that may have used pesticides and other hazardous substances, construction-related ground disturbance could result in the inadvertent disturbance and release of undocumented concentrations of such materials and wastes.

The risk of exposure to asbestos and lead has the potential to occur during the demolition of roadways and structures. Lead could also be released from soils along roadways or paint from demolished buildings. The potential for increased exposure to asbestos or lead as a result of building demolition will be temporary during construction.

Of the four Central Valley Wye alternatives, the Selected Alternative requires the second lowest amount of demolition (as measured in square feet of buildings to be demolished) and thus has the second lowest potential for risk of exposure to asbestos and lead.

Among the Central Valley Wye alternatives, the Selected Alternative is located near the fewest sites of Potential Environmental Concern, and it is not located in the vicinity of any landfills.

While operation of the Central Valley Wye alternatives could result in intermittent direct impacts through the transport, use, storage, and disposal of hazardous materials and wastes, these impacts will be minimized through conformance with established policies. These polices will reduce the potential for improper handling of materials and wastes that could result in routine or

accidental releases. Intermittent direct impacts from HSR operation in proximity to schools and recreational areas also have the potential to occur. However, hazardous materials and wastes activities will not occur within 0.25 mile of the nearest school or recreational area during operation.

The Authority has developed BMPs and similar strategies as IAMFs that will avoid or minimize hazardous material-related impacts of the Selected Alternative. These strategies include property acquisition; Phase I environmental site assessments and appropriate remediation; incorporation of methane protection measures and gas monitoring; use of work barriers; creation and utilization of an environmental management system; and preparation and implementation of plans for construction management, demolition, spill prevention, hazardous materials and wastes, undocumented contamination, hazardous materials transportation, and construction and operation near landfills. Additionally, the Authority will implement mitigation measures that will require documentation to demonstrate compliance with regulations governing the use of extremely hazardous materials near schools during construction.

5.5 Socioeconomics and Communities

As discussed in Section 3.12, Socioeconomics and Communities, of the Final Supplemental EIR/EIS, construction and operation of the Selected Alternative (as well as all other Central Valley Wye alternatives) will have unavoidable adverse impacts on community cohesion, resulting from road closures that disrupt pedestrian, bicycle, and transit circulation patterns, as well as noise and visual impacts that could have implications on community cohesion and social engagement in Fairmead and the rural agricultural community. The alternatives will also have adverse impacts on the agricultural economy from the acquisition and conversion of farmland to a nonagricultural use, and it will have permanent disruptive noise impacts on communities adjacent to the wye alignment. Construction equipment and activities could potentially deter neighbors from interacting and participating in community activities and could result in a perception by area residents that they have been separated from their community. However, these impacts will generally be lowest under the Selected Alternative compared to the other wye alternatives.

Additionally, the Selected Alternative will affect community cohesion in Fairmead because the alignment will impede travel between residences in the northern part of the community and between residences and community facilities (e.g., Fairmead Elementary School) to the south at some sites.

Construction and operation of the Selected Alternative will require the acquisition of right-of-way, resulting in the displacement of residents, commercial and industrial businesses, and agricultural operations. The Selected Alternative will result in the reduction of revenues from property taxes, close roads on school bus routes, and use/transport hazardous materials (during construction). However, among the Central Valley Wye alternatives, the Selected Alternative will result in the fewest displaced residential units and agricultural facilities, as well as the lowest acreage of important farmland converted to transportation use.

Construction of the Selected Alternative will generate jobs that will result in an estimated $4.61 million increase in construction-generated sales tax revenue, contributing to a net positive economic effect. While the Selected Alternative's projected number of construction-related jobs (8,120) in the four-county region (Madera, Merced, Fresno, and Stanislaus) is slightly lower than those associated with the other Central Valley Wye alternatives, the beneficial impact of the Selected Alternative is still notable.

Operation of the Selected Alternative as part of the statewide HSR system will improve state and regional connectivity while facilitating new access to employment and educational opportunities, creating job opportunities across many sectors of the regional economy and stimulating local sales tax revenues. While operation of the Selected Alternative will result in some adverse community-related impacts, including permanent increases in noise levels, it will result in long-term regional air quality benefits from a reduction in vehicle miles traveled.

The Authority has developed BMPs and similar strategies as IAMFs that will avoid or minimize construction-related community impacts of the Selected Alternative. However, even with implementation of IAMFs, impacts on socioeconomics and communities will be substantial. Therefore, the Authority has developed mitigation measures to further reduce such impacts on neighborhoods and communities. The mitigation measures will require the Authority to conduct special outreach efforts to affected residents and property owners to ensure that suitable replacement properties are acquired; this outreach will include local community workshops to identify additional strategies that could minimize impacts on remaining residents and property owners. Mitigation measures associated with noise and vibration and with hazardous materials will also help reduce community-related effects.

5.6 Land Use and Development

As discussed in Section 3.13, Land Use and Development, of the Final Supplemental EIR/EIS, construction of the Selected Alternative will result in both temporary and permanent effects related to land use. The Selected Alternative will require the permanent conversion 2,740 acres of land (along a total of 49.3 linear miles) to transportation or electrical facility uses. Among the Central Valley Wye alternatives, this is the second-lowest acreage of such conversion. The Selected Alternative will require the permanent closure of 33 roads (the second lowest among all Central Valley Wye alternatives) and the construction of 24 undercrossings and overcrossings (tied for the lowest among all Central Valley Wye alternatives). Construction of the Selected Alternative will also require the temporary use of lands outside the right-of-way; the Selected Alternative will require 484 acres of such temporary use, the second lowest among all Central Valley Wye alternatives. Such temporary uses will likely entail disruptions to property access and neighborhoods and indirect impacts related to increased noise levels, dust and other air pollutants, traffic, and visual changes as well as by reducing access to irrigation ditches and causing potential crop damage on adjacent lands.

Operation of the Selected Alternative will not result in continued changes to land use and development, because permanent land use impacts (including by conversion) will occur during construction.

The Authority has developed BMPs and similar strategies as IAMFs that will avoid or minimize the land use and development-related impacts of the Selected Alternative. However, even with adherence to these IAMFs, impacts of the Selected Alternative on land use patterns will remain adverse. The Authority will implement mitigation measures related to reducing community division and ensuring that the design of elevated guideways can adapt to local contexts.

5.7 Agricultural Farmland

As discussed in Section 3.14, Agricultural Farmland, of the Final Supplemental EIR/EIS, construction of the Selected Alternative (as well as of any of the other Central Valley Wye Alternatives) will temporarily use Important Farmland, permanently convert Important Farmland to nonagricultural use (i.e., transportation), and result in the creation of remnant parcels (which are too small to economically farm). However, among the Central Valley Wye alternatives, the Selected Alternative will require the lowest acreages of Important Farmland for temporary use and permanent conversion. Moreover, construction of the Selected Alternative will result in the lowest acreage of remnant parcels among all Central Valley Wye alternatives. Overall, among the Central Valley Wye alternatives, the Selected Alternative will result in the least direct and indirect permanent conversion of Important Farmland, including conversion that may occur through the creation of remnant parcels.[2]

Construction and operation of the Selected Alternative (as well as any of the other Central Valley Wye alternatives) will result in limited changes in aerial spraying patterns but will generally not

[2] Many severed parcels contain small or irregularly shaped remnants. Some of these parcels would not be added to the acquisition area because the Authority has determined that some agricultural use would continue to be viable. For example, some small parcels could be consolidated with adjacent landowners, and larger, irregularly shaped parcels could still be farmed (although with some loss of efficiency).

interfere with spraying of crops and will not result in the conversion of Important Farmland to a nonagricultural use. Regarding construction-related effects on agricultural infrastructure, the Selected Alternative (as well as all other Central Valley Wye alternatives) will largely avoid impacts associated with utility interruption, and no conversion of Important Farmland to a nonagricultural use will occur from agricultural infrastructure disruptions.

The Authority has developed BMPs and similar strategies as IAMFs that will avoid or minimize the Selected Alternative's impacts on Important Farmland (refer to Appendix D of this Supplemental ROD for details). However, even with adherence to these IAMFs, the Selected Alternative will still result in the permanent conversion of Important Farmland to a nonagricultural use. Therefore, through an existing agreement with the California Department of Conservation, the Authority funds the California Farmland Conservancy Program's work to identify suitable agricultural land for mitigation of impacts as well as the purchase of agricultural conservation easements from willing sellers. This agreement provides for the purchase of agricultural conservation easements to preserve Important Farmland in an amount to commensurate with the quantity and quality of converted farmlands. Because the Selected Alternative will require the lowest acreage of permanent conversion of Important Farmland compared to the other Central Valley Wye alternatives, the Selected Alternative will require the lowest amount of mitigation for agricultural land.

5.8 Aesthetics and Visual Resources

As discussed in Section 3.16, Aesthetics and Visual Resources, of the Final Supplemental EIR/EIS, construction of the Selected Alternative (as well as all other Central Valley Wye Alternatives) will temporarily degrade visual quality through the presence of construction equipment, such as stockpiles, dust, and nighttime lighting. In addition, the Selected Alternative (as well as the other Central Valley Wye alternatives) will result in the removal of established palm trees from the Robertson Boulevard Tree Row, a visually prominent scenic and historic resource. In addition, the Selected Alternative will traverse the community of Fairmead (similar to two other Central Valley Wye alternatives), thereby decreasing visual quality in this area. The Selected Alternative, among the Central Valley Wye Alternatives, will require the least removal (4,088 linear feet) of established palm trees from the Robertson Boulevard Tree Row.

To avoid or reduce other visual impacts of the Selected Alternative, the Authority has developed BMPs and similar strategies as IAMFs (refer to Appendix D of this Supplemental ROD for details). These IAMFs include adherence to design strategies that will avoid, minimize, and reduce adverse effects on aesthetic and visual resources.

However, to further reduce potential adverse visual effects associated with construction of the Selected Alternative, the Authority has developed mitigation measures that require contractors to minimize and/or screen construction areas and minimize or avoid nighttime light disturbance. These mitigation measures also require the Authority to engage with local communities to help inform the design of elevated guideways so that they are more visually harmonious with the local context. Landscape treatments and other plantings after construction will also enhance visual quality, along with mitigation measures to ensure the prompt treatment of graffiti on new infrastructure.

5.9 Cultural Resources

As discussed in Section 3.17, Cultural Resources, of the Final Supplemental EIR/EIS, construction of the Selected Alternative (as well as any of the other Central Valley Wye alternatives) will result in the removal of trees from the Robertson Boulevard Tree Row, which is considered a historic built environment (architectural) resource. While the Selected Alternative (or any of the other Central Valley Wye alternatives) will not encounter or adversely affect any known archaeological resource, construction-related excavation has the potential to unearth unknown archaeological resources.

Among the Central Valley Wye alternatives, the Selected Alternative requires the least removal (4,088 linear feet) of trees from the Robertson Boulevard Tree Row.

To avoid or reduce cultural resources impacts of the Selected Alternative, the Authority has developed BMPs and similar strategies as IAMFs (refer to Appendix D of this Supplemental ROD for details). These include requirements for additional surveys, training sessions for construction personnel to be able to identify cultural resources, a monitoring plan, a discovery plan, procedure if unanticipated discoveries are made during ground-disturbing activities, and plans to protect and to avoid or minimize damage to historic properties. Additionally, the Selected Alternative will incorporate mitigation measures concerning both archaeological resources and built environment resources. Mitigation measures include phased identification of archaeological and built environment resources, allowing for the potential discovery of previously unidentified resources once access to all properties within the construction area is secured. Surveys for such resources will be conducted on all properties that have not been subject to prior surveys before construction begins. Should any resources be identified, the Authority will consult with Section 106 consulting parties and agree upon appropriate mitigation measures, which may include preservation in place, data recovery, or other appropriate steps outlined in the Built Environment Treatment Plan or Archaeological Treatment Plan. Archaeological mitigation measures will set forth protocols and standards to ensure that any unanticipated discoveries are properly evaluated, avoided if possible, and treated, and that will halt construction work in the area while such discoveries are evaluated. For built environment resources, mitigation will help minimize, but not fully avoid, impacts associated with tree removal from the Robertson Boulevard Tree Row.

5.10 Cumulative Impacts

As discussed in Section 3.19, Cumulative Impacts, of the Final Supplemental EIR/EIS, adherence to IAMFs and/or mitigation measures will avoid or minimize most impacts associated with construction and operation of the Selected Alternative, as well as the other Central Valley Wye alternatives. However, when combined with other past, present, and reasonably foreseeable projects, the construction of the Selected Alternative (as well any of the Central Valley Wye Alternatives) will, even with adherence to IAMFs and mitigation measures, contribute to cumulative impacts in the following resource areas:

- Biological resources
- Agricultural farmland
- Aesthetics and visual resources
- Cultural resources

The Selected Alternative will result in direct impacts on critical habitats for eight special-status species, including San Joaquin Orcutt grass, vernal pool fairy shrimp, vernal pool tadpole shrimp, Conservancy fairy shrimp, Central Valley steelhead, Colusa grass, fleshy owl's-clover, and Greene's tuctoria. Although some of these habitats are protected from development, construction of the Selected Alternative, along with other planned development anticipated under the cumulative condition, will result in a cumulative loss of habitat for these species. Construction of the Selected Alternative will increase turbidity and siltation in the San Joaquin River, contributing to cumulative impacts on essential fish habitat. In addition, construction of the Selected Alternative will require the construction of new permanent linear infrastructure that will disrupt seasonal migrations and animal foraging and mating opportunities. IAMFs incorporated into the project design, as well as mitigation measures, will minimize but not avoid the Selected Alternative's contributions to these significant wildlife crossing and EFH cumulative impacts.

The Selected Alternative's conversion of existing agricultural land uses, including Important Farmland, to urban or transportation uses, is occurring in a regional context where other development projects are also resulting in loss of agricultural land uses, including Important Farmland. The Authority has entered into an agreement with the Department of Conservation and its California Farmland Conservancy Program to implement agricultural land mitigation (including the purchase of off-site agricultural easements that will protect Important Farmland elsewhere in the region) to help offset impacts of the Selected Alternative (and of farmland conversion in other project sections). However, Important Farmland is a finite resource that cannot be replaced, so the Selected Alternative's conversion of Important Farmland will contribute to this regional cumulative impact.

In terms of visual and historic resources, the Selected Alternative will require removal of 4,088 linear feet of the Robertson Boulevard Tree Row, a visually prominent scenic and historic resource. While the Authority commits to minimize tree removal and replant/landscape other areas, the Robertson Boulevard Tree Row is a unique resource consisting of mature palm trees stretching for several miles. The Selected Alternative's modification to the Robertson Boulevard Tree Row is the least among all Central Valley Wye alternatives, but the removal of 4,088 linear feet will contribute to the degradation of this visual and historic resource.

6 MITIGATION COMMITMENTS AND MONITORING

The Authority will supervise construction and require implementation of mitigation measures for the Selected Alternative. The Authority is responsible for ensuring that these commitments are implemented, and the Authority has a full oversight role for this project. It is also expected that USACE, the State Water Resources Control Board, and the California Department of Fish and Wildlife will make frequent compliance reviews to verify that all conditions of their respective permits are satisfied.

Consistent with 40 C.F.R. 1505.2(c), all practicable means to avoid or minimize environmental harm caused by the Selected Alternative have been identified and incorporated as IAMFs. Further means to reduce and/or compensate for environmental impacts have been identified and included as mitigation measures.

The MMEP describes mitigation measures that will avoid, minimize, or compensate for reasonably foreseeable environmental impacts that result from constructing and operating the Central Valley Wye portion of the Merced to Fresno Project Section of the California HSR System. Pursuant to its responsibilities under NEPA Assignment, these measures were developed by the Authority in consultation with appropriate agencies, as well as with input received from the public.

The Selected Alternative also incorporates many IAMFs that are identified in the Final Supplemental EIR/EIS. The Authority, as part of the Draft Supplemental EIR/EIS, identified these IAMFs to avoid and minimize potential Project impacts. The Authority will apply these IAMFs and BMPs to avoid impacts in several resource areas. Regulatory requirements (such as hazardous material disposal and various mandatory safety strategies) provide additional assurance that impacts on the environment will not occur or will be minimized to the fullest extent practicable. The applicable regulatory requirements and the IAMFs that are part of the Selected Alternative are described in more detail in the MMEP. The IAMFs are a condition of Project approval and must be implemented by the Authority during design, construction, and operation of the Selected Alternative approved by this Supplemental ROD.

All IAMFs and mitigation measures are included in Appendix D of this Supplemental ROD. The Authority is required to comply with all mitigation measures adopted with this Supplemental ROD. The MMEP, as incorporated into this Supplemental ROD, is a formal commitment by the Authority to carry out all of the measures identified therein as a condition of Project approval. Therefore, in designing, constructing, and operating the Selected Alternative, the Authority is required to adhere to and provide appropriate funding for all IAMFs and mitigation measures in the MMEP.

7 SUMMARY OF COMMENTS

This section would summarize any comments received on the Final Supplemental EIR/EIS during the availability period. It will be provided in the Final Supplemental ROD.

8 DECISION

The Authority finds that the SR 152 (North) to Road 11 Wye Alternative, identified in the Final Supplemental EIR/EIS as the Preferred Alternative, is the Selected Alternative. In making this finding, the Authority concludes that, among the alternatives considered, the Selected Alternative best fulfills the purpose and need and objectives for the Project while balancing impacts on the natural and human environment.

In reaching this decision, the Authority considered the physical and operational characteristics and potential environmental consequences associated with all considered Central Valley Wye alternatives. The Authority, as lead agency, consulted with the cooperating agencies and considered the Draft Supplemental EIR/EIS, the Revised/Second Draft Supplemental EIR/EIS, Biological Resources Analysis, the Final Supplemental EIR/EIS, and all public and agency comments received during the review periods in reaching this decision.

The cooperating agencies may issue their own decision documents, as appropriate, consistent with their statutory and regulatory responsibilities.

8.1 Section 106

Section 106 of the National Historic Preservation Act (16 U.S.C. 470f) requires that any federal agency having direct or indirect jurisdiction over a proposed federal or federally assisted undertaking take into account the effect of the undertaking on any district, site, building, structure, or other object that is listed or eligible for listing on the National Register of Historic Places. The FRA, State Historic Preservation Officer (SHPO), the Authority, and the Advisory Council on Historic Preservation executed the *Programmatic Agreement among the Federal Railroad Administration, the Advisory Council on Historic Preservation, the California State Historic Preservation Officer, and the California High-Speed Rail Authority Regarding Compliance with Section 106 of the National Historic Preservation Act as it Pertains to the California High-Speed Train Project* (PA) in 2011. The PA sets forth numerous requirements intended to ensure appropriate treatment of historic resources during ground-disturbing activities associated with Project construction. The PA also provides protocols for how and when formal eligibility determinations will be made. Eligibility determinations will be made by the appropriate agency based on information presented in the appropriate, completed State site records forms. Moreover, the PA sets forth requirements for tribal monitoring of construction activities to help ensure protection of cultural resources that may be encountered. Adherence to the terms of the PA will fulfill all obligations under Section 106.

The *California High-Speed Train Merced to Fresno Section: Memorandum of Agreement for the Treatment of Adverse Effects on Historic Properties under Section 106 of the National Historic Preservation Act* (Merced Fresno MOA) was also signed by the same parties in 2012. The Merced Fresno MOA was amended in 2013 to add the STB and USACE to the signatories and again in 2017 to add efficiencies for re-examinations. The MOA summarizes the results of the Section 106 process and the treatment measures agreed to among the Project's consulting and concurring parties for both above- and below-ground cultural resources.

The assessment of adverse effects required under Section 106 of the National Historic Preservation Act was documented in the *Merced to Fresno Section: Central Valley Wye Final Supplemental Section 106 Findings of Effect Report* that was approved by SHPO in 2018 in a Concurrence Letter (see Appendix E to this Supplemental ROD) and is available at the following link: https://www.hsr.ca.gov/docs/programs/merced-fresno-eir/TR-15_Supplemental_Section_106_Findings_of_Effect_Report.pdf.

8.2 Section 4(f)

Projects that are undertaken by an operating administration of the Department of Transportation (DOT) or that may receive federal funding and/or discretionary approvals from such an operating administration must demonstrate compliance with Section 4(f) of the DOT Act of 1966. Section 4(f) protects publicly owned lands that are parks, recreational areas, and wildlife refuges. Section 4(f) also protects historic sites (including archaeological resources) of national, state, or local significance that are on public or private land.

Under the NEPA Assignment MOU, the Authority has been delegated the power to make determinations under Section 4(f). The NEPA Assignment MOU stipulates that the Authority must consult with FRA prior to making any constructive use determination, but otherwise delegates all responsibilities under Section 4(f) to the Authority. As further detailed below, there is no constructive use determination associated with the Central Valley Wye.

As described in Chapter 4 of the Draft Supplemental EIR/EIS, Section 4(f) properties were considered throughout the planning and alternatives development and analysis process to avoid and minimize impacts on resources protected by Section 4(f). During this process, the Selected Alternative was designed to avoid direct adverse effects on parks, recreational areas, and historic resources. The Final Supplemental EIR/EIS contains the Authority's evaluation of whether the Central Valley Wye alternatives would result in any of the following "uses" of properties projected under Section 4(f):

- Permanent use (which encompasses permanent easements or temporary easements that exceed limits for temporary occupancy);
- Temporary occupancy; and
- Constructive use.

Impacts were then evaluated to see if the criteria for a *de minimis* impact determination were met and appropriate coordination with officials having jurisdiction over each resource was conducted. Three Section 4(f) properties are present in the Selected Alternative's RSA for recreational and cultural resources: one outdoor play area (at the Fairmead Elementary School) and two historic resources (the Chowchilla Canal and Robertson Boulevard Tree Row). The Authority issued its Draft Section 4(f) Evaluation in the Draft Supplemental EIR/EIS and finalized that Section 4(f) Evaluation in the Final Supplemental EIR/EIS. The analysis and information in the Section 4(f) Evaluation included with the Final Supplemental EIR/EIS is incorporated herein by reference.

The Fairmead Elementary School play areas will not incur a use under Section 4(f) because the Selected Alternative will not incorporate any land from the play areas.

The Selected Alternative will cross the Chowchilla Canal. Crossing the Chowchilla Canal is considered a use. However, the Selected Alternative will not realign or impair the Chowchilla Canal. Since the publication of the Draft Supplemental EIR/EIS, the Authority has made a Section 4(f) *de minimis* impact determination for the Chowchilla Canal. The Authority notified the SHPO of its intent to make this determination during the Section 106 consultation process with the SHPO. In April 2018, the SHPO concurred in writing on the Authority's finding of no adverse effect under Section 106 on the Chowchilla Canal, and the Section 4(f) *de minimis* impact determination was thus finalized.

The Selected Alternative will incur an unavoidable permanent use of the Robertson Boulevard Tree Row, requiring removal of 4,088 linear feet of this historic property. The Authority made a Section 106 finding of adverse effect on the Robertson Boulevard Tree Row. Accordingly, as reflected in the Final Supplemental EIR/EIS, the Authority completed a Section 4(f) evaluation for this resource and concluded there are no feasible and prudent avoidance alternatives for the Robertson Boulevard Tree Row, further determining that the Selected Alternative will cause the overall least harm to the resource among all of the Central Valley Wye alternatives. The Authority is continuing coordination, as appropriate, with the SHPO regarding adverse effects on the Robertson Boulevard Tree Row.

8.2.1 Measures to Minimize Harm/Mitigation

The Authority developed measures to minimize harm to the Robertson Boulevard Tree Row during project planning to avoid or minimize impacts, as well as mitigation and enhancement measures to compensate for the unavoidable project impacts of tree removal and visual intrusion.

In consultation with the SHPO (the Official with Jurisdiction for the Robertson Boulevard Tree Row), the Authority has identified measures to minimize harm, as required by 49 U.S.C. 303(c)(2). These measures are now incorporated into the Selected Alternative. The Authority is continuing ongoing coordination, as appropriate, with the SHPO. During the Authority's consideration of its decision and during final design, the Authority, in consultation with the SHPO, may identify and implement additional measures to further reduce impacts on the Robertson Boulevard Tree Row. The Authority has identified the following measures to minimize harm to the Robertson Boulevard Tree Row:

- The Built Environment Treatment Plan currently identifies protective measures for any substantially affected historic properties. Mitigation commitments include, but are not limited to, pre-construction condition assessments, a plan for protection, a response plan for unanticipated effects, relocation of selected trees and replacement in kind of any trees that would not survive relocation, interpretive materials, weekly assessments during construction, and a post-construction conditions assessment.
- The Built Environment Treatment Plan has been amended and SHPO concurred with the amendment to add a commitment for the Authority to refine the design to further minimize the number of trees affected. Furthermore, the SHPO would be asked to review and comment on the design as it is developed.

8.2.2 Section 4(f) Determination

Section 4(f) requires the selection of an alternative that avoids the use of a Section 4(f) property if that alternative is deemed feasible and prudent and the use does not qualify for a finding of *de minimis* impact. After making a Section 4(f) determination and identifying measures to minimize harm, if there is more than one alternative that results in the use of a Section 4(f) property, the Authority must also compare the alternatives to determine which alternative has the potential to cause the least overall harm in light of the preservationist purpose of the statute.

As described above and in Chapter 4 of the Final Supplemental EIR/EIS, the Authority has determined that the Selected Alternative will not use any Fairmead Elementary School play areas. Accordingly, no Section 4(f) determination is required.

Regarding the Selected Alternative and the Chowchilla Canal, the Authority has made a *de minimis* determination under Section 4(f). Because of this determination, no mitigation is necessary for this resource.

Regarding the Selected Alternative and the Robertson Boulevard Tree Row, the Authority has made a permanent use determination under Section 4(f). As noted above, the Authority came to this determination after undertaking a rigorous evaluation to ultimately conclude that there are no feasible or prudent avoidance alternatives to the Selected Alternative. This is in part due to the fact that the Robertson Boulevard Tree Row extends for approximately 9 miles to the southwest of the city of Chowchilla and thus constitutes a resource of substantial length. Avoidance would require substantial alignment changes found to be infeasible and/or imprudent. Among all Central Valley Wye alternatives, the Selected Alternative requires the least removal of linear feet (4,088 feet) from the Robertson Boulevard Tree Row and thus the least overall harm to this resource's value as a cultural resource and regionally prominent visual resource.

8.3 General Conformity Determination

As described in greater detail in Section 2.1, the Final GCD (see Appendix A) for the Merced to Fresno Section was signed by FRA on September 18, 2012 and published with the Merced to Fresno Section ROD. It was based on the condition that the Authority enter into a VERA with the SJVAPCD to offset construction emissions of NOx, VOC, and PM to net zero.

Because the Merced to Fresno Final EIR/EIS decision documents deferred a final decision on a wye alternative, the Central Valley Wye was not initially included in the GCD for the Merced to Fresno Section. However, the Authority found that its Air Quality and Global Climate Change Technical Report for the Central Valley Wye (2017) indicated general consistency with the pertinent air quality conclusions in the Merced to Fresno Final EIR/EIS (2012), including the previous GCD.

FRA concurred with this conclusion on April 21, 2020. Therefore, a separate GCD was not prepared for the Central Valley Wye because the Merced to Fresno Final GCD is valid for the Central Valley Wye Section.

8.4 Section 7 Endangered Species Finding

The proposed action (construction and operation of the Selected Alternative) is in compliance with Section 7 of the FESA. Because the proposed action is likely to have an impact on threatened or endangered species, the Authority prepared BAs and consulted with USFWS and NMFS, as required under Section 7 of the FESA. The Authority submitted requests to reinitiate Section 7 consultation with USFWS and NMFS in 2019. USFWS issued its amended BO on September 27, 2019 (see Appendix B). Refer to Section 2.5 above for details on the Authority's (and FRA's) submittals to the USFWS and NMFS regarding the Central Valley Wye.

Because the Central Valley Wye has changed since the wye alternatives were evaluated as part of the Merced to Fresno Section in 2012 and Incidental Take Statements were not issued for the entirety of the Merced to Fresno Section, supplemental BAs addressing the effects of the Central Valley Wye on federally listed species and critical habitat were prepared.

USFWS concluded that the proposed action is not likely to jeopardize the continued existence of threatened or endangered species and is not likely to adversely affect critical habitat. The amended BO contains an Incidental Take Statement and reasonable and prudent measures covering the extent of the project that was not previously covered by the incidental take statement in the 2012 Merced to Fresno BO. The Authority will implement the measures identified in the amended USFWS BO.

Because the Central Valley Wye crosses the San Joaquin River, which is identified as EFH for Central Valley steelhead and Central Valley spring-run Chinook salmon, the Authority also coordinated with NMFS in accordance with the Magnuson-Stevens Act. NMFS concluded there would be an adverse effect on EFH in an amended BO on September 3, 2019. NMFS concluded that the proposed action was not likely to jeopardize listed species or the experimental nonessential population and would have no effect on critical habitat. The amended NMFS BO (Appendix C) contains an Incidental Take Statement and reasonable and prudent measures authorizing activities associated with project construction throughout the Merced to Fresno Section, including the Central Valley Wye. The Authority will implement the measures in the amended NMFS BO.

The proposed action is in compliance with the Magnuson-Stevens Act.

8.5 Wetlands Finding

In addition to NEPA and other environmental laws, the federal lead agency is also required to make findings pursuant to Executive Order 11990, Protection of Wetlands, and the U.S. Department of Transportation Wetlands Order, DOT Order 5660.1A.

Though impacts on waters of the United States may occur as a result of the Selected Alternative, in September 2018 the USACE concurred that the Selected Alternative is the preliminary LEDPA because there is no practicable alternative to the placement of fill in waters of the United States and all practicable measures to avoid harm to waters of the United States have been included (see Appendix F). Design requirements and permit conditions will require contractors to avoid impacts on jurisdictional waters wherever feasible. The requirements identified in the MMEP, incorporated as part of this document (Appendix D), will minimize the destruction, loss, or degradation of wetlands and preserve and enhance the natural and beneficial values of wetlands. The proposed action is in compliance with the Section 404(b)(1) guidelines.

To the maximum extent practicable, the Authority will implement pre- and post-construction BMPs for sediment and erosion control. The measures and features included in the MMEP will reduce impacts on wetlands to a level sufficient to achieve no net loss. However, if determined to be necessary by USACE and the State Water Resources Control Board, these measures can be increased through Clean Water Act permitting, or additional measures may be recommended and reflected in other project permits and authorizations. Based upon USACE findings and the Authority's evaluation, the Authority determines that the proposed action is consistent with Executive Order 11990 and DOT Order 5660.1A, Section 401, and Section 404, including Section 404(b)(1).

8.6 Floodplains Finding

DOT Order 5620.2 implements Executive Order 11988, Floodplain Management. These orders state that the federal lead agency may not approve an alternative involving a significant encroachment unless the agency can make a finding that the proposed encroachment is the only practicable alternative. The major purposes of Executive Order 11988 are to avoid federal support for floodplain development; to prevent uneconomic, hazardous, or incompatible use of floodplains; to restore and preserve the natural and beneficial floodplain values; and to be consistent with the standards and criteria of the National Floodplain Insurance Program.

As indicated in Section 3.8, Hydrology and Water Resources, of the Final Supplemental EIR/EIS, the Authority, as the federal lead agency, concludes that the Selected Alternative will not result in any substantial adverse impacts on natural and beneficial values of the floodplains, will not result in a substantial change in flood risks or damage, and will not have a substantial potential for interruption or termination of emergency service and evacuation routes. Design of the Selected Alternative includes effective measures to avoid or minimize the potential for exposure of HSR passengers and employees to flooding, and new or additional exposure to flooding risks and hazards from the failure of a levee or dam will not occur. Based upon these findings, the Authority determines that the proposed action is consistent with requirements of Executive Order 11988.

8.7 Environmental Justice Finding

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires that each federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. DOT Order 5610.2(a), "Department of Transportation Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," 77 Federal Register 27534 (May 10, 2012), imposes similar obligations on DOT operating administrations to promote the principles of Executive Order 12898 and incorporate such principles in all programs, policies, and activities, including the NEPA Process.

The Central Valley Wye alternatives, including the Selected Alternative will result in adverse effects on low-income and minority populations residing along the project corridor, primarily within the Community of Fairmead. However, among the three SR 152 alternatives, the Selected Alternative will have the lowest effect on this community. The Avenue 21 to Road 13 Wye Alternative would mostly avoid the community of Fairmead.

Impacts of the Selected Alternative on low-income and minority populations will include:

- an increase in noise levels, the introduction of new visible features that permanently change the aesthetic and visual quality in Fairmead;
- temporary and permanent road closures resulting in traffic diversion;
- impacts on community cohesion;
- residential and commercial unit displacement;
- the acquisition and permanent conversion of agricultural lands and confined agricultural facilities;
- localized air quality degradation due to construction activities;
- temporary impacts on surface water and groundwater quality;
- the nearby use of hazardous materials during construction;
- potential disruption of cultural resources; and
- temporary disruptions to recreational facility access.

The Selected Alternative will include the application of both IAMFs and mitigation measures that reduce disproportionate adverse effects on low-income and minority populations (see the MMEP, Appendix D). The Authority and its contractors must comply with:

- FRA guidelines for minimizing noise and vibration impacts on sensitive receptors;
- specific strategies to minimize construction-related noise impacts;
- implementation of locally appropriate design criteria into HSR facilities; implementation of features to minimize traffic impacts;
- construction of vehicular crossings, sidewalks, and multiuse trails to improve community cohesion and improve recreational facilities;
- assistance for displaced residents with finding new suitable housing within the communities in which they currently reside;
- incorporation of dust control plans and other construction-phase air quality management strategies;
- implementation of erosion-minimization strategies; restrictions on the locations in which hazardous materials can be used; and
- implementation of cultural resource surveys and testing.

In addition to the above IAMFs and mitigation measures that will reduce disproportionate adverse effects related to issues such as noise, air quality, transportation, and hazardous materials, the Authority will also implement additional mitigation measures specific to socioeconomic effects. These mitigation measures include additional outreach to affected minority and low-income populations, such as but not limited to facilitated community workshops. These mitigation measures will reduce but not eliminate the effects that result from displacements. There are no practicable mitigation measures beyond these available to completely eliminate such displacements. Similarly, no other wye alternatives would completely avoid such displacements.

The Authority also considered the potential offsetting benefits associated with the Selected Alternative. For example, construction and operation of the Selected Alternative will result in employment growth in the region, and it will specifically benefit low-income and minority populations through special recruitment, training, and job set-aside programs. The California HSR System, of which the Central Valley Wye is a portion of just one section (Merced to Fresno), will improve transportation options throughout the state, improve long-term air quality, and reduce traffic congestion. These Project benefits will accrue not only to low-income and minority populations, but also to the broader community as a whole. The Authority, as NEPA lead agency, finds that there is a substantial need, based on the overall public interest, for an HSR system that connects the Central Valley to the San Francisco Bay Area. In completing the Merced to Fresno Project Section, the Central Valley Wye will support increased intercity mobility and complement existing highway and airport infrastructure that has not meaningfully expanded in decades despite significant population growth in California. On a state level, the Central Valley Wye will contribute the California HSR System goal to provide program benefits that are in the overall public interest, including:

- Improvements in mobility and travel time
- Reductions in vehicle miles traveled and commensurate drops in emissions of GHGs and criteria air pollutants
- Increased job creation both during construction and throughout operation, which is particularly important in the Central Valley as an economic matter
- Enhanced community planning leading to transit-oriented development and pedestrian scale communities

- Greater opportunities for walking and improved health outcomes as identified through the HSR planning and environmental documentation

Operation of the first segment of the Phase 1 HSR system will remove the equivalent of 31,000 passenger cars from the highways per day, according to the C*alifornia High-Speed Rail Project Comparison of Providing the Equivalent Capacity to High-Speed Rail through Other Modes* (Authority and FRA 2012). The HSR operation will present an alternative to the needed expenditure of $158 billion for new highway miles and airport infrastructure. Additionally, the diversion of travelers from passenger cars to rail will reduce vehicle miles traveled (an indicator of energy consumption), GHG emissions, and criteria air pollution generation.

The implementation of HSR will have a beneficial effect on future community development around station sites and in proximity to intercity transit affected by HSR investment. Operation of the Selected Alternative will also provide long-term benefits associated with improvements in mobility; vehicular, pedestrian, and bicycle safety; and air quality, as well as new employment opportunities consisting of approximately 1,200 jobs within the Central Valley. These regional project benefits will accrue equally to low-income and minority populations within the RSA and to the general population as a whole. For communities such as Fairmead, which has a high unemployment rate, the employment opportunities created by construction of the Selected Alternative, in combination with the Authority's employment commitments and training programs designed to increase the ability of local workers to compete for these jobs, will result in economic benefits for the community.

Though the Selected Alternative will displace 62 residential units within unincorporated areas in the Merced and Madera Counties, including within the community of Fairmead, this the lowest amount of displacements that would occur out of any of the three SR 152 alternatives. The Selected Alternative will not displace any migrant farmworker housing or transient camps. The Selected Alternative will also require the fewest commercial and industrial business displacements among the three SR 152 alternatives. Though the Avenue 21 to Road 13 Wye Alternative would result in the fewest residential and commercial displacements due to its alignment south of Fairmead, it would have greater effects on other resource areas, including exposure to a larger number of sensitive receptors to severe noise impacts, displacement of a larger number of agricultural facilities, larger impacts on wetlands and other waters, larger impacts on multiple special-status plant and wildlife species, and a larger impact on the Robertson Boulevard Tree Row.

The Authority has conducted extensive outreach with the community of Fairmead to identify and evaluate measures that could mitigate impacts beyond the resource-specific measures that, for example, reduce noise, visual impacts, and community division stemming from construction and operation of the Central Valley Wye alternatives. Coordination to develop mitigation aimed at offsetting the HSR contribution to stressors on the community would provide an opportunity to maintain quality of life in Fairmead. As part of the Selected Alternative, the Authority will provide funding to Madera County to construct a community center in Fairmead. In addition, the Authority will address the community's lack of sewer and water service, which constrains future development, by providing funding to connect Fairmead to the Chowchilla Wastewater Treatment Plant and the nearest safe and reliable municipal water supply system.

In addition to reducing the impacts that the Selected Alternative will have on environmental justice in the community of Fairmead, the mitigation strategies will improve the quality of life of Fairmead residents and remove a constraint to development in Fairmead. The Authority therefore concludes that there will be no disproportionately high and adverse effects on the community of Fairmead from construction and operation of the Selected Alternative.

9 CONCLUSION

The Authority, as the federal lead agency, and as authorized by the NEPA Assignment MOU, has reached a decision that most closely aligns with the Authority's statutory mission and responsibilities, considering economic, environmental, technical, and other factors and based on the information contained within the Final Supplemental EIR/EIS and the project record.

For the Central Valley Wye, the Authority approves the SR 152 (North) to Road 11 Wye Alternative. The Authority has selected this alternative because: (1) it best satisfies the Purpose, Need, and Objectives for the proposed action; and (2) it minimizes impacts on the natural and human environment by utilizing an existing transportation corridor where practicable and incorporating mitigation measures. Accordingly, the SR 152 (North) to Road 11 Wye Alternative has been selected and approved for Project implementation.

Brian P. Kelly — Date
Chief Executive Officer
California High-Speed Rail Authority

APPENDIX A: GENERAL CONFORMITY DETERMINATION MEMORANDUM

CALIFORNIA High-Speed Rail Authority

Memorandum

DATE: 1/4/2017

TO: Stephanie Perez-Arrieta, Chris Van Nostrand, Kathryn Johnson (FRA)

FROM: Alice Lovegrove, Edward Tadross (HSR)

CC: Mark McLoughlin, Lisa Nungesser, Kitty Barkley, Karin Lilienbecker (HSR)

SUBJECT: General Conformity Determination for Merced to Fresno Project Section: Central Valley Wye

Introduction

The emissions associated with the construction of the Merced to Fresno section of the HST project were analyzed in the Merced to Fresno Section: Final General Conformity Determination (GCD) (Authority and FRA 2012). The purpose of this memo is to discuss changes to the project since issuance of the GCD, resulting changes in construction emission estimates due to these changes, as well as the current project's consistency within the framework of the approved GCD.

Merced to Fresno Final EIR/EIS

The California High-Speed Rail Authority (Authority) prepared the Final Environmental Impact Report/Environmental Impact Statement (Final EIR/EIS) for the Merced to Fresno section of the High-Speed Train (HST) project. The Authority's Board of Directors certified the Final EIR/EIS under CEQA on May 3, 2012, and the Federal Railroad Administration (FRA) issued a Record of Decision (ROD) under NEPA on September 18, 2012.

The project, as approved in the Final EIR/EIS, evaluated three HST north-south alignment alternatives: the UPRR/SR 99 Alternative, the BNSF Alternative, and the Hybrid Alternative (the Hybrid Alternative is a combination of the UPRR/SR 99 Alternative and the BNSF Alternative). Each of these alternatives would extend between and include the proposed Downtown Merced Station and the Downtown Fresno Station, an approximate 65-mile long corridor.

Each of these three alternatives included two different east-west design options, the Ave 24 Wye and the Ave 21 Wye, resulting in a total of six different alternative design options

Merced to Fresno Final GCD

The Merced to Fresno Section: Final GCD (Authority and FRA 2012) evaluated the annual construction emissions associated with the Hybrid Alternative, which was identified as the Preferred Alternative. Furthermore, the Preferred Alternative with the Avenue 21 Wye option was presented in the GCD, because that option had the highest estimated emissions. The annual construction emissions were compared with the general conformity applicability threshold values (**Table 1**).

Table 1 Total Annual Construction-phase Emissions
Merced to Fresno Section: Final GCD (2012)

Pollutant	Emissions (Tons/Year)										Conformity Applicability Thresholds (tons/year)
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	
NO_x	39.85	128.76	109.51	114.52	32.02	13.34	49.35	15.14	7.36	3.96	10
VOCs	2.97	12.14	11.07	8.33	2.42	1.73	10.83	1.81	1.01	4.90	10
$PM_{2.5}$*	1.71	6.33	5.84	4.29	1.72	0.57	2.94	0.97	0.46	1.98	100
CO	14.11	52.45	49.24	31.51	11.40	7.65	32.42	18.41	11.58	2.51	100

Note: **Bold** values exceed applicability thresholds

* Includes sulfur dioxide emission rates as a partial precursor to $PM_{2.5}$ (i.e., it was conservatively assumed that 100% of SO_2 emissions becomes $PM_{2.5}$)

As shown in Table 1, construction-phase emissions, compared to the General Conformity applicability rates, were as follows:

- Annual estimated NOx emissions were greater than the applicability rate of 10 tons per year in years 2013 through 2020;
- Annual estimated VOC emissions were greater than the applicability rate of 10 tons per year in years 2014, 2015, and 2019; and
- Annual estimated $PM_{2.5}$ and CO emissions were less than the applicability rate of 100 tons per year in all years.

As such, a General Conformity Determination was required for the project for NOx and VOCs for the years indicated. This determination, which was published coincident with the Record of Decision (ROD) for the Project, included a commitment from the FRA/Authority to reduce all NOx and VOC emissions through emissions offsets using a Voluntary Emissions Reduction Agreement (VERA) with the San Joaquin Valley Air Pollution Control District (SJVAPCD, explained below.

Voluntary Emissions Reduction Agreement (VERA)

To support the General Conformity compliance determination, the FRA demonstrated in the GCD that the emissions of NOx and VOCs (a precursor to O_3) caused by the construction of the proposed Project would not result in an increase in regional NOx and VOC emissions. This was achieved by off-setting the NOx and VOC emissions generated by the construction of the Project through a Voluntary Emissions Reduction Agreement (VERA) between the Authority, the project proponent, and the San Joaquin Valley Air Pollution Control District (SJVAPCD). The requirement for the VERA was imposed on the project through the following mitigation measure from the Final EIR/EIS:

> **AQ-MM#4**: Offset Project Construction Emissions through a SJVAPCD Voluntary Emission Reduction Agreement (VERA). The Authority and SJVAPCD will enter into a contractual agreement to mitigate the project's emissions by providing funds for the district's Emission Reduction Incentive Program to fund grants for projects that achieve emission reductions, thus offsetting project-related impacts on air quality. The project will commit to reduce construction emissions for NOx and VOC through the VERA program.

A VERA is a mitigation measure by which the project proponent (the Authority, in this case, in partnership with the FRA) provides pound-for-pound offsets of emissions that exceed General Conformity thresholds through a process that develops, funds, and implements emissions reduction projects, with the SJVAPCD serving role of administrator of the emissions reduction projects and verifier of the successful mitigation effort.

In June 2014 the SJVAPCD and the Authority entered into a Memorandum of Understanding to establish the process to fully mitigate (by offsetting to net zero) emissions from construction of the HST San Joaquin Valley District Portion, through Voluntary Emission Reduction Agreements (VERA). As such, the Authority and the SJVAPCD entered into a contract to mitigate the project's emissions (NOx and VOCs, in this case) by providing funds for the SJVAPCD's Emission Reduction Incentive Program to fund grants for projects that achieve emission reductions, thus offsetting project-related impacts on air quality.

As part of the VERA agreements signed to date (including numbers HSR14-12 and HSR14-74 for Construction Package 1A, 1B and 1C) between the Authority and the District, the Authority must submit to the District a Construction Emission Report every three months. This report contains the calculated criteria pollutant emission burdens based on actual construction reporting information. In addition, the report contains the emissions calculations, associated assumptions, methodologies, and equipment information collected during the three month period. This final mitigation, in the form of emissions offsets, is based on the actual emissions in these reports.

Since construction commenced in 2014, the SJVAPCD has offset all construction emissions of NOx and VOCs, mainly by replacing old farm equipment (tractors) with new, cleaner, more efficient tractors. The SJVAPCD has verified, through quarterly reports, that the actual emission reductions have been achieved. As such, the District has certified to the Authority that these offsets have been achieved.

Central Valley Wye (CVY) Supplemental EIR/EIS

Since issuance of the Merced to Fresno Final EIR/EIS, several changes in alignments in the vicinity of the Central Valley Wye have prompted the development of a supplemental environmental document.

Four HST alignment alternatives are currently proposed for the Central Valley Wye Section of the HST System: the SR 152 (North) to Road 13 Wye Alternative, SR 152 (North) to Road 19 Wye Alternative, the Avenue 21 to Road 13 Wye Alternative, and the SR 152 (North) to Road 11 Wye Alternative. Each of these alignment alternatives contain additional miles of track as compared to the Merced to Fresno Final EIR/EIS analyzed, as the current study area extends approximately 13 miles further west to Carlucci Road. In addition, there have been changes to the construction schedule, quantities, and emissions estimation methodologies since issuance of the Merced to Fresno Final EIR/EIS.

As such, the annual construction emissions presented in the Merced to Fresno GCD have been revised to reflect these changes. The Avenue 21 to Road 13 alternative, which shows the highest emissions of ROG and NOx, has been presented for this analysis. Emissions from regional building demolition and construction of the at-grade rail segments, elevated rail segments, retained-fill rail segments, and traction power substations were calculated using emission factors from CARB's OFFROAD 2011 and 2007 models. Mobile source emission burdens from worker trips and truck trips were calculated using VMT estimates and appropriate emission factors from EMFAC2014. Fugitive dust emissions from dirt and aggregate handling were calculated using emission factors derived from equations from USEPA's AP-42.

The revised emissions are based upon the emission estimates for the Central Valley Wye, as presented in the Draft Central Valley Wye Supplemental EIR/EIS. The additional emissions for the Merced to Fresno portions of the project, outside of the Central Valley Wye (north of Ranch Road and south of Avenue 19) were calculated as follows:

- Additional Rail Mile Construction: the emissions from the construction of additional rail miles for the Merced to Fresno Section (including hauling) were calculated by track mile, based upon the emissions estimates of the Central Valley Wye. The additional track associated with the Merced to Fresno Section includes 7.7 miles of additional track from Ranch Road north to Merced, and 26.1 miles of additional track from Avenue 19 south to Fresno. Since the portion of the project south of Avenue 19 is currently under construction, those emissions were distributed across the years 2014 to 2018. Since the portion of the project north of Ranch Road will be constructed at a later date, those emissions were distributed over the years 2023 and 2024.
- Merced Station: the emissions of the Merced Station were based upon station emissions calculated in the Fresno to Bakersfield Section: Final General Conformity Determination (Authority and FRA 2014), which used the same construction emission calculation methodologies as the Central Valley Wye analysis. Since the Fresno station was already included in the Fresno to Bakersfield Section: Final

General Conformity Determination, it has not been included in this analysis. The emissions for the Merced station were distributed across the years 2019 to 2023.

- VERA emissions: those emissions which have already been offset under the VERA agreement with the SJVAPCD since the start of construction in mid-2014 have been subtracted from the overall emissions estimates in the years 2014, 2015 and 2016.

Table 2 presents the revised emissions estimates, representing the Merced to Fresno portion of the project in conjunction with the current Central Valley Wye portion of the project. As shown in **Table 2**, construction-phase emissions, compared to the General Conformity applicability rates, are as follows:

- Annual estimated NOx emissions are greater than the applicability rate of 10 tons per year in years 2019 through 2022;
- Annual estimated VOC emissions are greater than the applicability rate of 10 tons per year in the year 2020; and
- Annual estimated CO, PM_{10} and $PM_{2.5}$ emissions are less than the applicability rate of 100 tons per year in all years.

Table 2 Total Annual Construction-phase Emissions
Merced to Fresno with Central Valley Wye

Pollutant	Emissions (Tons/Year)											Conformity Applicability Thresholds (tons/year)
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	
NO_x	0.64	1.79	9.72	90.68	102.83	118.85	173.75	102.97	26.16	30.52	26.17	10
VOCs	0.11	0.25	0.66	5.29	6.31	7.15	10.99	6.05	1.81	1.90	1.70	10
PM_{10}	0.07	0.16	0.44	14.80	15.48	22.80	28.76	13.62	1.35	4.64	4.46	100
$PM_{2.5}$*	0.00	0.00	0.00	4.41	4.41	5.19	7.46	4.43	0.99	1.32	1.20	100
CO (Fresno)**	0.00	0.00	0.00	7.19	7.19	7.83	12.90	6.92	1.87	2.17	1.99	100

Note: **Bold** values exceed applicability thresholds
* Includes sulfur dioxide emission rates as a partial precursor to $PM_{2.5}$ (i.e., it was conservatively assumed that 100% of SO_2 emissions becomes $PM_{2.5}$)
** Fresno urbanized maintenance area only

Conclusion

Upon comparing the emissions estimates of the revised project, with the current Central Valley Wye alignments, as opposed to those presented in the Merced to Fresno GCD, the following holds true for both analyses:

- Annual estimated NOx emissions are greater than the applicability rate of 10 tons per year in several construction years;
- Annual estimated VOC emissions are greater than the applicability rate of 10 tons per in several construction years; and
- Annual estimated CO, PM_{10} and $PM_{2.5}$ emissions are less than the applicability rate of 100 tons per year in all construction years.

As such, the approved GCD for the Merced to Fresno Project Section covers all pollutants which have been estimated. Regardless of the years in which the emissions of NOx and VOCs may exceed applicability rates, the GCD included a commitment from the FRA/Authority to reduce all NOx and VOC emissions through emissions offsets using a Voluntary Emissions Reduction Agreement (VERA) with the San Joaquin Valley Air Pollution Control District (SJVAPCD). Furthermore, since the commencement of

construction in 2014, it has been verified that all actual reported construction emissions have been fully offset through VERA agreements.

In conclusion:

- All construction emissions of NOx and VOCs have been and will continue to be fully offset to zero, and
- The revised construction analysis indicates that no additional pollutants would exceed General Conformity applicability rates.

As such, the findings and recommendations contained with the Merced to Fresno GC hold true, and no further action is required.

CALIFORNIA High-Speed Rail Authority

(Headquarters/Environmental)_ Memorandum	**DATE ISSUED:** 01/27/2020	**EXPIRES:** Not Applicable
TO: Ms. Stephanie Perez	**REFERENCES:** Merced to Fresno Project Section	
FROM: Mark A. McLoughlin		
SUBJECT: General Conformity Verification: Merced to Fresno Project Section Central Valley Wye		

Following on the California High-Speed Rail Authority's (Authority) 2019 publication and distribution of *Merced to Fresno Section: Central Valley Wye Draft Supplemental Environmental Impact Report/ Environmental Impact Statement* (Central Valley Wye Draft Supplemental EIR/EIS); the Authority is moving forward to prepare a Final Supplemental EIR/EIS for this project section.

The July 23, 2019 Memorandum of Understanding between the Federal Railroad Administration (FRA) and the Authority (NEPA Assignment MOU) delegates to the Authority responsibilities under the National Environmental Policy Act (NEPA) and several other environmental laws. However, subsection 3.2.5 of the NEPA Assignment MOU states that FRA retains its responsibilities to make conformity determinations under Section 176 of the Clean Air Act (42 U.S.C. 7506). Consistent with this provision, in preparation for the Authority's anticipated 2020 publication of the Final Supplemental EIR/EIS for the Central Valley Wye, the Authority requests that FRA confirm:

1. That the Final General Conformity Determination for the Merced to Fresno (M-F) Project Section, between the Downtown Merced Station and Downtown Fresno Station, remains valid for the Central Valley Wye; and,
2. No new conformity determination is needed for the Central Valley Wye.

Merced to Fresno Environmental Impact Report/Environmental Impact Statement

The Final General Conformity Determination for the M-F Project Section was signed by FRA Administrator Joseph Szabo on September 18, 2012 and published with the Record of Decision. It was based on the condition that the Authority enter into a Voluntary Emissions Reduction Agreement (VERA) with the San Joaquin Valley Air Pollution Control District (SJVAPCD or Valley Air District) to offset construction emissions of nitrogen oxides (NOx), volatile organic compounds (VOC), and particulate matter (PM) to net zero. The Authority and FRA made this commitment as part of Air Quality Mitigation Measure #4 (AQ-MM#4), "Offset Project Construction Emissions through an SJVAPCD VERA" in the *California High-Speed Train Final Project Environmental Impact Report/Environmental Impact Statement for the Merced to Fresno Section* (M-F Final EIR/EIS).

The Authority and FRA prepared and released the M-F Final EIR/EIS in April 2012. The M-F Final EIR/EIS had evaluated three north-south alignment alternatives, each of which included two different east-west design options for the Central Valley Wye (Avenue 24 Wye and Avenue 21 Wye). The M-F Final EIR/EIS included both Air Quality Mitigation Measure AQ-MM#4 and a Draft General Conformity Determination stating that, by entering a VERA with the Valley Air District, the M-F Project Section would meet General Conformity requirements during construction. In May 2012 the Authority certified the M-F Final EIR/EIS, and in September 2012 FRA approved a Record of Decision, which included the Final General Conformity Determination.

The M-F Final EIR/EIS decision documents deferred a final decision on a Wye alternative. Initially, the Authority and FRA assumed that a Wye alternative would be incorporated into the San Jose to Merced Project Section. However, subsequently, the Authority and FRA agreed to evaluate the Wye alternatives via a supplement to the M-F Final EIR/EIS.

The M-F Final General Conformity Determination evaluated the annual construction emissions associated with the Avenue 21 Wye option because that option had the highest estimated emissions. Construction emissions from the Final General Conformity Determination are shown in Table 1.

Central Valley Construction

After approval of the Merced to Fresno Section Final EIR/EIS (2012) and the Fresno to Bakersfield (F-B) Section Final EIR/EIS (2014), the Authority procured three design-build contracts (Construction Packages [CP] 1, 2/3, and 4). The Authority developed emissions estimates based on the designs in the construction packages; provided the emissions estimates for each construction package to the Valley Air District; and negotiated and signed individual VERAs. The VERA for CP 1 became effective July 23, 2014, while the agreement for CP 2/3 and the agreement for CP 4 were approved on January 13, 2016, and September 16, 2016, respectively. The Authority has funded the offsets. The design-build contractors report their actual emissions monthly so the Authority can confirm the emissions do not exceed the reductions specified in the VERA. The Valley Air District reports to the Authority annually to demonstrate that the construction emissions have been offset to net zero.

In addition, on November 9, 2017, the Authority issued guidance requiring the use of Tier 4 engines on all off-road construction equipment, where feasible. The guidance also mandates use of renewable diesel fuel, which is required to meet the most recent ASTM D975 specification for ultra-low-sulfur diesel and must have a carbon intensity no greater than 50 percent diesel. Renewable diesel fuel has the lowest carbon intensity among petroleum fuels sold in California.

Central Valley Wye Draft Supplemental EIR/EIS

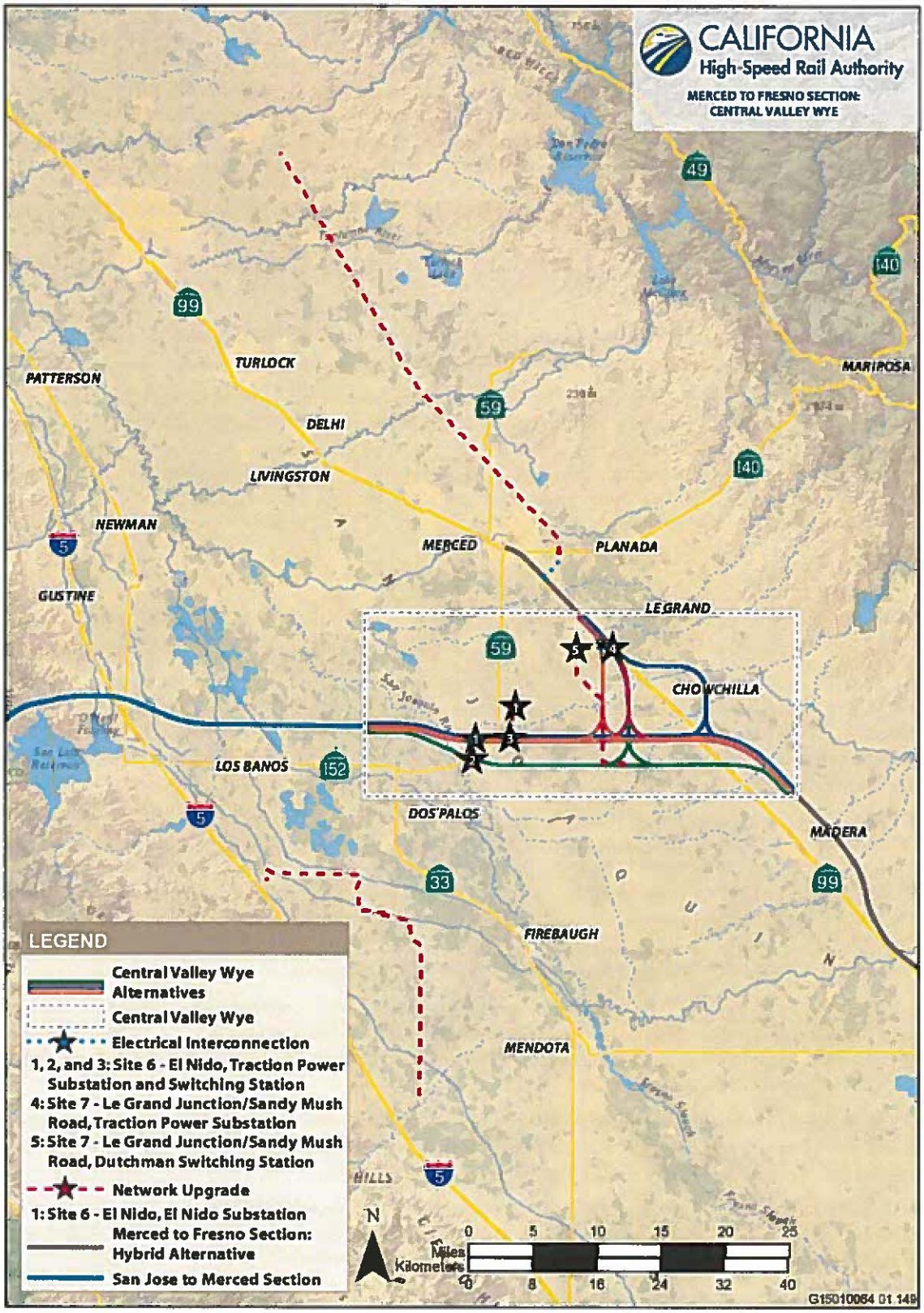
The Central Valley Wye Draft Supplemental EIR/EIS was published pursuant to the NEPA Assignment MOU on September 13, 2019 for a 45-day NEPA public review period which concluded on October 28, 2019.

The text of the Draft Supplemental EIR/EIS had gone through several reviews with FRA and cooperating agencies through 2017 and 2018. In a footnote on page 3-2 of the Final General Conformity Determination for the M-F Section, the FRA explains that FRA and the Authority were not selecting a wye as part of the initial M-F Section rail alignment decision. It goes on to state that the decision would be made as part of the San Jose to Merced Section as a State Route (SR) 152 Wye Alternative was not under consideration in the San Jose to Merced EIR/EIS. As indicated earlier in this memorandum, the FRA and Authority chose to supplement the M-F EIR/EIS instead.

Between 2013 and 2017, the Authority and FRA conducted an intensive, multi-faceted stakeholder engagement process regarding Wye alignment alternatives. As many as 17 different alignment alternatives were considered through this process. Ultimately, four alignment alternatives were fully considered for the Central Valley Wye. These alternatives were first analyzed in the Central Valley Wye Draft Supplemental EIR/EIS, which was published in May 2019 for review under the California Environmental Quality Act (CEQA).

As shown in Figure 1, the study area of the Central Valley Wye expanded from the wyes illustrated in the M-F Final EIR/EIS to include the appropriate tie-ins of the HSR alignments to the north and south of the wyes and to the west of the wyes to the San Jose to Merced alignment. The west wye options tie into the San Jose to Merced alignment at Carlucci Road (a distance of 15.5 miles farther than the endpoint of the wyes in the M-F Final EIR/EIS at Road 8).

FIGURE 1: Central Valley Wye Alternatives Considered in the Final Supplemental EIR/EIS



The Authority completed the Air Quality and Global Climate Change Technical Report for the Central Valley Wye in October 2017. Consistent with previous air quality technical reports, chapter 10 of the aforementioned technical report contains the General Conformity analysis. The chapter explains that a separate General Conformity determination was not prepared for the Central Valley Wye because the conclusions of this Central Valley Wye Air Quality and Global Climate Change Technical Report are generally consistent with the conclusions in the M-F Final EIR/EIS. Appendix 3.3-B to the Central Valley Wye Draft SEIR/EIS presents the revised annual construction emissions for the M-F project section with the current Central Valley Wye alignment, which are shown in Table 2. Upon comparing the emissions estimates of the revised project to those presented in the M-F Final General Conformity Determination, the following holds true for both analyses:

- Annual estimated NOx emissions are greater than the applicability rate of 10 tons per year in several construction years (i.e., 2017 through 2024);
- Annual estimated VOC emissions are greater than the applicability rate of 10 tons per in several construction years (i.e., 2020); and
- Annual estimated carbon monoxide and PM emissions are less than the applicability rate of 100 tons per year in all construction years (i.e., 2014 through 2024).

Accordingly, the Central Valley Wye Draft SEIR/EIS concludes that the Final General Conformity Determination for the M-F project section covers the revised Central Valley Wye alignment. That is, regardless of the years in which the emissions of NOx and VOCs exceed applicability rates, the Final General Conformity Determination includes a commitment from the FRA/Authority to reduce all NOx, VOC, and PM emissions through a VERA. Thus, the M-F Final General Conformity Determination is still valid, and no reevaluation of the Determination is required for the Central Valley Wye (Authority and FRA, September 2019, Central Valley Wye Draft SEIR/EIS, page 3.3-31).

Comments Received on the Draft Supplemental EIR/EIS

The Authority is currently preparing the Central Valley Wye draft Final SEIR/EIS. No comments were received from the general public related to General Conformity during either the CEQA or NEPA public reviews. The Valley Air District had five comments on the Central Valley Wye Draft SEIR/EIS:

1) The Valley Air District recommended revising Mitigation Measure AQ-MM#4 to reflect the commitment in the June 2014 Memorandum of Understanding (MOU) between the SJVAPCD and the Authority regarding emissions offsets. The Authority will duly revise the mitigation language in the Central Valley Wye Final SEIR/EIS.
2) The Valley Air District recommended revisions to the health risk assessment (HRA) to exclude use of an initial vertical dimension in the dispersion model. The Authority's response is that all modeling assumptions are consistent with published guidance, including that from the USEPA, and represent the best, and likely conservative estimate of potential construction health risks. Accordingly, no technical revisions to the HRA are required. However, minor text revisions will be made in the Central Valley Wye Final SEIR/EIS in response to SJVAPCD's comment to clarify that the use of an initial vertical dimension of 1 meter is consistent with USEPA's AERMOD guidance.
3) The Valley Air District noted that the project is subject to Rule 9510 and requires submittal of an Air Impact Assessment (AIA) application. The Authority has clarified in Section 3.3.2.3 of the Central Valley Wye draft Final SEIR/EIS that all district rules identified in the M-F Final EIR/EIS would apply to the project, including Rule 9510.
4) The Valley Air District noted that the project may be subject to other SJVAPCD rules and regulations. The Authority has revised Section 3.3.2.3 of the Central Valley Wye draft Final SEIR/EIS to list the cited rules and others that may apply during construction of the project.
5) The Valley Air District recommended revising Mitigation Measure AQ-MM#4 in the General Conformity analysis to reflect the June 2014 offset MOU between SJVAPCD and the Authority. The Authority will duly revise the mitigation language and analysis in the Central Valley Wye Final SEIR/EIS.

The U.S. Environmental Protection Agency provided comment letters during both the CEQA and NEPA review periods, but none of the comments related to the air quality analysis.

Table 1
Final General Conformity Determination Merced to Fresno Project Section with Central Valley Wye Annual Construction-Phase Emissions (California High Speed Train, Merced to Fresno: Final Air Quality Conformity Determination, Table 6, p. 10-1)

Pollutant	Emissions (tons/year)										Conformity Applicability Thresholds (tons/year)
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	
NO_x	**39.85**	**128.76**	**109.51**	**114.52**	**32.02**	**13.34**	**49.35**	**15.14**	7.36	3.96	10
VOCs	2.97	**12.14**	**11.07**	8.33	2.42	1.73	**10.83**	1.81	1.01	4.90	10
$PM_{2.5}$*	1.71	6.33	5.84	4.29	1.72	0.57	2.94	0.97	0.46	1.98	100
CO	14.11	52.45	49.24	31.51	11.40	7.65	32.42	18.41	11.58	2.51	100

Note: **Bold** values exceed applicability thresholds.
* Includes sulfur dioxide emission rates as a partial precursor to $PM_{2.5}$ (i.e., it was conservatively assumed that 100 percent of SO_2 emissions become $PM_{2.5}$).
CO = carbon monoxide; NO_x = nitrous oxides; $PM_{2.5}$ = particulate matter smaller than or equal to 2.5 microns in diameter; VOC = volatile organic compound

Table 2
Draft Central Valley Wye SEIR/EIS Merced to Fresno Project Section with Central Valley Wye Annual Construction-Phase Emissions (Appendix 3.3-B to the Central Valley Wye Draft SEIR/EIS, Table 2, p. 5)

Pollutant	Emissions (tons/year)										Conformity Applicability Thresholds (tons/year)
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
NO_x	0.64	1.79	9.75	**90.68**	**102.83**	**118.85**	**173.75**	**102.97**	**26.16**	**30.52**	**26.17**	10
VOCs	0.11	0.25	0.66	5.29	6.31	7.15	**10.99**	6.05	1.81	1.90	1.70	10
PM_{10}	0.07	0.16	0.44	14.80	15.48	22.80	28.76	13.62	1.35	4.64	4.46	100
$PM_{2.5}$*	0.00	0.00	0.00	4.41	4.41	5.19	7.46	4.43	0.99	1.32	1.20	100
CO**	0.00	0.00	0.00	7.19	7.19	7.83	12.90	6.92	1.87	2.17	1.99	100

Note: **Bold** values exceed applicability thresholds.
* Includes sulfur dioxide emission rates as a partial precursor to $PM_{2.5}$ (i.e., it was conservatively assumed that 100 percent of SO_2 emissions become $PM_{2.5}$).
** Fresno urbanized maintenance area only.
CO = carbon monoxide; NO_x = nitrous oxides; PM_{10} = particulate matter smaller than or equal to 10 microns in diameter;
$PM_{2.5}$ = particulate matter smaller than or equal to 2.5 microns in diameter; VOC = volatile organic compound

Final General Conformity Determination

The Authority will enter into a VERA with the Valley Air District for the Central Valley Wye. The Authority has entered into VERAs prior to construction on the previous construction packages and has demonstrated their efficacy to offset construction emissions to net zero. Based on this information, the Authority requests that the FRA confirm that the Final General Conformity Determination remains valid for the M-F Project Section, between the Merced Station and the Fresno Station, for the Central Valley Wye, and that a new conformity determination is not needed.

From: Perez-Arrieta, Stephanie (FRA) <s.perez-arrieta@dot.gov>
Sent: Tuesday, April 21, 2020 12:13 PM
To: McKell, Dan@HSR <Dan.McKell@hsr.ca.gov>
Cc: Patel,Manisha@HSR <manisha.patel@hsr.ca.gov>; Beightel <eric.beightel@wsp.com>; Beightel, Eric(PB)@HSR <Eric.Beightel@hsr.ca.gov>; Osterhues, Marlys (FRA) <Marlys.Osterhues@dot.gov>; Van Nostrand, Christopher (FRA) <christopher.vannostrand@dot.gov>; Martin, Andrea (FRA) <andrea.martin@dot.gov>; Blatnica, Rebecca (Volpe) <Rebecca.Blatnica@dot.gov>; Mast, Travis (Volpe) <Travis.Mast@dot.gov>
Subject: RE: URGENT: VERA Inquiry: CHSRA AQ Conformity Transmittal: Central Valley Wye (CVY)

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

FRA agrees with the underlying conclusion of the memo that no new conformity determination or re-evaluation is required for the CV WYE.

APPENDIX F: LEAST ENVIRONMENTALLY DAMAGING PRACTICABLE ALTERNATIVE CONCURRENCE LETTER

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

Operations and Readiness Branch

SEP 12 2018

Mr. Mark McLoughlin
Director of Environmental Services
California High Speed Rail Authority
770 L Street, Suite 620
Sacramento, California 95814

Dear Mr. McLoughlin:

I am writing in response to your May 1, 2018 letter requesting concurrence/agreement on your Proposed Preliminary Least Environmentally Damaging Practicable Alternative (LEDPA) and recommendation for Section 408 approval for the Merced to Fresno Project Section, Central Valley Wye. In accordance with our *National Environmental Policy/Clean Water Act Section 404/Rivers and Harbors Act Section 14 Integration Process for the California High Speed Train Program Memorandum of Understanding* dated November 2010 (NEPA/*404/408* MOU), this letter is our written response for the Section 408 component of Central Valley Wye.

Based on the information provided, the Sacramento District preliminarily recommends Section 408 approval for your preferred alternative, the SR 152 (North) to Road 11 Wye Alternative, as determined by your analysis. The information provided shows that the impacts from the proposed project are minor, low impact modifications to the flood risk reduction project and the modifications will not adversely affect the functioning of the flood risk reduction facilities. The work appears to require a California Central Valley Flood Protection Board (CVFPB) encroachment permit. Please work with the CVFPB as the design is further developed. The Sacramento District will review the CVFPB encroachment permit application when one is submitted. If the design changes such that the proposed project is no longer a minor, low impact modification to the flood risk reduction project, this recommendation is no longer valid and may require approval from Headquarters, U.S. Army Corps of Engineers.

Please contact Kimberlee Leonard at Kimberlee.leonard@usace.army.mil or 916-557-7183 if you have any questions. A copy of this letter is being furnished to Ms. Leslie M. Gallagher, Executive Officer, Central Valley Flood Protection Board.

Sincerely,

Rick L. Poeppelman

Rick L. Poeppelman, P.E.
Chief, Engineering Division
Levee Safety Officer

APPENDIX B: U.S. FISH AND WILDLIFE SERVICE BIOLOGICAL OPINION

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Suite W-2605
Sacramento, California 95825-1846

In Reply Refer to:
08ESMF00-
2012-F-0248-16

SEP 27 2019

Marck A. McLoughlin
Director of Environmental Services
California High-Speed Rail Authority
770 L Street, Suite 620
Sacramento, California 95814

Subject: Reinitiation of Formal Consultation on the California High-Speed Train System: Merced to Fresno Section Project, Merced, Madera, and Fresno Counties Biological Opinion (08ESMF00-2012-F-0248)

Dear Mr. McLoughlin:

This letter is sent to the California High-Speed Rail Authority (Authority) in its role as the federal lead agency under the National Environmental Policy Act (NEPA) and other federal laws. Pursuant to 23 U.S.C. 327, under the NEPA assignment Memorandum (MOU) between the Federal Railroad Administration (FRA) and the State of California, effective July 23, 2019, the Authority is the federal lead agency for environmental reviews and approvals for all Authority Phase 1 and Phase 2 projects. Under the MOU, the Authority has been assigned FRA's Endangered Species Act Section 7 (16 U.S.C. 1536) responsibilities for consultations (formal and informal) with respect to High-Speed Rail and other projects described in subpart 3.3 of the MOU.

Prior to the NEPA assignment MOU, when FRA was the lead agency for High-Speed Rail projects, the Authority, on behalf of FRA, sent letters to the U.S. Fish and Wildlife Service on August 8, 2018, and May 28, 2019. In those letters, the Authority requested reinitiation of formal consultation with the Service on the California High-Speed Train System: Merced to Fresno Section Project (CHST-MF Project), in Merced, Madera, and Fresno Counties, California. These requests were received by the Service on August 17, 2018, and June 3, 2019, respectively. At issue are revisions of effects on the following federally-listed species and critical habitats:

The federally-listed as endangered:

- San Joaquin kit fox (*Vulpes macrotis mutica*) (kit fox);
- Fresno kangaroo rat (*Dipodomys nitratoides exilis*) (FKR);
- giant kangaroo rat (*Dipodomys ingens*) (GKR);
- blunt-nosed leopard lizard (*Gambelia sila*) (lizard);
- Conservancy fairy shrimp (*Branchinecta conservatio*);
- vernal pool tadpole shrimp (*Lepidurus packardi*) (tadpole shrimp) and designated critical habitat;
- hairy Orcutt grass (*Orcuttia pilosa*);
- Greene's tuctoria (*Tuctoria greenei*);
- Palmate-bracted bird's-beak (*Cordylanthus palmatus*) (bird's-beak); and

- San Joaquin woollythreads (*Monolopia condonii*) (woollythreads).

and the federally-listed as threatened:

- giant gartersnake (*Thamnophis gigas*) (snake);
- Central California distinct population segment of the California tiger salamander (*Ambystoma californiense*) (salamander);
- valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) (beetle);
- vernal pool fairy shrimp (*Branchinecta lynchi*) and designated critical habitat;
- Colusa grass (*Neostapfia colusana*);
- San Joaquin Valley Orcutt grass (*Orcuttia inaequalis*);
- succulent owl's-clover (*Castilleja campestris* ssp. *succulenta*) (owl's-clover); and
- Hoover's spurge (*Chamaesyce hooveri*).

This response is provided under the authority of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (Act) and in accordance with the implementing regulations pertaining to interagency cooperation (50 CFR §402).

The Service previously issued the September 14, 2012 *Biological Opinion on the California High-Speed Train System: Merced to Fresno Section Project, Merced, Madera, and Fresno Counties* (Service File Number 08ESMF00-2012-F-0248) (2012 MF-BO). The 2012 MF-BO analyzed the CHST-MF Project's effects on federally-listed species under two design options, and incidental take was exempted only for Permitting Phase 1 of the project (PP1) at that time. Due to the Design/Build nature of the project, design refinements occur as construction progresses. In addition, acquisition of right-of-way provides access for surveys and updated habitat mapping. These changes in project description and effects to federally-listed species are addressed through reinitiation of formal consultation. We have previously amended or revised the 2012 MF-BO as follows:

September 26, 2013:	Clarification to Conservation Measures and Term and Condition 3 requested by the Authority.
March 13, 2014:	Added the Lazy K Ranch Mitigation Site (LKMS) project to the Project Description, evaluated the LKMS project's effects on federally-listed species, and updated habitat impacts within PP1 due to additional habitat assessment surveys.
May 21, 2015:	Evaluated design refinements at Avenue 13 in Madera County and in the vicinity of the Fresno River.
April 12, 2016:	Evaluated design refinements between Storey and downtown Fresno.
June 16, 2016:	Extended PP1 north to include overcrossings at Avenue 17 and Road 27.
April 14, 2017:	Extended PP1 north to Avenue 19 (North Extension) and evaluated minor design refinements, revised estimates of habitat loss, and impacts associated with the discovery of occupied hairy Orcutt grass habitat in 2016.
February 22, 2018:	Revised Conservation Measure 1 in order to clarify the approval process, roles, and responsibilities of biologists who directly implement the conservation measures.

The 2012 M-F BO presented two design options for the Central Valley Wye (CV-Wye) portion of the CHST M-F Project and analyzed conservative assumptions about the magnitude and nature of impacts resulting from construction and operation of the entire section. At that time, incidental take was exempted only for PP1, from the Fresno station north to Avenue 17 (later extended north to Avenue 19). The August 8, 2018 request addresses the selection of a preferred alternative for the CV-Wye, the State Route 152 (North) to Road 11 segment, including electrical interconnections and network upgrades, as well as the Ranch Road to Merced Variation (RR-M), which differs from the design previously proposed. In addition, the Conservation Measures proposed by the Authority have been modified for clarification and consistency among biological opinions and requirements of other regulatory agencies. The May 28, 2019 concerned project refinements on PP1 to include the abandonment and replacement of a water line, relocation of telecommunication lines, acquisition of eight single-family residential parcels, and modifications of the Tremaine Avenue and Road 27 intersection design.

Fresno kangaroo rat

The Service concurs with your determination that the proposed project is not likely to adversely affect the FKR. The proposed project reached the 'may affect' level, and the subsequent requirement for a biological assessment, due to the fact that portions of the proposed project occur within the historic range of the FKR and suitable habitat is present in the action area. There are currently no known populations of the FKR (Service 2010a); however, not all suitable habitat has been surveyed. Presence of the FKR within the limited suitable habitat in the action area is unlikely; however, because surveys have not been conducted in the action area, absence cannot be confirmed. Therefore, the Authority has proposed the following conservation measures:

CM-FKR-1: Habitat Assessment. Prior to the start of ground-disturbing activities, a Service-approved biologist will conduct a habitat assessment of areas in the project footprint that may support the FKR to determine the species potential presence based on the presence of their sign or burrows. The habitat assessment will be submitted to the Service for review and approval.

CM-FKR-2: Exclusion Fencing along Perimeter of Project Footprint. If no potential burrows or signs of kangaroo rats are detected and kangaroo rats are determined to be absent from the project footprint, but the footprint is bordered by potentially suitable habitat, the Service-approved biologist may install, maintain, and monitor exclusion fencing along the perimeter of the project footprint to ensure that no take of FKR or destruction of their potential habitat outside of the project footprint occurs.

CM-FKR-3: Agency Notification. In the unlikely event that FKR individuals, their burrows, or signs of them are found within the project footprint during the habitat assessment or relocation of GKR, the Service will be notified immediately and consultation will be reinitiated to identify appropriate conservation measures to be implemented for the FKR.

Due to the fact that no FKR populations are known to exist and the conservation measures proposed by the Authority, the Service believes that any potential adverse effects to the FKR from the CHST-MF Project are extremely unlikely to occur, and are therefore discountable for purposes of this consultation.

Critical habitat for the vernal pool fairy shrimp and the vernal pool tadpole shrimp

Critical habitat for the vernal pool fairy shrimp and the tadpole shrimp occurs within the LKMS project area. The Service has determined that the project, as proposed, may affect but is not likely to

adversely affect critical habitat for the vernal pool fairy shrimp or the tadpole shrimp based on the following:

1. Permanent destruction or alteration of the critical habitat is not expected to occur as a result of the LKMS project, as proposed;
2. Adverse effects to the Primary Constituent Elements (PCEs) that occur within the LKMS are not anticipated;
3. The effects from habitat restoration activities proposed are expected to be temporary and occur over a short duration (less than 3 months);
4. The habitat restoration proposed for the LKMS project will result in 16.76 acres of restored vernal pool habitat, and thus provide an increase in PCEs available for the vernal pool fairy shrimp; and
5. The LKMS project will provide 12.03 acres of preserved vernal pool habitat and 16.76 acres of vernal pool restoration to support breeding, feeding, and sheltering (PCEs) for the vernal pool fairy shrimp, and the Lazy K Mitigation Site will be protected and managed for the conservation of this species in perpetuity.

The remainder of this document provides our biological opinion on the effects of the proposed project on the kit fox, the GKR, the lizard, the snake, the salamander, the Conservancy fairy shrimp, the vernal pool fairy shrimp, the tadpole shrimp, the beetle, the hairy Orcutt grass, the Greene's tuctoria, the bird's-beak, the woollythreads, the Colusa grass, the San Joaquin Valley Orcutt grass, the owl's-clover, and the Hoover's spurge.

This biological opinion is based on:

(1) *Draft Merced to Fresno Section Project EIR/EIS, Volume I Report*, dated August 2011;
(2) *Draft Merced to Fresno Section Project EIR/EIS, Volume II: Technical Appendices*, dated August 2011;
(3) *Draft Biological Resources and Wetlands Technical Report, Merced to Fresno Section Project EIR/EIS*, dated August 2011;
(4) *Draft Wetlands Delineation Report, Merced to Fresno Section Project EIR/EIS*, dated August 2011;
(5) *Draft Special Status Plant Survey Report, Merced to Fresno Section Project EIR/EIS*, dated August 2011;
(6) *Draft Biological Assessment, Merced to Fresno Section Project EIR/EIS*, dated November 2011;
(7) *Draft Biological Assessment Appendix B-Suitable Habitat for Branchiopods and Central California tiger salamander, Appendix C-Suitable Habitat for Valley Longhorn Elderberry Beetle, Merced to Fresno Section Project EIR/EIS*, dated October 2011;
(8) *Draft Biological Assessment, Merced to Fresno Section*, dated November 2011;
(9) *Supplemental Information on the Preferred Hybrid Alternative for the Merced to Fresno Section of the California High-Speed Train*, dated February 21, 2012;
(10) *Memorandum: Response to Request for Supplemental Information for the Merced to Fresno (MF) Section of the California High-Speed Train Project*, dated February 29, 2012;
(11) *Merced to Fresno Section Draft Landscape Permeability Plan* (LPP), dated March 2012;
(12) *Draft Merced to Fresno Section Mitigation Strategy and Implementation Plan* (MSIP), dated March 2012 and updated July 2012;
(13) site visit conducted on March 20, 2012;
(14) *Project Description, Hybrid Alternative, Merced to Fresno Section*, dated April 2012;
(15) *Memorandum: Dedicated Wildlife Crossings for the Merced to Fresno Section of the California High-Speed Train System*, dated April 13, 2012;
(16) *USFWS Conservation Measures Matrix*, received on April 16, 2012;
(17) Additional Information Regarding the Cumulative Effects of Implementing the Merced to Fresno High-Speed Train Project, received on April 16, 2012;
(18) *Final California High-Speed Train Final Merced to Fresno Section Project EIR/EIS*, dated April 2012;

(19) additional documents available to the Service, including the *Preliminary Alternatives Analysise Report, Merced to Fresno Section High-speed Train Project EIR/EIS,* dated April 2010; the *Supplementale Alternatives Analysis Report, Merced to Fresno Section High-speed Train Project*, dated August 2010 *EIR/EIS;e Final Bay Area to Central Valley High-Speed Train (HST) Program Environmental Impacte Report/Environmental Impact Statement (EIR/EIS*, dated May 2008 and revised in 2010; the *Bay Area toe Central Valley High-Speed Train (HST) Revised Final Program Environmental Impact Report (EIR)*, dated August 2010; the *Final Program Environmental Impact Report/Environmental Impact Statement (EIR/EIS)e for the Proposed California High-Speed Train System*, dated August 2005; the *Fresno to Bakersfield Sectione California High-Speed Train Draft EIR/Supplemental Draft EIS,* dated August 2011; and the *Fresno toe Bakersfield Section California High-Speed Train Revised Draft EIR/Supplemental Draft EIS*, dated July 2012;
(20) the August 13, 2013 letter from the Authority suggesting clarification to Conservation Measures in the MF-BO;
(21) *Biological Assessment Addendum for the Lazy K Ranch Permittee-Responsible Mitigation Component of thee Merced to Fresno Section*, dated November 2013 (Lazy K BA);
(22) *Merced to Fresno Section Permitting Phase I Impact Change Summary for San Joaquin kit fox, Technicale Memorandum*, dated November 2013 (2013 SJKF TM);
(23) *Merced to Fresno Section Permitting Phase I Aquatic and Upland Habitat Impacts for California Tigere Salamanden Technical Memorandum*, dated November 2013 (2013 CTS TM);

(24) *Merced to Fresno Section Permitting Phase I Evaluation of Habitat for Vernal Pool Branchiopods, Technicale Memorandum*, dated November 2013 (2013 VPB TM); and
(25) *Merced to Fresno Section Permitting Phase I Special-Status Plant Sites-Specific Habitat Assessments fore Succulent Owls-Cloven Hairy Orcutt Grass, and San Joaquin Valley Orcutt Grass, Technical Memorandum,e* dated November 2013 (2013 Special-Status Plant TM);

(26) *Permittee-Responsible Mitigation Plan for Onsite and Offsite Mitigation for Permitting Phase 1 of the Mercede to Fresno Section*, dated November 2013 (2013 PRMP);

(27) *Draft Permittee Responsible Mitigation Plan for Onsite and Offsite Mitigation for Permitting Phase 1 of thee Merced to Fresno Section*, dated January 2014 (2014 Final PRMP);
(28) *Supplemental technical memorandum for the USFWS on the California tiger salamanderepotential breedinge habitat assessment for the HST (PPI) in Madera County, California*, dated March 3, 2014;
(29) *Supplemental technical memorandum for the USFWS on the succulent owl's-clover, hairy Orcutt grass, and Sane Joaquin Valley Orcutt grass for the HST (PPI) in Madera County, California*, dated March 10, 2014;

(30) *Permittee Responsible Mitigation Plan for Onsite and Offsite Mitigation for Permitting Phase 1 of the Mercede to Fresno Section*, dated March 2014 (2014 Final PRMP);
(31) *Merced to Fresno Section Permitting Phase 1 Project Description update: Ave 13 Design Refinement, Technicale Memorandum*, dated January 2015;

(32) *Merced to Fresno Section Permitting Phase 1 Evaluation of Habitat for Conservancy Fairy Shrimp, Technicale Memorandum*, dated January 2015;
(33) *Merced to Fresno Section Permitting Phase 1Biological Assessment Addendum for Fresno River River Designe Refinements, Technical Memorandum*, dated April 23 2015;
(34) *Merced to Fresno Section Lazy K Ranch Mitigation Site California tiger Salamander Relocation Plan,e Technical Memorandum (2015 Lazy K CTS Relocation Plan)*, dated February 2015;
(35) *Merced to Fresno Section Permitting Phase 1 California tiger Salamander Relocation Plan, Technicale Memorandum (2015 PP1 CTS Relocation Plan)*, dated February 2015;
(36) *Merced to Fresno Section Permitting Phase 1 Project Description update: Biological Assessment Addendum fore Storey to Fresno Design Refinements, Technical Memorandum*, dated June 19, 2015;
(37) *Merced to Fresno Section Permitting Phase 1 Biological Assessment Addendum for Storey to Fresno Designe Refinements, Technical Memorandum*, dated September 2015;

(38) *Reinitiation of Formal consultation on the California High-Speed Train System: Merced to Fresno Sectione Project, Merced, Madera, and Fresno Counties (08ESMF00-2012-0248), dated April 12, 2016* ;
(39) *Email from the Authority to the Service entitled "CAHSR CP1 BO Amendment No. 4 (08ESMF00-2012-0248)",* dated April 27, 2016;

(40) *Merced to Fresno Section Permitting Phase I Biological Assessment Addendum for Avenue 17 and Road 27 Overcrossings*, dated May 2016;
(41) the March 29, 2017 letter requesting reinitiation of formal consultation and the enclosed March 2017 *Merced to Fresno Section CP1D Biological Assessment Addendum Technical Memorandum*, prepared by the Authority;
(42) the April 4, 2017 email from the Authority providing clarifications regarding the proposed conservation measures;
(43) the February 7, 2018 email from the Authority requesting a revision of Conservation Measure 1;
(44) the August 8, 2018 letter requesting reinitiation of formal consultation with the enclosed April 2018 *Merced to Fresno Section: Central Valley Wye Final Biological Assessment*, prepared by the Authority;
(45) the September 2018 *Merced to Fresno Section: Central Valley Wye Draft Supplemental Environmental Impact Report/Environmental Impact Statement*;
(46) the October 29, 2018 letter from the Authority providing updated information on proposed compensatory habitat and conservation measures;
(47) the May 28, 2019 letter and biological assessment detailing changes to impacts in the vicinity of Road 27;
(48) meetings and email and telephone correspondence between representatives of the Service, the Authority, other regulatory agencies and consultants; and
(49) and other information available to the Service.

Consultation History

December 1, 2011:	The Service received the biological assessment and request for formal consultation for the CHST-MF Project from the FRA.
February 15, 2012:	The Service requested further information regarding the LPP, estimates of habitat loss and action area, conservation measures, effects analyses for federally-listed species, train operations, and mitigation during the weekly conference call with the Authority.
February 21, 2012:	The Authority submitted supplemental information regarding the Hybrid Alternative, particularly with a more focused analysis of effects of the Hybrid Alternative to federally-listed species and updated appendices for the biological assessment.
February 29, 2012:	The Authority submitted supplemental information to the Service in response to their February 15, 2012 email request.
March 7, 2012:	The Service provided our request for information and a set of example conservation measures to the Authority via email.
March 9, 2012:	The Authority submitted the Draft LPP to the Service.
March 12, 2012:	The Authority submitted the Draft MSIP to the Service.
March 14, 2012:	The Service participated in a meeting at the Sacramento Fish and Wildlife Field Office, Sacramento, California, with the Authority, California Department of Fish and Wildlife (CDFW; formerly, California Department of Fish and Game), AECOM, and CH2M HILL.

March 15, 2012:	The Service provided comments regarding the LPP and the MSIP to the Authority via email.
March 16, 2012:	The Service received some information from the CH2M HILL consultants via email.
March 21, 2012:	The Service participated in a site visit with the Authority, CDFW, AECOM, and CH2M HILL.
March 27, 2012:	The Service provided a checklist for information necessary for formal consultation and the *50 Code of Federal Regulations, Part 402, Interagency Cooperation-Endangered Species Act of 1973, As Amended* to the Authority via email.
March 28, 2012:	The Service participated in a meeting at the AECOM office, Sacramento, California, with the Authority, FRA, CDFW, AECOM, CH2M HILL, and URS, Inc.
April 4, 2012:	The Service participated in a meeting at the AECOM office, Sacramento, California, with the Authority, CDFW, CH2M HILL, and URS, Inc.
April 5, 2012:	The Service provided guidance regarding the LPP to the Authority via email.
April 16, 2012:	The Service received some of the requested information from the Authority via email.
April 18, 2012:	The Service provided clarification regarding our information requests to the Authority via email.
April 19, 2012:	The Service provided additional clarification regarding our information requests to the Authority via email. The Service participated in a conference call with the Authority and AECOM. The Service received requested information from the Authority via email.
April 20, 2012:	The Service received requested information from the Authority via email.
April 24, 2012:	The Service requested further information from the Authority via email.
May 8, 2012:	The Service received requested information from the Authority via email.
July 18, 2012:	The Authority provided additional information about kit fox conservation measures to the Service via email.
December 2011 to August 2012:	The Service participated in weekly conference calls and email correspondence with the FRA, Authority, CDFW, AECOM, and CH2M HILL.
September 14, 2012:	The Service issued a biological opinion to the FRA.
September 26, 2013:	The Service issued an amendment to the MF BO.

November 12, 2013:	The Service received the 2013 PRMP from the FRA/Authority via email.
November 22, 2013:	The Service received the request for reinitiation of formal consultation, the Lazy K BA, the 2013 SJKF TM, the 2013 CTS TM, the 2013 VPB TM, and the 2013 Special-Status Plant TM from the FRA/Authority via email.
November 20, 2013 & January 8, 2014:	The Service participated in a meeting with the Authority and ECORP Consulting, Inc. (ECORP) regarding the proposed LKMS project.
February 1, 2014:	The Service received the 2014 Final PRMP, dated January 2014, from the FRA/Authority via email.
February 7, 2014 & February 12, 2014:	The Service participated in a meeting with the Authority, ECORP, and CDFW regarding the proposed LKMS project.
February 14, 2014 - February 19, 2014:	The Service requested and received information from the Authority via email.
February 25, 2014:	The Service provided comments to the FRA/Authority regarding the 2014 PRMP and requested further information via email.
March 6, 2014:	The Service received responses from the FRA/Authority to our comments regarding the 2014, PRMP, dated March 2014, and the Inoculum Collection Memo via email.
March 7, 2014:	The Service received the *Supplemental technical memorandum for the USFWS on the California tiger salamander potential breeding habitat assessment for the HST (PPI) in Madera County, California*, dated March 3, 2014, via email from the FRA/Authority.
March 10, 2014:	The Service received the Final 2014 PRMP and the *Supplemental technical memorandum for the USFWS on the succulent owl's-clover, hairy Orcutt grass, and San Joaquin Valley Orcutt grass for the HST (PPI) in Madera County, California*, dated March 10, 2014 from the FRA/Authority via email.
November 2013 - March 2014:	The Service participated in weekly conference calls and email correspondence with the FRA, the Authority, and ECORP.
March 13, 2014:	The Service issued an amendment to the MF-BO.
October 21, 2014:	The Service received the letter from the FRA and the Authority, via email, regarding notification to the Service of project-related activities that occurred outside of the project footprint of PP1 analyzed in the 2012 MF-BO.
January 23, 2013:	The FRA and the Authority requested reinitiation of section 7 consultation for changes to the project description that would alter the amount of habitat that would be permanently lost for the Conservancy fairy shrimp.
January 26, 2015:	The Service sent a letter to the FRA and the Authority regarding our response to the October 21, 2014, letter and non-compliance issues.

February 10, 2015:	The Service participated in a meeting with the FRA and the Authority to discuss the issues addressed in our January 26, 2015, letter.
February 19, 2015:	The Service participated in a meeting with the FRA and the Authority to discuss the overall status of the PP1 construction package, the status of any Environmental Studies that were to be completed after the Record of Decision, the process for design changes and permit modifications, and compliance monitoring and reporting issues. The FRA and the Authority submitted the 2015 Lazy K CTS Relocation Plan and the 2015 PP1 CTS Relocation Plan via email correspondence.
February 26, 2015:	The Service approved the 2015 Lazy K CTS Relocation Plan and the 2015 PP1 CTS Relocation Plan via email correspondence to the FRA and the Authority.
March 4, 2015:	The Service received a request for reinitiation of section 7 consultation, via email, for changes to the project description that resulted from project-related activities that occurred outside of the project footprint of PP1.
April 24, 2015:	The Service received the letter from the FRA and the Authority requesting reinitiation of section 7 consultation for changes to the project description that resulted from project-related activities that occurred outside of the project footprint of PP1 and design refinements that result in revised habitat loss estimates.
April 28, 2015:	The Service participated in a meeting with the FRA and the Authority to discuss proposed schedule of reinitiation packages.
May 21, 2015:	The Service issued an amendment to the MF-BO.
July 15, 2015:	The Service received the draft *Merced to Fresno Section Permitting Phase 1 Project Description update: Biological Assessment Addendum for Storey to Fresno Design Refinements, Technical Memorandum*, dated June 19, 2015, via email correspondence, for our review.
September 25, 2015:	The Service received the letter from the FRA and the Authority requesting reinitiation of section 7 consultation for changes to the project description that resulted from project-related activities that occurred outside of the project footprint of PP1 and design refinements that result in revised habitat loss estimates, along with the final *Merced to Fresno Section Permitting Phase 1 Biological Assessment Addendum for Storey to Fresno Design Refinements, Technical Memorandum*, dated September 2015.
April 12, 2016:	The Service issued an amendment to the MF-BO.
April 27, 2016:	The Service received an email from the Authority notifying the Service that an error was discovered in the total acreage impacts in the *Reinitiation of Formal Consultation on the California High-Speed Train system: Merced to Fresno Section Project, Merced, Madera, and Fresno Counties,* dated April 16, 2016.

May 2, 2016: The Service received the letter from the FRA and the Authority requesting reinitiation of section 7 consultation for changes to the project description that resulted from design refinements that result in revised habitat loss estimates, along with the final *Merced to Fresno Section Permitting Phase I Biological Assessment Addendum for Avenue 17 and Road 27 Overcrossings Design Refinement, Technical Memorandum,* dated May 2, 2016.

June 16, 2016: The Service issued an amendment to the MF-BO.

March 29, 2017: The Service received the March 29, 2017 letter from the Authority requesting reinitiation of formal consultation with the March 2017 *Merced to Fresno Section CP1D Biological Assessment Addendum Technical Memorandum* enclosed.

April 4, 2017: The Service received an email from the Authority clarifying the proposed conservation measures.

April 14, 2017: The Service issued an amendment to the MF-BO.

February 22, 2018: The Service issued a revision to the MF-BO.

August 17, 2018: The Service received the August 8, 2018 letter from the Authority requesting reinitiation of formal consultation to exempt take for the Central Valley Wye portion of the CHST M-F Project.

October 29, 2018: The Service received the October 29, 2018, letter from the Authority, including a summary of proposed compensatory habitat and updated conservation measures.

December 14, 2018: The Service received additional information requested by the Service in order to complete the reinitiation request.

June 3, 2019: The Service received the May 28, 2019, request from the Authotiry for design modifications to the Road 27 area for the PP1 portion of the CHST M-F Project.

BIOLOGICAL OPINION

Description of the Proposed Action

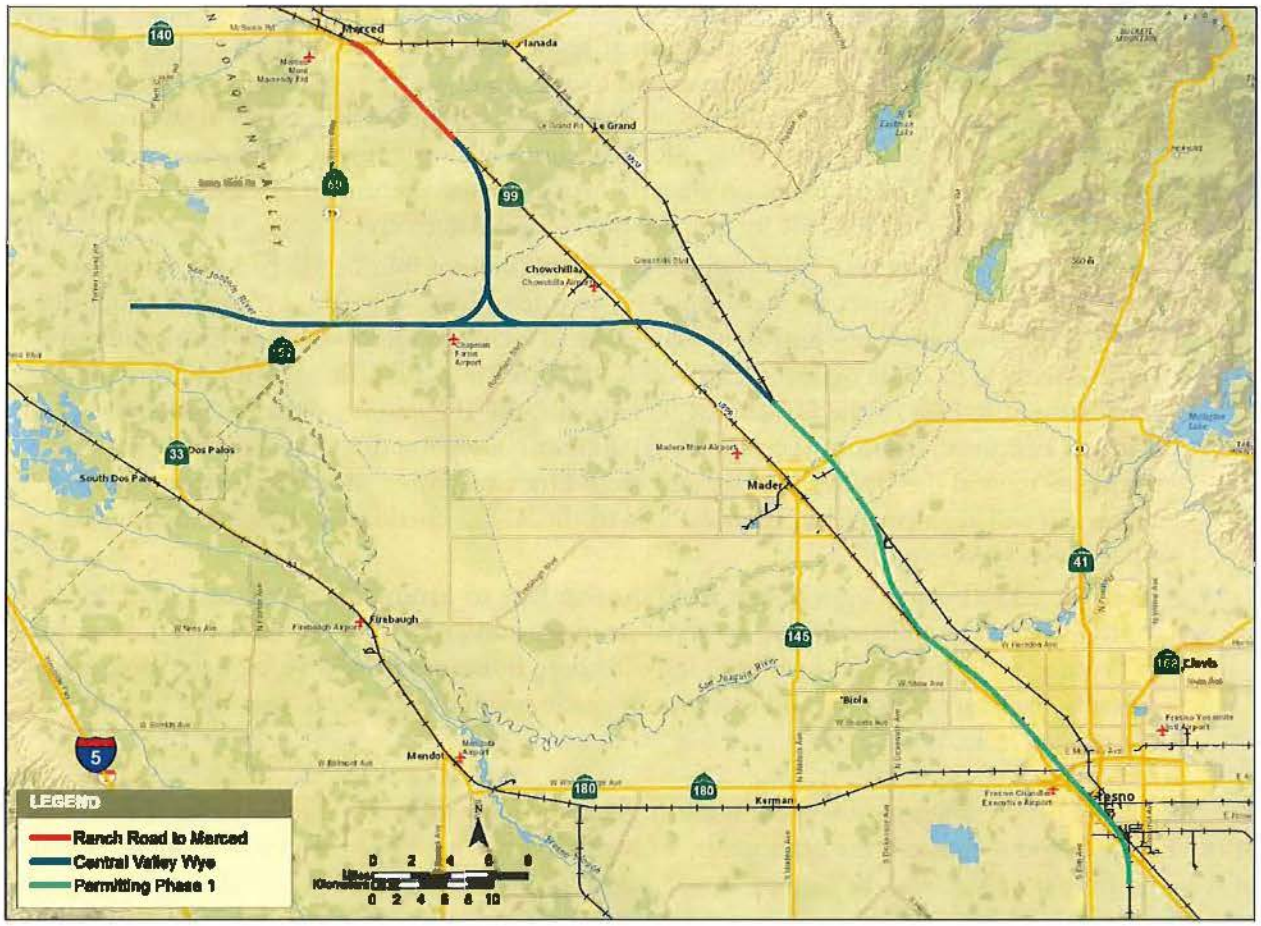
Project overview

The proposed project consists of construction and operation of a rail line to support an inter-city High-Speed Train (HST) from Merced to Fresno. The State of California proposes to build an HST System to connect the major population centers of the San Francisco Bay Area with the Los Angeles metropolitan region. The HST System is envisioned as an electrically powered, high-speed, steel-wheel-on-steel-rail technology with state-of-the-art safety, signaling, and automated train-control systems. The trains will be capable of operating at speeds of up to 220 miles per hour (mph) over a fully grade-separated, dedicated track alignment.

The Hybrid Alternative of the Merced to Fresno Section alignment of the HST originally proposed will generally parallel the Union Pacific Railroad (UPRR) Railway in the north and the Burlington Northern Santa Fe (BNSF) Railway in the south (Figure 1). HST stations are proposed for both the

City of Merced and the City of Fresno. The alignment will begin at the HST station in downtown Merced, on the west side of the UPRR right-of-way.

Figure 1. Proposed High-Speed Train: Merced to Fresno Section.



South of the Merced Station, the alignment extends approximately 7.5 miles from G Street to Ranch Road. This RR-M portion is primarily at-grade or on embankment, with the exception of three aerial structures over watercourses, 1.15 miles of retained-cut construction, and 0.11 mile of cut-and-cover tunnel. The proposed project includes the permanent closure of seven public roadways and the construction of three overcrossings in lieu of closure. The alignment will pass under East Mission Avenue, Childs Road, and State Route (SR) 99 through cut-and-cover tunnel. Local roads paralleling the proposed alignment may be shifted and reconstructed to maintain their function.

South of Ranch Road is the CV-Wye portion of the section, where trains will transition between the Merced to Fresno Section and the future San Jose to Merced Section. The wye configuration will be located west-southwest of the city of Chowchilla, with the east-west axis along the north side of SR 152 and the north-south axis on the east side of Road 11. The CV-Wye includes approximately 51 miles, mostly at-grade on raise embankment, with some aerial structures. Beginning in Merced County at the intersection of Henry Miller Road and Carlucci Road, the CV-Wye will continue at-grade on embankment east toward Elgin Avenue., where it will curve southeast. Approaching Willis Road, the alignment will rise to cross the San Joaquin River on an aerial structure, return to embankment, then cross the Eastside Bypass on an aerial structure. It will then continue east, crossing SR 59 at-grade just north of the existing SR 152/SR 59 interchange, which will be reconstructed to the south. In order to create a grade-separated crossing, SR 59 will be raised to

span over the HST. The alignment will continue east at-grade along the north side of SR 152 towards Chowchilla, splitting into two legs (four tracks) near Road 10, crossing Ash Slough on an aerial structure. All but the northbound track of the San Jose to Merced leg will return to at-grade embankment; the northbound track will rise to cross over the tracks of the San Jose to Fresno leg on an aerial structure as it curves north towards Merced. The legs will be routed as follows:

- The San Jose to Merced leg will turn north at-grade and continue north on the east side of Road 11, crossing the Chowchilla River and then over Road 11 to its west side. Returning to grade, the alignment will curve northwest, crossing Dutchman Creek on an aerial structure, following the west side of the UPRR/SR 99 corridor. The alignment will continue north, crossing over Sandy Mush Road on an aerial structure, then return to grade and continue on the west side of the UPRR/SR 99 to meet the Hybrid Alternative at Ranch Road.
- The San Jose to Fresno leg will continue east from the wye split near Road 10, along the north side of SR 152 toward Chowchilla. It will primarily be at-grade, with aerial structures over several road crossings and Berenda Slough. The leg will pass south of Chowchilla at-grade, then rise to cross over the UPRR/SR 99 corridor and Fairmead Boulevard on an aerial structure. East of the UPRR/SR 99 corridor, the alignment will extend at-grade through Fairmead, north of Avenue 23. At approximately Road 20, the leg will curve southeast toward the BNSF corridor and cross Dry Creek on a short aerial structure. The alignment will align parallel to the west side of the BNSF corridor as it meets the Hybrid Alternative at Avenue 19.
- The Merced to Fresno leg will split from the San Jose to Fresno leg near Road 13. The southbound track will ascend on an aerial structure and cross over the tracks of the San Jose to Fresno leg. The Merced to Fresno leg will curve northwest, rise on a high embankment crossing over several roads, and continue at-grade on embankment to join the San Jose to Merced leg near Avenue 25.

The Merced to Fresno alignment will continue at grade through agricultural areas along the west side of the BNSF corridor through the community of Madera Acres north of the city of Madera. South of Avenue 15 east of Madera, the alignment will transition toward the UPRR corridor, following the east side of the UPRR corridor near Avenue 9 south of Madera, then cross the San Joaquin River before entering Fresno. After crossing the San Joaquin River, the alignment will rise over the UPRR Railway on an elevated guideway, supported by straddle bents, before crossing over the existing Herndon Avenue and descending into an at-grade profile and continuing west of and parallel to the UPRR right-of-way.

South of Golden State Boulevard, the alignment will be constructed at grade and cross under the reconstructed Ashlan Avenue and Clinton Avenue overhead structures. Advancing south from Clinton Avenue between Clinton Avenue and Belmont Avenue, the HST guideway will run at grade adjacent to the western boundary of the UPRR right-of-way. The HST guideway will descend in a retained cut to pass underneath the San Joaquin Valley Railroad spur line and SR 180, transition back to being at grade before Stanislaus Street, and continue at grade into the station in downtown Fresno. The Mariposa Street station has been identified as the preferred HST station location in Fresno.

The physical elements of the Merced to Fresno Section will include trainsets, at-grade track and elevated track, road crossings, HST stations (the Merced Station and the Fresno Station), the electrical system and associated facilities (including substations, switching stations, and paralleling stations) that power the train, control and maintenance facilities, the maintenance-of-way facility, access control systems, and potentially one Heavy Maintenance Facility (HMF). A location for the

HMF has not yet been selected. However, impacts associated with five alternative HMFs within the CHST-MF Project study area were studied in detail in the Final EIR/EIS for the CHST-MF Project, including supporting technical documents. The HMF alternative with the greatest potential impacts to habitat for federally listed species was identified for the purposes of the Service's jeopardy evaluation.

The HST System will be designed for the operation of trainsets ranging from 8 to 16 cars that are 9 to 11 feet wide and 660 to 1,320 feet long and designed to operate at a top speed of 220 mph. The current design preference is for a single-level train. The Merced to Fresno Section of the California HST Project will consist of a fully dedicated rail line, constructed from continuous welded steel rail. The Merced to Fresno Section will use four different track profiles: (1) Tracks that are near-the-ground tracks in open areas (i.e., "at grade"); (2) Tracks that are at-grade in constrained areas or transitioning to elevated (i.e., "retained fill"); (3) Tracks that are below-grade (i.e., "retained cut"); and (4) Tracks that are supported by piers or straddle bents (i.e., "elevated track"). The types of bridges that may be installed include multiple short span structures or full channel spans for the smaller natural water courses, while utilizing box culverts or pipes for canals or minor drainage features. The larger river crossings will utilize longer spans, which are limited to the piers within the ordinary high-water channel. The various track profiles are described in Table 1.

Table 1. Track Profiles

Design Feature	Hybrid[a]	CV-Wye[a]
Total length (linear miles)	75	51
At-grade profile (linear miles)	60	46.5
Elevated profile[b] (linear miles, including retained fill)	15	4.5
Number of straddle bents[c]	55	27
Number of railroad crossings	6	1
Number of water crossings	113	13
Approximate number of road closures[d]	49	33
Number of roadway overcrossings	48	24

[a] The Hybrid Alternative included two Design Options for a portion of the CV-Wye. In addition, the CV-Wye extends farther west than what was evaluated in the 2012 M-F BO. Therefore, these columns cannot be totaled.

[b] Lengths shown are based on equivalent dual-track alignments. For example, the length of single-track elevated structure will be divided by a factor of 2 to convert to dual-track equivalents.

[c] The number of straddle bents was estimated by dividing the preliminary structural span lengths by 100 feet, the assumed spacing between columns/bents. Actual structural configuration would be determined during design.

[d] Includes public and private road closures.

At-grade track profiles are best suited in areas where the ground is relatively flat, as in the Central Valley, and in rural areas where interference with local roadways is less. Where the rail line is at grade, the track will be built on compacted soil and ballast material (a thick bed of angular rock) to prevent subsidence or changes in the track surface from soil movement. For at-grade track, the top of the rail will be constructed at a minimum of 4.5 feet above the 100-year floodplain or higher when transitioning to an elevated structure. The height of the at-grade profile may vary to accommodate slight changes in topography, provide clearance for storm water culverts and structures in order to allow water flow, and sometimes wildlife movement.

Retained-cut profiles are used when the rail alignment crosses under existing roads or highways that are at grade. This profile type is only used for short distances in highly urbanized and constrained situations. In some cases, it is less disruptive to the existing traffic network to depress the rail profile under these crossing roadways. Retaining walls will typically be needed to protect the adjacent properties from a cut slope extending beyond the rail guideway. Retained-cut profiles may be used

for roads or highways when it is more desirable to depress the roadway underneath an at-grade HST alignment, which may be at grade on either side.

Elevated profiles can be used in urban areas where extensive road networks must be maintained. An elevated profile must have a minimum clearance of approximately 16.5 feet over roadways and 23.5 feet over railroads. Pier supports will typically be approximately 10 feet in diameter at the ground. These types of structures may also be used to cross water bodies; even though the trackway might be at grade on either side, the width of the water channel could require a bridge at the same level, which will be built in the same way as an elevated profile.

When the HST elevated profile crosses over a roadway or a railway on a very large skew (degree of difference from the perpendicular), a straddle bent ensures that the piers are outside the roadway or railway right-of-way. A straddle bent is a pier structure that spans (or "straddles") the functional/operational right-of-way limit of a roadway, highway, or railway. Typical roadway and highway crossings that have a smaller skew angle (i.e., the crossing is nearly perpendicular) generally use intermediate piers in medians and span the functional right-of-way. However, for large-skew-angle crossing conditions, median piers will result in excessively long spans that are not feasible. Straddle bents that clear the right-of-way can be spaced as needed (typically 110 feet apart) to provide feasible span lengths for bridge crossings at large-skew angles.

The Merced to Fresno Section consists of a fully grade-separated and access-controlled guideway in order to maintain local traffic and agricultural access. Unlike existing passenger and freight trains in the project vicinity, there will be no at-grade road crossings in this section, and the HST System will not share its rails with freight trains. There are numerous roadway and State route facilities that currently cross at grade with or over the UPRR and BNSF railroad tracks that may be grade-separated over both the HST and the railroad. Similar conditions occur when an at-grade HST alignment crosses rural roads adjacent to farmland. These overcrossings will generally occur approximately every 2 miles to provide continued mobility for local residents and farm operations.

California's electricity grid will power the HST System. According to the FRA and the Authority, although the HST System would result in increased electricity demand, it would reduce the energy demands from automobile and airplane travel, resulting in an overall beneficial effect on statewide energy use. The Merced to Fresno Section will not include construction of separate power sources, although the extension of power lines existing power substations positioned along the HST project corridor will be included to even out the power feed to the HST System.

The Overhead Catenary System (OCS) will consist of a series of mast poles approximately 23.5 feet higher than the top of rail, with contact wires suspended from the mast poles between 17 to 19 feet from top of rail. The train will have an arm, called a pantograph, to maintain contact with this wire to provide power to the train. The mast poles will be spaced approximately every 200 feet along straight portions of the track down to every 70 feet in tight-turn track areas. The OCS will be connected to the substations described below, required at approximately 30-mile intervals. Statewide, the power supply will consist of a 2-by-25-kilovolt (kV) overhead contact system for all electrified portions of the system.

Based on the HST System's estimated power needs, Traction Power Substations (TPSSs) will each need to be approximately 32,000 square feet (200 feet by 160 feet) and located at approximately 30-mile intervals. TPSSs will accommodate the power supply stations and require a substantial buffer area around them for safety purposes. The TPSS could be screened from view with a wall or fence. Each TPSS site will have a 20-foot-wide access road (or easement) from the street access point to

the protective fence perimeter at each parcel location. Each site will require up to a 2-acre parcel. Each substation will include an approximately 450-square-foot control room.

Switching and paralleling stations work together to balance the electrical load between tracks, and to switch power off or on to either track in the event of an emergency. Switching stations will be required at approximately 15-mile intervals, midway between the TPSSs. These stations will need to be approximately 9,600 square feet (120 feet by 80 feet). Paralleling stations will be required at approximately 5-mile intervals between the switching stations and the TPSSs. The paralleling stations will be approximately 8,000 square feet (100 feet by 80 feet). Each station will include an approximately 450-square-foot (18 feet by 25 feet) control room. TPSS, switching stations, and paralleling stations are included in the design as appropriate.

During normal system operations, power will be provided by the local utility service and/or from the TPSS. Should the flow of power be interrupted, the system will automatically switch to a back-up power source, through use of an emergency standby generator, an uninterruptable power supply, and/or a DC battery system. For the Merced to Fresno Section, permanent emergency standby generators are anticipated to be located at passenger stations and at the HMF, and terminal layup/storage and maintenance facilities.

Signaling and train control elements include small signal huts/bungalows within the right-of-way that house signal relay and microprocessor components, cabling to the field hardware and track, signals, and switch machines on the track. These will be located in the vicinity of track switches, and will be grouped with other power, maintenance, station, and similar HST facilities where possible.

The CV-Wye portion of the Merced to Fresno Segment includes three sites for electrical interconnection and network upgrade (EINU). For Site 6-El Nido, interconnection facilities will include a 115 kV TPSS located at the northwest quadrant of the intersection of SR 152 and Lincoln Road and occupying approximately 2 acres, an approximately 2.5-miled long, 115 kV tie-line connecting the Site 6 TPSS to the El Nido Substation and constructed on approximately twenty-five 60-75 foot-tall tubular steel poles along the west side of Lincoln Road, and an approximately 2.5-mile-long fiber optic cable trenched underground between the Site 6 TPSS and the El Nido Substation.

For Site 7-Wilson, interconnection facilities will include a 230 kV TPSS and an approximately 2.3-mile double-circuit 230 kV transmission line to the Wilson Substation. New conductors will be installed on new self-supporting lattice steel towers. Beneath this 230 kV transmission line, an approximately 2.3-mile-long fiber optic cable will be trenched underground To support this interconnection, the existing Wilson Substation will be reconfigured to a 4-Bay Breaker-and-a-Half within the existing fence line.

For Site 8-Storey, interconnection facilities will include an expansion of the Storey Substation by approximately 3.0 acres, and reconductoring of approximately 6.2 miles of the Borden-Gregg 230 kV No. 1 and No. 2 transmission line

Heavy Maintenance Facility

California's HST System includes three types of maintenance facilities (maintenance-of-way facilities, a heavy maintenance facility, and an operations control center). Each section will have maintenance-of-way facilities. A number of overnight layover and servicing facilities will be distributed throughout the HST System. In addition, the HST System will have a single HMF.

Maintenance-of-way facilities will provide for equipment, materials, and replacement parts storage, and support quarters and staging areas for the HST System subdivision maintenance personnel. Each subdivision will cover about 150 miles; the maintenance-of-way facility will be centrally located in the subdivision, no more than 75 miles in each direction. For the Merced to Fresno Section, the maintenance-of-way facility will be co-located with the HMF.

The maintenance-of-way facility will sit on a linear site adjacent to the HST tracks with a maximum width of two tracks, and will be approximately 0.75 mile long for a total size of 26 acres. The track will be approximately 1,600 feet long, will not have electric power, and will be connected to the main line. Access by road for work crews will be required, along with enough space to park work crew vans while working from the site and to drive the length of the track. The track and access area will be within the fenced and secure area of the HST line.

An HST rail heavy vehicle maintenance and layover facility, otherwise known as the HMF, may be located in the Merced to Fresno Section. However, the location of an HMF in this section will be determined by the San Jose to Merced and Fresno to Bakersfield Sections. The HMF alternative within the CHST-MF Project area with the greatest potential impacts to federally listed species will occupy 392 acres with space for all activities associated with train fleet assembly, disassembly, and complete rehabilitation; all on-board components of the trainsets; and overnight layover accommodations and servicing facilities. The site will include a maintenance shop, Operations Control Center building, one traction power substation, other support facilities, and a train interior cleaning platform.

The HMF will have two functions. First, it will support train arrival, assembly, testing, and commissioning to operations. Second, it will become the State's system-wide heavy maintenance workshop. The HMF will support the following functions:

1. Assembly, Testing, and Commissioning: During the pre-revenue service period, the HMF will be used for the assembly, testing, acceptance, and commissioning of the HST System's new trains. Implementation of the testing, acceptance, and commissioning activities will require a mainline test track between 80 and 105 miles in length, connected directly to the HMF. This will also accommodate the equipment decommissioning or retirement of equipment from the system to make way for the future generations of trains.
2. Train Storage: Some trains will be stored at the HMF prior to the start of revenue service.
3. Service Monitoring: Service monitoring will include daily train testing and diagnostics of certain safety sensitive apparatus on the train in addition to automatic on-board and on-ground monitoring devices.
4. Examinations in Service: Examinations will include inspections, tests, verifications, and "quick" replacement of certain train components on the train. Examples include inspection and maintenance tasks associated with the train's running gear, bogies, underbody elements, and pantographs.
5. Inspection: Periodic inspections will be part of the planned preventive maintenance program requiring specialized equipment and facilities. Examples include examination of interior fittings and all train parts, passenger environment, in-depth inspection of axles and underbody components critical to train safety, and/or wheel condition diagnostics and re-profiling (wheel truing).
6. Rolling Stock Modifications and Accident Repair: Rolling stock modifications and accident repair will include major design modifications for improving safety, reliability, and passenger comfort.
7. Overhaul: Part of planned lifecycle maintenance program, overhauls require a specialized heavy maintenance shop with specific heavy-duty equipment. Activities will include complete

overhaul of train components. Overhauls will be completed on each trainset every 7 to 10 years (30 days per trainset) and mid-life overhauls will be performed on each trainset every 15 to 20 years (45 days per trainset).

A single, gated entry will control access to the HMF. A two-way, 24-foot-wide circulation road will follow the facility's interior perimeter and a 50-foot-wide asphalt apron will surround the main shop building to provide emergency vehicles access to the structure. About 1,200 to 1,500 employees may be accommodated during peak shifts, including overlapping personnel departures and arrivals. The HMF will require parking for approximately 1,200 vehicles based on an estimate of 80 percent automobile share, and assuming 20 percent of employees will use public transportation or ride-share. In addition, up to 150 parking spaces near the facility will be available for management and administrative personnel, visitors, deliveries, and parking. Some crew, rolling stock preparation personnel, and train yard employees will park their vehicles near the yard tracks. Thus, the plan will include spaces for approximately 50 crew, 50 rolling stock preparation personnel, and 150 yard support employees at full build-out. A pedestrian bridge over the train yard tracks will connect the employee parking lot to the main shop building.

The HMF may house the Operations Control Center on the second floor, and will provide space for employee parking, pedestrian access/egress, and appropriate bathroom and lunchroom facilities. Housing the Operations Control Center in the HMF will minimize costs and impacts because it will not increase the HMF's footprint or require a separate building. If not housed on the HMF site, the Operations Control Center will be housed in an office building where adequate and reliable electronic data connections could be provided for up to 200 employees.

Stations

Stations are sited and designed to allow for connection to local transit, airports, and highways; to maximize the use of existing transportation corridors and rights-of-way; and to develop a practical and economically viable transportation system. The stations contain the following elements:

1. Station buildings of 40,000 to 60,000 square feet that are two to three stories high and contain passenger boarding platforms, ticketing, waiting areas, passenger amenities, employee areas, and baggage and freight handling areas.
2. Parking structures of 5.5 to 7.5 acres in Merced and Fresno.
3. Waiting areas and queuing space for taxis and shuttle buses.
4. Pedestrian connections.

The Downtown Merced and Downtown Fresno station areas will each occupy several blocks, to include station plazas, drop-offs, a multimodal transit center, and parking structures. The areas will include the station platform and associated building and access structure, as well as lengths of platform tracks to accommodate local and express service at the stations. Both the Downtown Merced and Downtown Fresno stations will be at grade, including all trackway and platforms, passenger services and concessions, and back-of-house functions.

The Downtown Merced Station will be between Martin Luther King Jr. Way to the northwest and G Street to the southeast, approximately 7 blocks west of the existing Amtrak station. The station will be accessible from both sides of the UPRR, but the primary station house will front 16th Street. The major access points from SR 99 include V Street, R Street, Martin Luther King Jr. Way, and G Street. Primary access to the parking facility will be from West 15th Street and West 14th Street, just one block east of SR 99. The closest access to the parking facility from the SR 99 freeway will be R Street, which has a full interchange with the freeway. The site proposal includes a parking

structure that will have the potential for up to 6 levels with a capacity of approximately 2,250 cars and an approximate height of 50 feet.

The Mariposa Street Station will be located in Downtown Fresno, less than 0.5 mile east of SR 99. The station will be centered on Mariposa Street and bordered by Fresno Street on the north, Tulare Street on the south, H Street on the east, and G Street on the west. The station building will be approximately 75,000 square feet, with a maximum height of approximately 60 feet. The two-level station will be at-grade, with passenger access provided both east and west of the HST guideway and the UPRR tracks, which will run parallel with one another adjacent to the station. Entrances will be located at both G and H Streets. The eastern entrance will be at the intersection of H Street and Mariposa Street, with platform access provided via the pedestrian overcrossing. The main western entrance will be located at G Street and Mariposa Street.

The station and associated facilities will occupy approximately 18.5 acres, including 13 acres dedicated to the station, bus transit center, surface parking lots, and passenger drop-off areas. A new intermodal facility will be included in the station footprint on the parcel bordered by Fresno Street to the north, Mariposa Street to the south, Broadway Street to the east, and H Street to the west. The site proposal includes the potential for up to three parking structures occupying a total of 5.5 acres. Two of the three potential parking structures will each sit on two acres, and each will have a capacity of approximately 1,500 cars. The third parking structure will have a slightly smaller footprint (1.5 acres), with 5 levels and a capacity of approximately 1,100 cars. Surface parking lots will provide approximately 300 additional parking spaces.

Project roadway modifications

Project roadways modifications will have varying right-of-way (widths) and extent from the HST right-of-way and will include the following:

1. New two-lane overcrossings over the HST right-of-way.
2. Shift of frontage roads (two to four lanes, with shoulders) that parallel the HST right-of-way.
3. Shift of SR 99 two-lane overcrossings and interchanges and associated two-lane roadway connections.
4. Shift of SR 99 between Clinton Avenue and Ashlan Avenue (six lanes) and one new interchange.

Project construction footprint

The HST Project will require acquisition of property necessary for project operation. When the remnant portion of an acquired parcel beyond the right-of-way is too small to sustain current use without other modifications, it will also be acquired. These remnant parcels have been considered a part of the construction footprint, or the total area disturbed during construction and by building the project because they could be used for construction staging. The construction footprint or project footprint refers to the entire area of potential permanent impacts associated with the project, including construction, construction staging, and built facilities, such as the track, the stations, electrical facilities, road modifications, crossings, and the HMF sites.

The construction footprint for the Merced to Fresno Section includes staging, laydown, and casting yards for fabrication of the piers or columns for elevated portions of the alignment. All construction staging areas for storage of equipment and materials have been considered directly impacted. If staging areas are needed outside the construction footprint, the Authority or its contractors will be responsible for obtaining all necessary environmental permits. As described in conservation measure

3 below, if the contractor needs to establish a temporary staging area near the San Joaquin River, it will be located at least 50 feet from the channel in order to minimize impacts on the riparian corridor.

If the pre-cast span method is used to build the concrete bridge spans associated with elevated sections, casting yards will be required. Casting yards will be located in the construction footprint. The HST construction area will be fenced and secured. Construction access roads must be inside the construction footprint and will be designed and/or maintained for dust control.

Some disposal of earth unsuitable for reuse in construction (e.g., expansive clays and organic materials) is anticipated. Because the project area is predominantly flat and does not contain geographic barriers, extensive excavation and material removal is not anticipated. The material unsuitable for reuse will be hauled off site to a permitted landfill or sold as fill for another project.

Preconstruction activities

During final design phase, the Authority and its contractor will conduct a number of pre-construction activities to determine how best to stage and manage the actual construction. These activities will include the following:

1. Conducting geotechnical investigations which will focus on defining precise geology, groundwater, seismic, and environmental conditions along the alignment. The results of this work will guide final design and construction methods for foundations, underground structures, tunnels, stations, grade crossings, aerial structures, systems, and substations.
2. Identifying staging areas and pre-casting yards which will be needed for the casting, storage, and preparation of pre-cast concrete segments, temporary spoil storage, workshops, and the temporary storage of delivered construction materials. Field offices and/or temporary job-site trailers will also be located at the staging areas. Construction staging will use the areas within the construction footprint. For example, staging areas may be placed at the future locations of the HST maintenance yards or other facilities. Additional staging areas may be located within other identified parcels within the construction footprint at various points along the HST right-of-way, chosen in part for their easy access to the local road network and highways. As described in conservation measure 3 below, if the contractor needs to establish a temporary staging area near the San Joaquin River, the staging area will be located at least 50 feet from the riparian corridor in order to minimize impacts on the riparian corridor.
3. Initiating site preparation and demolition, such as clearing, grubbing, and grading, followed by the mobilization of equipment and materials. Demolition will require strict controls to ensure that adjacent buildings or infrastructure are not damaged or otherwise affected by the demolition efforts.
4. Initiating utility relocations, where the contractor will work with the utility companies to relocate or protect in place high-risk utilities such as overhead tension wires, pressurized transmission mains, oil lines, fiber optics, and communications prior to construction.
5. Implementing temporary, long-term, and permanent road closures to re-route or detour traffic away from construction activities. Handrails, fences, and walkways will be provided for the safety of pedestrians and bicyclists.
6. Locating temporary batch plants, which will be required to produce Portland cement concrete (PCC) or asphaltic concrete (AC) needed for roads, bridges, aerial structures, retaining walls, and other large structures. The facilities generally consist of silos containing fly ash, lime, and cement; heated tanks of liquid asphalt; sand and gravel material storage areas; mixing equipment; aboveground storage tanks; and designated areas for sand gravel

truck unloading, concrete truck loading, and concrete truck washout. The contractor will be responsible for implementing procedures for reducing air emissions, mitigating noise impacts, and reducing the discharge of potential pollutants into storage drains or watercourses from the use of equipment, materials, and waste products.

7. Conducting other studies and investigations, as needed, such as local business surveys to identify business usage, delivery, shipping patterns, and critical times of the day or year for business activities. This information will help develop construction requirements and worksite traffic control plans, and will identify potential alternative routes, cultural resource investigations, and historic property surveys.

Major construction activities

Major construction activities anticipated for the Merced to Fresno Section include earthwork; bridge and aerial construction; road crossing construction; at-grade construction; construction of elevated structures; construction of elevated structures at the San Joaquin River; railroad systems construction; and station construction.

Earthwork: Earth support is an important factor in constructing deep excavations that will be encountered on several alignment sections. It is anticipated that the following excavation support systems may be used along the route. There are three general excavation support categories, which are described below.

1. Open-Cut Slope: Open-cut slope is used in areas where sufficient room is available to open-cut the area and slope the sides back to meet the adjacent existing ground. The slopes are designed similar to any cut slope, taking into account the natural repose angle of adjacent ground material and global stability.
2. Temporary: Temporary excavation support structures are designed and installed to support vertical or near vertical faces of the excavation in areas where room to open-cut does not exist. This structure does not contribute to the final load carrying capacity of the tunnel or trench structure and is either abandoned in place or dismantled as the excavation is being backfilled. This construction component may consist of soldier piles and lagging, sheet piles, slurry walls, secant piles, or tangent piles.
3. Permanent: Permanent structures are designed and installed to support vertical or near vertical faces of the excavation in areas where room to open-cut does not exist. This structure forms part of the permanent final structure, and may consist of slurry walls, secant piles, or tangent pile walls.

Bridge and Aerial Structure Construction: Similar to existing high-speed rail systems around the world, it is anticipated that the elevated guideways will be designed and built using pre-fabricated elements such as single-cell pre-cast-prestressed concrete box span-by-span segmental girder construction. Where needed, other structural types will be considered and used, including steel plate and box girders, steel trusses, various cast-in-place concrete (both reinforced and prestressed), and cable-supported structures.

1. Foundations: A typical aerial structure foundation pile cap is supported by an average of four large-diameter piles with diameters ranging from 5 to 9 feet. Commonly referred to as drilled shafts, they are holes drilled to the design depth and filled with reinforced concrete. Depth of piles depends on geotechnical site conditions. Pile construction can be achieved by using rotary drilling rigs, and either bentonite or synthetic slurry along with temporary steel pipe casings may be used to stabilize pile shaft excavation. The estimated pile production rate varies with the diameter and depth of the drilled hole, with an estimate of 3 to 4 days per pile

for installation of the larger diameter elements. Additional pile installation methods available to the contractor include bored piles, rotary drilling cast-in-place piles, driven piles, and a combination of pile jetting and driving.

2. For pile caps constructed near existing structures such as railway, bridges, and underground drainage culverts, temporary sheet piling (i.e., temporary walls) may be used to minimize disturbances to adjacent structures. It is anticipated that sheet piling installation and extraction may be accomplished using vibratory pile driving equipment where impact driving will affect adjacent facilities or sensitive resources.
3. Substructure: Aerial structures with pier heights ranging from 20 to 90 feet may be constructed using conventional slip form and scaffolding methods. A self-climbing formwork system may be used to construct piers and portal beams over 90 feet high. The self-climbing formwork system is equipped with a winched lifting device, which is raised up along the column by hydraulic means with a structural frame mounted on top of the previous pour. Each 12 feet increment of pour height may be completed over a three-day cycle.
4. The final size and spacing of the piers will depend upon the type of superstructure and spans they will support.
5. Superstructure: It will be necessary to consider the loadings, stresses, and deflections encountered during the various intermediate construction stages, including changes in statical scheme, sequence of tendon installation, maturity of concrete at loading, and load effects from erection equipment. As a result, the final design will depend on the contractor's means and methods of construction and can include several different methods, such as a span-by-span, incrementally launched, progressive cantilever, balanced cantilever, etc. Where structures will be constructed over areas of the San Joaquin River containing sensitive resources, top down methods will be used to the maximum extent feasible to minimize impacts on those resources

Road Crossing Construction: Road crossings of existing railroads, roads, and the HST System will be constructed on the line of the existing road or offline at some locations. When constructed online, the existing road will be closed or temporarily diverted. When constructed offline, the existing road will be maintained in use until the new crossing is completed. Where new roadway undercrossings of existing railroads are required, a temporary shoofly track would be constructed to maintain railroad operations during undercrossing construction.

Construction of At-Grade Sections: Contractors will begin construction of at-grade sections, which may require excavating or leveling the ground surface in areas with highly compressible soils, such as peat or soft clay, are present and cannot be remedied by other means due to construction or cost constraints. Prior to buildup of the track, rough grading will occur within the alignment footprint, and typically excavation to a depth of 3 feet, although excavation of up to 6 feet may be necessary where zones of poor material are encountered. Cut and fill will be balanced to the extent feasible, including for building embankments for nearby overpasses. Contractors will obtain borrow materials from existing, permitted borrow pits and quarries, and complete construction of the rail bed using ballast material from existing permitted quarries.

Construction of Elevated Structures: Contractors may implement various methods of construction for the elevated portions of the Merced to Fresno Section, using cast-in-place (CIP) or pre-cast concrete and structural steel in various combinations. Installation methods and equipment required to install the elements of a structure will vary depending on the method utilized by the contractor. Under the pre-fabricated method, the contractor will produce the various pre-fabricated elements offsite, while concurrently constructing the substructure required to support them at the various locations. Once the substructure is complete, the pre-fabricated elements will be transported

to the job site for installation whether they are retaining wall components, part of a column/pier, or the super-structure. Contractors may produce large pre-fabricated bridge segments at a temporary, purpose-built facility, known as a fabrication/casting yard. To provide enough onsite concrete, portable concrete batch plants will be used during construction of the alignment sections. Portable batch plants have a footprint of approximately 2,500 to 3,000 square feet, and will be located so that the duration of concrete hauls to the construction site minimizes potential impacts on the quality of the concrete due to extended travel time once mixed.

Once completed, the contractors will move each pre-fabricated element on a special wheeled transporter to the job site for installation. Depending on the type of pre-fabricated element, the transporters may travel atop the already-completed portion of the viaduct and then feed a segment to a special gantry crane (which will also sit atop the already completed viaduct) that hoists and positions the segment. The contractors will then place the segments on piers constructed prior to arrival of the segments at the site.

The pre-cast span-by-span segmental method of viaduct construction may be implemented because it appears to be less expensive, faster, and results in less schedule uncertainty. However, other methods for viaduct construction include the cast-in-place, box girders, erection of specially designed steel structures, American Association of State Highway and Transportation Officials girders, pre-cast segmental balanced cantilevers, and pre-cast segmental span-by-span.

Construction of Elevated Structures at the San Joaquin River: The HST guideway will be elevated from approximately 1,000 to 1,500 feet north of the north bank of the San Joaquin River to just north of Veterans Boulevard, a distance of between 9,000 and 12,000 feet. The soffit or lowest portion of the structure, spanning the waterway will be a minimum of 10 to 15 feet above the top bank on both sides of the river, providing ample clearance for passage of flood flows and wildlife. The section of the elevated structure or guideway that crosses the San Joaquin River is anticipated to be supported on foundations consisting of CIDH with cast-in-place concrete column extensions.

Currently, the existing UPRR Railway and the Caltrans SR 99 bridge structures downstream from the future crossing have piers in the San Joaquin River corridor that are spaced approximately 160 feet apart. The proposed HST design presents a configuration for a crossing that uses a combination of the typical precast segmental construction at each approach to the crossing and then spans the main low-flow channel with a 160 to 320-foot steel truss superstructure to minimize the need to enter the wetted perimeter of the low-flow river channel. Where required, the construction of foundations within the edge of the active waterway will use construction methods such as installation of sheet pile cofferdams to isolate the activity from the live stream to avoid or minimize the potential for adverse effects on anadromous fish within the Action Area. In addition, both temporary and permanent steel casings for CIDH pile construction and piling for falsework will use vibratory pile hammers for installation, which will minimize underwater sound pressures.

The number of foundation elements will be directly related to the span arrangement necessary to meet the requirements for bridge hydraulics. Because the future crossing will be located upstream from the two existing bridge structures, the hydraulic effect of placing new piers in the river corridor on downstream structures and the geomorphology of the channel will be considered during the design of the final configuration of the structure.

Railroad Systems Construction: The railroad systems are to include trackwork, traction electrification, signaling, and communications. After completion of earthwork and structures, trackwork is the first rail system to be constructed, and it must be in place to start traction electrification and railroad signalizing installation. Trackwork construction requires welding of

transportable lengths of steel running onto longer lengths (approximately 0.25 mile), which will be placed in position on crossties or track slabs and field-welded into continuous lengths.

Both tie and ballast track construction and slab track construction will be used. Tie and ballast track construction typically requires that crossties and ballast be distributed along the trackbed by truck or tractor. In sensitive areas where the HST is parallel to or in close proximity to streams, rivers, or wetlands, and in areas of limited accessibility, this operation may be accomplished by using the established right-of-way with material delivery via the constructed rail line. A slab track system will be used to construct elevated track and might involve using cast-in-place or precast slabs.

Traction electrification equipment to be installed includes TPSSs and the OCS. TPSSs are typically fabricated and tested in a factory, then delivered by tractor-trailer to a prepared site adjacent to the alignment. The TPSSs will be located every 30 miles along the alignment. The OCS is assembled in place over each track and includes poles, brackets, insulators, conductors, and other hardware.

Signaling equipment to be installed will include wayside cabinets and bungalows, wayside signals (at interlocking), switch machines, insulated joints, impedance bounds, and connecting cables. The equipment will support automatic train protection, automatic train control, and positive train control to control train separation, routing at interlocking, and speed.

Station Construction: For the Merced and Fresno stations, the worksites will be located in urban areas with both commercial and residential land uses nearby. Station improvements will require significant coordination and planning to accommodate safe and convenient access to existing businesses and residences, as well as traffic control during construction periods. The typical construction sequence will be:

1. Demolition and Site Preparation: The contractor will be required to construct detour roadways, new station entrances, construction fences and barriers, and other elements required as a result of taking existing facilities on the worksite out of service. For new facilities, the contractor will be required to perform street improvement work, site clearing and earthwork, drainage work, and utility relocations. Additionally, substations and maintenance facilities are assumed to be newly constructed structures. For platform improvements or additional platform construction, the contractor may be required to realign existing track.
2. Structural Shell and Mechanical/Electrical Rough-Ins: For these activities, the contractor will construct foundations and erect the structural frame for the new station, enclose the new building, and/or construct new platforms and connect the structure to site utilities. Additionally, the contractor will rough-in electrical and mechanical systems and install specialty items such as elevators, escalators, and ticketing equipment.
3. Finishes and Tenant Improvements: The contractor will install electrical and mechanical equipment, communications and security equipment, finishes, and signage. Additionally, the contractor may install other tenant improvements if requested.

Construction Utility Requirements and Waste Disposal

Contractors will need to use water for construction activities such as dust control during demolition of surface and subsurface features, excavation, soil compaction, landscape restoration, concrete work, general cleanup, hygiene, and drinking. If no available water sources exist near the site, then contractors will use tanker trucks, storage tanks, and/or water towers to provide water to the site. Contractors will temporarily store excavated materials produced by construction activities in within the construction footprint. Wherever possible, they will return excavated soil to its original location

to be used as backfill, and dispose waste materials associated with construction, including soils unsuitable for backfill, in landfills permitted to take these types of materials in conformance with ESA.

Construction Materials and Equipment

Materials required for construction include steel rails, building materials for the maintenance facilities, control buildings, and power supply facilities, as well as concrete, reinforcing steel, ballast, cement, aggregates, specialized train system components, fuel, and water. Materials will be delivered and stored at the Merced to Fresno Section project site for use. Various construction types of equipment will be used and staged at the site, including but not limited to cranes, pile drivers, dump trucks, bulldozers, and bucket loaders.

In procuring fill materials to build the grade-separated alignment, the Authority will attempt to identify available material from existing quarries as close to the construction site as practicable. For soils used as temporary fill material within the San Joaquin River, the contractor will be required to use native soils similar to that within the Action Area. In procuring fill materials to build the grade-separated alignment, the contractor will source the materials in conformance with the California Department of Transportation's, and other standard engineering specifications.

Construction timeline

The Authority intended to begin final design and project construction in 2013, with construction of the Initial Operating Section (IOS) first construction to be completed by December 2018. The Authority's Revised 2012 Business Plan for the California HST System specified that the IOS would connect the Central Valley and San Fernando Valley with operation of the IOS starting in 2022.

Construction of the CHST-MF Project began in 2015. The Authority's Revised 2018 Business Plan identifies the Silicon Valley to Central Valley Line, connecting San Francisco and Bakersfield, to be delivered using an incremental approach. Work that has been initiated in the Central Valley (Madera to Poplar Avenue north of Bakersfield), including Permit Package 1, will be completed by 2022.

The Merced to Fresno Section will be built using a Design/Build (D/B) approach, which is a method of project delivery where one entity works under a single contract with the project owner to provide design and construction services. This differs from the "design-bid-build" approach, where design and construction services are managed under separate contracts and the design is completed before the project is put out for construction bids. The D/B approach offers greater flexibility to adapt the project to changing conditions. The contract with the D/B contractor will require compliance with standard development practices and regulations, as well as implementation of any project design features and all applicable conservation measures.

One or more D/B packages will be developed and the Authority will then issue construction requests for proposals, start right-of-way acquisition, and procure construction management services to oversee physical construction of the project. During peak construction periods, work is envisioned to be under way at several locations along the route, with overlapping construction of various project elements. The overall general sequence of construction is presented in Table 2.

Table 2. Construction Sequence.

Activity	Tasks	Average Durations (Months)
Right-of- way acquisition	Per Assembly Bill 3034, proceed with right-of-way acquisitions after the state legislature appropriates funds in the annual budget.	18–24
Survey and preconstruction	Locate utilities, establish right-of-way and project control points and centerlines, and establish or relocate survey monuments.	6–8
Mobilization and site preparation	Relocate utilities, and clear and grub right-of-way (demolition); establish detours and haul routes; erect safety devices and mobilize special construction equipment; prepare construction equipment yards and stockpile materials; and establish precast concrete segment casting yard.	8–12
Heavy construction	Construct aerial structures, grade separations, highway realignments, surface streets, and major facilities (e.g., maintenance, stations).	30–36
Medium construction	Lay tracks, install drainage facilities, conduct backfilling operations, and perform street paving.	6–9
Light construction	Install and test systems (e.g., train control systems, overhead contact system, communication system); install traffic signals, street lighting, and striping; close detours; and clean up site.	12–18

Project construction will generally occur in 8-hour shifts between 7 a.m. and 7 p.m., 6 days per week. Occasionally, double shifts might also be required and will be subject to local regulations regarding construction hours. Whenever feasible and where local ordinances allow, contractors might work on Sundays. The construction schedule is presented in Table 3.

Table 3. Construction Package 1 Schedule.

Phase	Tasks
Mobilization	Mobilize safety devices and special construction equipment.
Site preparation	Relocate utilities; clear/grub right-of-way; establish detours and haul routes; and prepare construction equipment yards, stockpile materials, and precast concrete segment casting yard.
Earth moving	Excavate for earth support structures.
Construction of road crossings	Modify surface streets, and make grade separations.
Construction of aerial structures	Construct aerial structure and bridge foundations, substructure, and superstructure.
Track laying	Perform backfilling operations, and construct drainage facilities.
Systems	Potential construction of train control systems, overhead contact system, and communication system, and install signaling equipment.
Demobilization	Clean up site.

Operations and maintenance

Train Service: After the HST is constructed, three categories of trains will be operated. Express trains will run between major stations (e.g., San Francisco, Los Angeles, and San Diego). An express train could make the trip between San Francisco and Los Angeles in 2 hours and 40 minutes. Express trains will not stop at and will travel through the two HST stations in the Merced to Fresno Section on dedicated through-tracks. Limited-stop trains will provide service to some intermediate stations, as well as to the major stations. Frequent-stop trains will make all stops between the two terminus stations and will focus on regional service. Trains will not pass each other within an interval of three minutes or less.

The conceptual HST service plan for Phase 1 begins with service between Anaheim/Los Angeles running through the Central Valley from Bakersfield to Merced, and traveling northwest into the Bay Area. Subsequent stages of the HST System include a southern extension from Los Angeles to San Diego via the Inland Empire and an extension from Merced north to Sacramento.
Trains will run in diverse patterns between various terminals. Three basic service types are proposed:

1. Express trains, which will serve major stations only, providing fast travel times; for example, between Los Angeles and San Francisco during the morning and afternoon peak with a run time of 2 hours and 40 minutes.
2. Limited-stop trains, which will skip selected stops along a route to provide faster service between stations.
3. All-stop trains, which will focus on regional service.

The vast majority of trains will provide limited-stop services and offer a relatively fast run time along with connectivity among various intermediate stations. Numerous limited-stop patterns will be provided, to achieve a balanced level of service at the intermediate stations. The service plan envisions at least four limited trains per hour in each direction, all day long, on the main route between San Francisco and Los Angeles. Each intermediate station in the Bay Area, Central Valley between Fresno and Bakersfield, Palmdale in the High Desert, and Sylmar and Burbank in the San Fernando Valley will be served by at least two limited trains every hour—offering at least two reasonably fast trains an hour to San Francisco and Los Angeles. Selected limited-stop trains will be extended south of Los Angeles as appropriate to serve projected demand. Trains will not pass each other within an interval of three minutes or less.

Including the limited-stop trains on the routes between Sacramento and Los Angeles, and Los Angeles and San Diego, and the frequent-stop local trains between San Francisco and Los Angeles/Anaheim, and Sacramento and San Diego, every station on the HST network will be served by at least two trains per hour per direction throughout the day, and at least three trains per hour during the morning and afternoon peak periods. Stations with higher ridership demand will generally be served by more trains than those with lower estimated ridership demand.

The service plan provides direct train service between most station pairs at least once per hour. Certain routes may not always be served directly, and some passengers will need to transfer from one train to another at an intermediate station, such as Los Angeles Union Station, to reach their final destination. Generally, the Phase 1 and full-build conceptual operations and service plans offer a wide spectrum of direct service options and minimize the need for passengers to transfer. Specifically for the Merced to Fresno Section, trains will take approximately 25 minutes to run between Merced and Fresno. The maximum operating speed will reach 220 mph in this section. In Phase 1 the first train will start from Merced after 5 a.m. at the earliest, and the last train will arrive before midnight. In the full system, trains will originate from Sacramento no earlier than 5 a.m.,

arriving in Merced before 6 a.m. In the late evening, the last train to Sacramento will pass through Merced shortly after 11 p.m. and reach Sacramento before midnight.

The Merced and Fresno stations will see a mix of stopping trains and through trains peaking for the full system. In 2035 for the high ridership scenario, the full system will see four trains an hour stop at Fresno in each direction at the peak, and six trains run through. At the off-peak the same number of stops will be made, but the through trains will drop to three per hour. At Merced, three trains will stop each hour per direction at the peak, with two running through. At the off-peak both of the two hourly trains will stop at Merced.

Lighting: In general, the right-of-way will not be lighted except at stations and associated maintenance and electrical facilities. Station lighting will be designed to provide safety for arriving and departing passengers within urban areas. Maintenance and electrical facilities will have permanent lighting for both interior and exterior areas, as needed to support operations, including those requiring lighting 24 .hours per day. Typically, exterior lights will be mounted on tall masts, towers, or poles, and flood the area with sodium or mercury-vapor light. The lights will be angled toward the ground to limit reflectance on the surrounding community.

Maintenance and Inspection Activities: During operation of the HST System, programmed inspection and maintenance will be performed to verify that the project components are functioning as required. A maintenance-of-way program will be instituted to schedule inspection and maintenance activities. The maintenance-of-way program has two types of activities: preventative maintenance and corrective maintenance. Preventative maintenance will maintain the quality of the system and aid in defining a maintenance cycle for each project component type. Corrective maintenance will establish the level of performance of the infrastructure for both safety and comfort. Corrective maintenance is anticipated to be performed within the rail line right-of-way during off-peak hours of operation, or at power supply system facilities. Corrective maintenance will consist of light maintenance, heavy maintenance, or major renewals. Regular maintenance for the HST will include the following activities:

1. Inspection and repair of the rail line, the power supply system, and the maintenance facilities.
2. Vegetation control monthly to several times per year.
3. Maintenance of ballasted track every 4 to 5 years.
4. Culvert replacement along road crossings and debris clearance from the rail lines, as necessary.
5. Regular inspection of foundation elements at river crossings, such as the San Joaquin River crossing, are expected to occur on a bi-annual basis for exposed elements (accessible on foot or by light vehicle) and on a 5-year cycle for the inspection of components which are underwater and require a dive team for the process.
6. Regular clearing and removal of vegetation and sediment at the dedicated wildlife crossings to allow these structures to be free of obstruction and maintain their function.
7. Long-term maintenance may include intermittent activities, such as replacing short lengths of rail or ballast.

LKR: Project Description (the following project description was provided to the Service by the FRA/ Authority)

Project Overview

The Authority proposes to contract with the Lazy K Ranch Heritage Preserve B, LLC for the LKMS to provide the land and services necessary to mitigate the potential loss of regulated aquatic resources and listed species habitat as a result of the construction and operation and maintenance of PP1. The LKMS features high-density vernal pools and swales, with mima-mound topography and upland annual grasslands that support a high density and diversity of Federally-listed species. Restoration and preservation of the LKMS will address most impacts associated with construction and operation and maintenance of PP1 on federally-listed species.

There are two components of the Mitigation Proposal: the restoration portion and the long-term management portion. Restoration of riparian habitat is proposed for the Riparian Restoration Area (RRA), and restoration of vernal pools is planned for the Wetland Restoration Area (WRA). Restoration activities would require the following site development activities (generally in chronological order):

1. Land grading and contouring for creation of vernal pools will occur in the WRA.
2. Inoculum collection activities will be conducted in the Preservation Area (PA) and Inoculum Collection Area (ICA).
3. Vernal pool inoculation and erosion control will be conducted in the WRA.
4. Riparian planting, installation and maintenance of a temporary irrigation system, weeding, and associated erosion control measures above the ordinary high-water mark of the Chowchilla River in the RRA.
5. Success monitoring and reporting to the Service and other agencies.
6. Long-term management of the LKMS will be occur in accordance with the Long Term Management Plan (LTMP), including monitoring and maintenance activities.

The second component of the Mitigation Proposal includes a number of activities that are associated with long-term management of the LKMS after vernal pool restoration and riparian habitat restoration, including monitoring and maintenance activities. These activities will be described in more detail in the final LTMP to be submitted to the Service for review and approval prior to implementation.

LKR: Land Grading and Contouring

Land grading and contouring will occur only within the WRA, where vernal pool habitat will be restored. Grading activities will be restricted to the dry season (April 15 to October 15). Vernal pool slopes would be constructed to mimic side slopes of natural vernal pools in the design reference site within the Preservation Area. Vernal pool slopes will range from approximately 2 percent to 6 percent, with a targeted mean average of approximately 3 percent. Excavation depths will vary for each vernal pool and be determined by size, shape, slope, and position of each pool. Vernal pools will be restored to include outlet features (topographic, not structural) that will limit ponding depth to better mimic natural features observed in the design reference site. Vernal pool depths will generally range from 5 to 15 inches.

The following vernal pool construction process will be implemented:

1. A 115-acre construction area will be identified and the topsoil scraped down 3 to 4 inches and stockpiled in an adjacent area. Existing wetlands in this area will be avoided by establishing a 50-foot buffer around each of them.
2. Pools will be excavated and contoured according to the design plan, with grades 3 inches below the final design grade.
3. Excavated soils will be distributed around the vernal pool margins and contoured to mimic natural mima-mound topography.
4. The junction between vernal pool boundaries and upland areas will be graded and contoured to ensure a smooth, natural, wetland-upland transition.
5. Stockpiled topsoil will be redistributed across the construction site, including vernal pools and mounds, to provide a good substrate for plant establishment and growth.
6. No soil will be disposed of offsite. Exposed soil will be reseeded with naturalized plant seed (i.e., seed from native and non-native but naturalized grassland plants already on the site) to minimize erosion and invasive plant establishment.
7. Inoculum will be collected from natural vernal pools within the ICA and PA and distributed within the restored vernal pool basins.
8. Final finish grading will be performed for an overall natural, smooth contour for the restored vernal pools and mounds. Sufficient soil will be left above the hardpan for proper propagation potential for vernal pool plants (minimum of 2 inches).

Development of the WRA will require the temporary establishment of a 1.23-acre storage and laydown area (staging area) to support vernal pool restoration construction activities. This area is already used for ranch operations and will be an ideal area for staging. The staging area may include fuel and lubricant storage areas, which will be located at least 100 feet from water sources and sensitive areas and will be contained by implementing the appropriate best management practices (BMPs). The staging area will be restored to pre-project conditions (currently actively used for Ranch operations) upon completion of the vernal pool restoration.

LKR: Inoculum Collection, Inoculation, and Erosion Control

Restored vernal pools will be inoculated with a mix of soil, seeds, and organic material collected from natural vernal pools in the PA and the ICA. Numerous natural vernal pools in those areas support vernal pool fairy shrimp and vernal pool tadpole shrimp (Vollmar Consulting 2009). Inoculum collection will occur when the donor vernal pools are dry (approximately June 15 to October 15) under the direction of a Service-approved biologist and in a manner consistent with all federal and state permits and authorizations.

The vernal pools within the Preservation and Inoculum Collection Areas would be divided into four tiers to ensure the most appropriate inoculum is collected to support an overall goal of restoring vernal pool ecosystem function (e.g., floral and faunal communities). The top three tiers would have documented populations of Federally-listed large branchiopods, while the Tier 4 would support populations of non-listed large branchiopods. If there are not enough vernal pools with documented occurrences of Federally-listed large branchiopods, vernal pools without documented occurrences would be used. Table LKR-1 presents the acreage of vernal pools in each category within the Inoculum Collection Area and the Preservation Area. The three categories of potential donor pools are displayed on Figure 2.

Table LKR-1. Acreage of potential donor pools available within the LKMS.

Category[a]	Inoculum Collection Area	Preservation Area	Total
Tiers 1 - 3	4.92	7.76	12.68
Tier 4	0.00	3.59	3.59
Other Potential Donor Pools	33.72	6.03	39.75
Subtotal	**38.64**	**17.37**	**56.01**
Not Suitable (listed plants present)	2.31	5.26	7.57
Grand Total	***40.95***	***22.63***	***63.58***

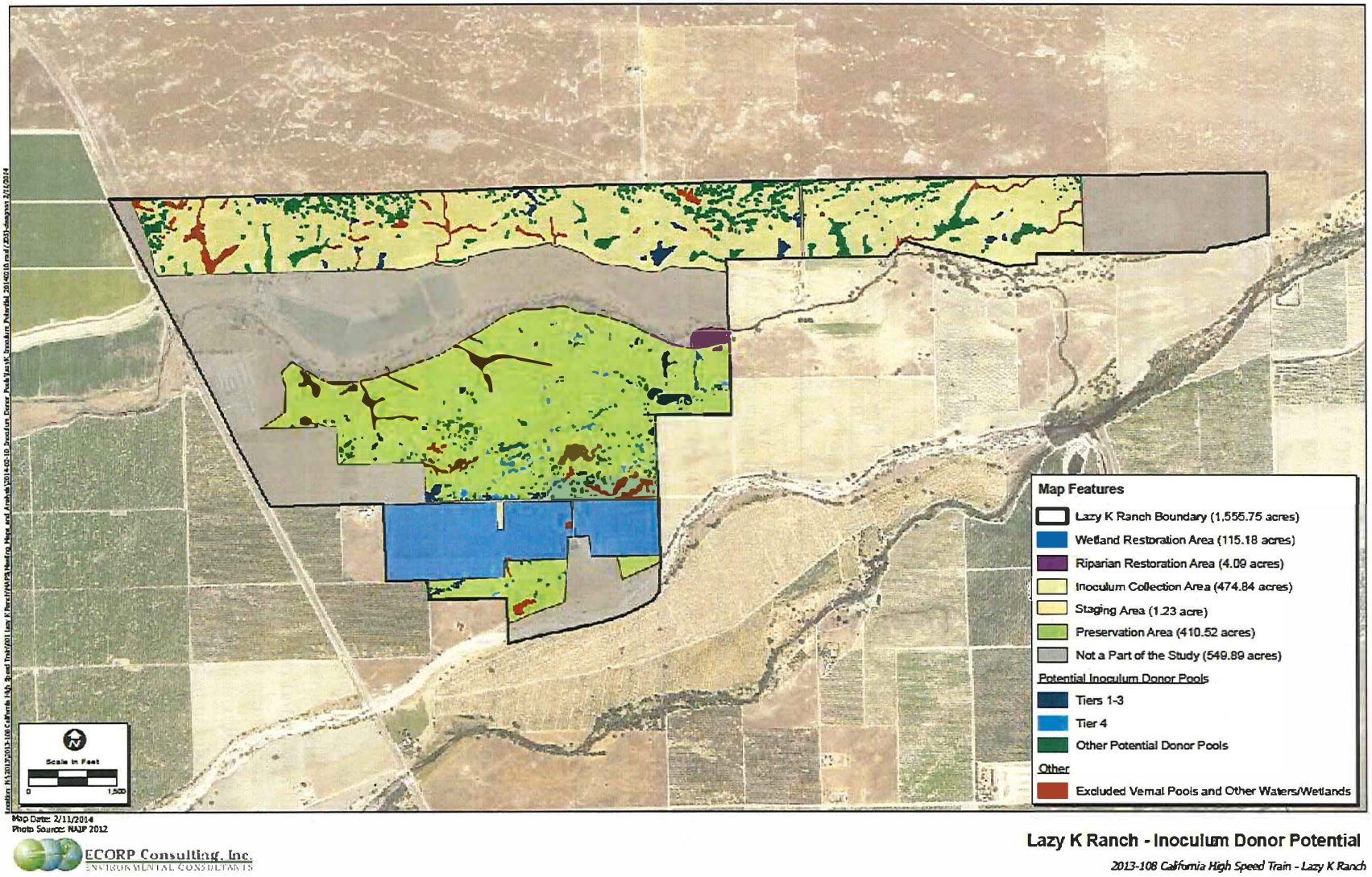
[a] Note that acreages shown in this table are based on surveys to date. As discussed in the PRMP, prior to inoculum collection, additional surveys for listed plants and invasive plant species will be conducted. For this reason, pools currently included in "Tier 4" or "Other Potential Donor Pools" may move up into "Tiers 1 - 3" based on the results of additional branchiopod surveys. Likewise, any of the potential donor pools listed in this table could change to "Not suitable" if listed plants or invasive plant species are found in these features during the plant surveys.

Only pools that do not support invasive species (especially waxy mannagrass) will be selected for inoculum collection. Inoculum will not be collected from vernal pools known to support succulent owl's-clover, or any other listed plant species, to avoid potential damage to the seed bank caused by the disturbance of the surface soils. Surveys for listed plant species will be conducted prior to inoculum collection to avoid and minimize adverse effects on these species.

Inoculum collected from vernal pools with documented midvalley fairy shrimp will be stockpiled separately and placed in shallow, restored vernal pools that provide the preferred habitat for that species. Inoculum collected from vernal pools with documented vernal pool tadpole shrimp will also be stockpiled separately and placed into deeper, restored vernal pools that provide preferred habitat for this species.

The inoculum collected from these vernal pools will likely include aquatic invertebrate cysts and plant seeds. The inoculum will be collected in accordance with applicable federal permits and authorizations to minimize disturbance. Inoculum will be collected manually with hand tools or by using small, relatively light equipment (rubber-tired tractor or skip loader with a gannon box blade and bucket, skip loader with a small harrow, mower vacuum, or shop vacuum). A Service-approved biologist will be present daily to directly supervise this activity at all times to verify there are no unintended negative effects on existing natural vernal pools and upland habitat. The Service-approved biologist will specifically identify and clearly mark travel routes that avoid vernal pools and direct the tractor operator along these routes.

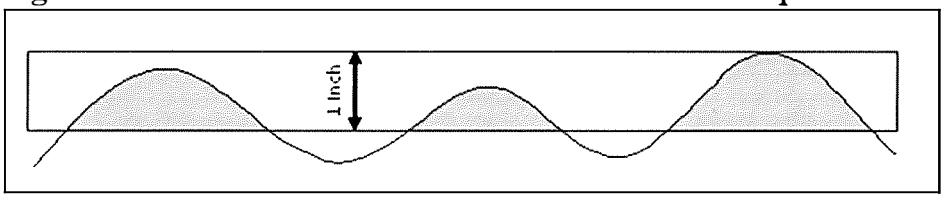
Figure 2. Lazy K Ranch inoculum donor pool potential.



At a maximum 1 inch deep over 2 acres, the maximum volume of inoculum collected would be approximately 270 cubic yards. Applying 270 cubic yards of inoculum over 16.76 acres of restored vernal pools would result in approximately 0.12 inch of inoculum being applied. A little more than 1/10-inch, on average a "light dusting", is an appropriate application for the restored vernal pools and consistent with multiple successful restoration projects the consultants have been involved with. Without a reasonable amount of inoculum, the restored pools are more susceptible to colonization by nonnative plant species that have the potential to slow the establishment of endemic vernal pool vegetation, resulting in a lower probability of success.

It is unlikely, however, that the full 270 cubic yards would be collected, because the 1-inch depth is a maximum, with variation of 1/2 inch in some locations, depending on donor pool bottom conditions. Also, because vernal pool bottoms are not uniform, a 1-inch scraping is unlikely to yield the volume associated with a full inch of material. As shown in Figure 3, only the shaded areas could feasibly be collected.

Figure 3. Inoculum collection variation within a selected pool.



Silt fencing will be temporarily installed as required or needed along the portions of the perimeter of the WRA where swales provide the potential for sediment runoff into the Chowchilla River or Ash Slough. These measures will be implemented prior to the construction period and removed when the disturbed areas have revegetated, in accordance with the stormwater pollution prevention plan. The silt fencing will consist of standard, woven black fabric attached to wooden stakes and buried approximately 6 inches in the ground. If needed, straw wattles will be placed adjacent to the silt fencing or along swales to capture sediments. These materials will be removed after one to two rain seasons, depending on the extent of re-establishment of vegetation.

LKR: Riparian Restoration

Riparian habitat restoration will occur on 3.0 acres within the 4.09-RRA adjacent to the Chowchilla River. These activities will be accomplished by obtaining and planting approximately 300 canes from species propagated from cuttings (i.e. willow and cottonwood) within the LKMS (maximum of 10 canes per tree), as specified in the 2014 PRMP. Container plants will be used to supplement cuttings, if needed, and for species that do not propagate from cuttings (e.g., valley oak, other native riparian trees, and associated native shrubs). Collection and planting will occur between November and February. Increasing the riparian habitat along the Chowchilla River will enhance the value of the habitat for wildlife adjacent to the river and surrounding areas by providing shade, shelter, nesting sites, and foraging habitat.

Water required to support initial planting growth will be obtained from existing wells. Establishment of plantings will require an estimated 22,240 gallons of groundwater (0.06 acre-feet) per year for up to 3 years, after which it is expected that plantings will have reached the water table. Holes for planting will be augured to a maximum depth of 5 feet. A temporary irrigation system using aboveground plastic pipes to supply drip irrigation to the riparian plantings will also be installed and connected to the well(s). The temporary irrigation system will be installed in late summer or fall, outside the raptor nesting season (March 1 to September 15); installation will be monitored by a

Service-approved biologist to verify there are no impacts on sensitive resources. If necessary, the Service-approved biologist will have the authority to stop work to avoid impacts on sensitive resources. The irrigation system would be installed by hand; a utility truck would transport irrigation pipe to the restoration area. The temporary irrigation system will be removed when riparian plantings are sufficiently established and irrigation is no longer needed. Maintenance of the irrigation system will occur as necessary, and the system will be removed within two to three seasons after the first planting season.

LKR: Construction Schedule and Equipment

Vernal pool restoration activities are scheduled to begin in 2014, the same year as impacts to habitat will occur as a result of PP1 construction activities. The creation of vernal pools will require one construction season (April to October) to complete. For every month that vernal pool restoration lags behind the start of the wet season (November) after the first PP1 impact on vernal pool and seasonal wetland habitat, a 0.05 increase to the ratios used to calculate the required vernal pool restoration acreage will be implemented. Additional mitigation is available within the LKMS to address the need for temporal loss mitigation if it is required. Preparation of the construction site (e.g., flagging and markings) will occur during June or early July. Wetland restoration work will be performed during late summer and early fall, when natural vernal pools on the site are dry (approximately July 15 to October 15); restoration work will be supervised and monitored by a Service-approved biologist. Application of inoculum will occur either during construction activities or during the final phase of construction of the WRA prior to winter rains.

It is anticipated that all ground-disturbing activities for wetland restoration will be conducted using the following heavy equipment:

- Backhoe
- Grader
- Small dozer
- Paddle-wheel scraper
- Dump trucks (two)
- Water truck
- Landscape tractor

Collection and planting of the RRA will be conducted primarily in the fall (October to December), before the winter rainy season. Riparian restoration activities will be limited to the use of hand tools, an auger mounted on a small tractor, privately-owned vehicles, and light-duty work trucks (to transport and plant riparian trees and shrubs). During restoration, equipment will be temporarily stored in the 1.23-acre Riparian Restoration Temporary Storage Area (staging area) on the bluff outside of the river floodplain directly adjacent to the RRA. The area will be mowed or grazed, but not scraped or otherwise cleared at the start of the planting activities. BMPs (e.g., installation of straw wattles) will be implemented as needed to ensure that the adjacent wetlands in the riparian zone are protected. As an alternative or supplement to the proposed temporary irrigation system, a water truck may be used to transport onsite well water, as required, during the dry season (late spring through late fall). All work will occur outside the ordinary high-water mark and be limited to those areas along the river channel corridor where planting is deemed to have the greatest opportunity for success and provide the greatest benefit. As previously discussed, irrigation is expected to be required immediately after planting and for two or three seasons after planting.

Conservation measures

The Authority has proposed the following measures to minimize effects on federally-listed species. The measures proposed below are considered part of the proposed action evaluated by the Service in this biological opinion.

General Conservation Measures

CM-GEN-1: Qualified Biologists and Biological Monitors. At least 15 days prior to the onset of ground disturbing activities, including but not limited to geotechnical investigations, utility realignments, creation of staging areas, or initial clearing and grubbing, the Authority will submit, for approval and review by the Service, the name(s), contact information, and relevant qualifications and experience of Project Biologists, Designated Biologists, and Species-Specific Biological Monitors who will conduct activities specified in the conservation measures. No ground disturbing activities will begin until the Authority has received approval from the Service that the Project Biologists, Designated Biologists, and Species-Specific Biological Monitors are approved to do the work. The selection of General Biological Monitors by the Authority does not require approval by the Service. The roles of Project Biologists, Designated Biologists, and Species-Specific and General Biological Monitors will be as follows:

a. **Project Biologist(s).** The Project Biologist (inclusive of the term mitigation manager also) will be responsible for the overall implementation of the conservation measures, the scheduling and work of Designated Biologists, Species-Specific and General Biological Monitors, and overall compliance reporting.
b. **Designated Biologist(s).** Designated Biologists and Designated Botanists (also referred to as contractor's biologist) will be responsible for directly overseeing and reporting the implementation of general and species-specific conservation measures. In some instances, Designated Biologists will only be approved for specific species, in which case they will only be authorized to conduct surveys and implement measures for the species for which they have been approved. The Designated Biologists will have support from Species-Specific and General Biological Monitors. Designated Biologists will submit memoranda and reports to document compliance with conservation measures. In addition, Designated Biologists can also perform the duties of the General Biological Monitor.
c. **Species-Specific Biological Monitor(s).** Species-Specific Biological Monitors will be responsible for implementation of species-specific measures and will report directly to a Designated Biologist. In addition, Species-Specific Biological Monitors can also perform the duties of the General Biological Monitor.
d. **General Biological Monitor(s).** General Biological Monitors will report directly to a Designated Biologist or to the Project Biologist. General Biological Monitors will be responsible for conducting Worker Environmental Awareness Program (WEAP) training, implementing general conservation measures, except where specified that a specific individual with specific qualifications (such as Project or Designated Biologist) must implement them, conducting general compliance monitoring, and reporting on compliance monitoring activities. If any potentially federally-listed species is observed in the construction footprint, the General Biological Monitor will have the authority to halt work as soon as practicable (as described in Conservation Measure 28 below) and contact and appropriate Designated Biologist. Work will not resume until the individual leaves the work area, or until a Designated Biologist implements the appropriate species-specific conservation measures or determines that it is not a federally-listed species.

No ground-disturbing project activities (e.g., geotechnical investigations, utility realignments, creation of staging areas, or initial clearing and grubbing) will begin until proponents have received written approval from the Service that the biologists and biological monitors are approved to conduct the work. This approval will be provided in 15 (calendar) days except under unusual or extraordinary cases.

CM-GEN-2: Regulatory Agency Access. If requested before, during, or upon completion of construction activities, the Authority or its designee will allow access by the Service or other resource agency staff to project lands (including mitigation lands) where these lands are under permittee control with 24-hour notice. To address any safety issues, all visitors will check in with the resident engineer prior to accessing the construction site. The Service will report any noncompliance issues to the Authority within 24 hours.

CM-GEN-3: Prepare and Implement a Biological Resources Management Plan. Prior to construction activities, the designated biologist will prepare the Biological Resources Management Plan (BRMP). The goal of the BRMP will be to provide the project biologist, designated biologists, and general biological monitors with an organized reference and reporting tool to verify that the mitigation measures and terms and conditions are implemented and reported in a timely manner. The BRMP will include terms and conditions from applicable permits and agreements and make provisions for monitoring assignments, scheduling, and responsibility. These will include all conservation measures and repair, mitigation, and compensatory actions included in the biological opinion. These measures and conditions will be tracked through final design, implementation, and post-construction phases. For all measures, terms, and conditions, requirements and planned mechanisms for documenting and reporting compliance will be identified. The BRMP will also identify the individual responsible for post-construction compliance reporting.

CM-GEN-4: Prepare and Implement a Worker Environmental Awareness Program. A WEAP will be developed and trainings and training updates conducted by designated biologists or general biological monitors as described below:

a. **Develop a Worker Environmental Awareness Program.** WEAP training materials will include the following: discussion of the Act and other applicable laws and regulations; consequences and penalties for noncompliance with these laws and regulations and project permits; identification and value of special-status plants, special-status wildlife, jurisdictional waters, and special-status plant communities; the contact person in the event of the discovery of a dead or injured wildlife species; and conservation measures including the location of planned minimization and avoidance measures. Training materials will include a fact-sheet handout or wallet-sized card conveying this information to be distributed to all participants in WEAP training sessions.
b. **Conduct Worker Environmental Awareness Training for Contractor Personnel.** Prior to working on project lands, construction contractor personnel who work onsite will attend a WEAP training session. Upon completion of the WEAP training, construction crews will sign a form stating that they attended the training and understand and will comply with the information presented.
c. **Provide Worker Environmental Awareness Training Updates to Contractor Personnel.** Updates and a synopsis of the training will be provided during the daily safety ("tailgate") meeting. Maintenance crews will be required to attend a contractor education and environmental training class annually.

CM-GEN-5: Prepare and Implement a Weed Control Plan. The contractor will prepare and implement a Weed Control Plan (WCP) to minimize or avoid the spread of weeds during construction activities, as described below:

a. **WCP Preparation.** Prior to construction activities, the contractor will prepare a WCP to minimize or avoid the spread of weeds during construction activities. The WCP will include the following:
    i. Schedule for conducting noxious weed surveys to be conducted in coordination with the BRMP.
    ii. Measures to prevent and control the introduction and spread of weeds, including cleaning of equipment to remove mud and plant materials, and use of herbicides by certified pesticide applicators in accordance with the compound label, other restrictions mandated by the Environmental Protection Agency, and requirements of the California Department of Pesticide Regulation and County Agricultural Commissioner.
    iii. Success criteria for noxious and invasive weed control as established by a qualified biologist.
    iv. Provisions to ensure that the development of the WCP will be coordinated with development of the Restoration and Revegetation Plan (RRP) so that measures to reduce the spread and establishment of noxious weeds and revegetation performance standards for percent cover of noxious weed may be incorporated in the RRP.
b. **WCP Implementation.** The contractor will implement the guidelines in the WCP during the project construction period. The Authority or its designee will require that maintenance crews follow the guidelines in the WCP and will appoint the responsible party for implementing the WCP during the operations period.

CM-GEN-6: Restoration and Revegetation Plan. An RRP for upland vegetation will be prepared and implemented as described below:

a. **RRP Preparation.** The RRP will describe the restoration and revegetation of habitat for federally listed species where vegetation or soil has been temporarily disturbed. Restoration activities will include but are not limited to grading landform contours to approximate pre-disturbance conditions, returning soil to its original location wherever possible, stockpiling and spreading of topsoil, removal of invasive plant species, stabilizing soil surfaces with mulch or straw certified as weed-free, and revegetating disturbed areas using native plant species to the extent practicable. During final design, a designated biologist will prepare the RRP describing restoration activities, the materials that should be used, timing of the work, monitoring requirements (including the monitoring schedule), success criteria, and contingency measures. The designated biologist will approve all procedures for handling of topsoil and all seed mixes. The RRP will be submitted to the Service for review and approval prior to its implementation.
b. **RRP Implementation.** During construction activities, the contractor will implement the RRP in temporarily disturbed areas. The designated biologist or general biological monitor will include documentation of this measure's implementation in the project's post-construction compliance reports (described in CM-GEN-22).

CM-GEN-7: Dedicated Wildlife Crossings. A combination of temporary wildlife crossings and permanent designated wildlife crossings will be incorporated during construction to mirror the proposed spacing of dedicated post-construction wildlife crossings as specified in the *Draft Landscape Permeability Plan for the Merced to Fresno Section* and the *Memorandum: Dedicated Wildlife Crossings for the*

Merced to Fresno Section of the California High-Speed Train System Accordingly, during construction, temporary or permanent wildlife crossings will be spaced at approximately 0.3-linear-mile intervals within the Eastman Lake–Bear Creek Essential Connectivity Area (ECA). Outside the ECA where adjacent land uses are relatively conducive to wildlife movement (e.g., grazing land; grain, hay, and idle pasture), temporary or permanent wildlife crossings would be spaced at no more than 2.5-linear-mile intervals. In areas outside the ECA where adjacent land uses are not conducive to wildlife movement (e.g., vineyards, high-density development), temporary or permanent wildlife crossings would be spaced at no more than 5-linear-mile intervals. All crossings will be placed for optimal use considering surrounding land cover and land uses, including built features, and under the advice of a qualified biologist.

CM-GEN-8: Land Cover and Habitat Verification. Under supervision of the project biologist, designated biologists or general biological monitors will verify the mapped land cover and habitats for federally listed species. Throughout the project footprint, this verification will be conducted prior to ground-disturbing activities. Results of preconstruction habitat verification surveys will be used to update maps of land cover in the project footprint and to identify where species-specific measures (including subsequent species habitat assessments and surveys) will be implemented.

CM-GEN-9: Biological Monitoring during Construction Activities. From on-site or remotely, a designated biologist will direct the work of general biological monitors who will be present onsite during initial ground-disturbance activities and for all construction activities conducted within or adjacent to identified Environmentally Sensitive Areas (ESAs) (i.e., occupied or potentially occupied habitat in footprint, suitable habitat abutting footprint, or occupied habitat within buffer distance of footprint), wildlife exclusion fence zones (WEF), or non-disturbance zones to oversee permit compliance and monitoring efforts. General biological monitors will also conduct daily biological 'sweeps' to ensure no listed species are located within the area to be disturbed during that day's forecasted activities. The general biological monitor(s) will advise the contractor on methods that may minimize or avoid impacts on federally-listed species, including all required species-specific measures.

CM-GEN-10: "Take" Notification and Reporting. The Service will be notified as soon as practicable, but no later than within 24 hours, via telephone and email, after discovery of a project-related accidental death or injury to a federally or state-listed species during project-related activities. The BRMP will identify all Service-approved individuals responsible for take notification and reporting.

CM-GEN-11: Scent Dog Surveys. With Service approval of the survey procedure, trained scent dogs may be used to perform preconstruction or protocol-level surveys required by the conservation measures.

CM-GEN-12: Establishment of Environmentally Sensitive Areas and Wildlife Exclusion Zones. Fencing or stakes, flags, and rope will be used to establish non-disturbance exclusion zones to restrict construction equipment and personnel from ESAs or restrict federally-listed wildlife species from entering construction areas, where feasible based on site-specific constraints. The location of fencing will be based on the species-specific conservation measures and will be determined through consultation with the Service. Two types of fencing, high visibility ESA fence and WEF, will be used for these purposes. ESA fencing will be delineated in the field by the designated biologists or general biological monitor(s), and will be identified on project plans where feasible.

a. **Delineation and Marking ESAs.** Prior to construction activities, ESAs will be delineated in the field by the designated biologist or general biological monitor(s). The contractor will mark ESAs with posted signs, posting stakes, flags, or rope or cord, and will place high-visibility fencing as necessary to minimize the disturbance of sensitive areas.
b. **Construction Activity Avoidance in ESAs.** The contractor will enforce exclusion of construction personnel and equipment from all ESAs. These areas will be monitored by a general biological monitor during all site preparation and subsequent construction activities.
c. **Maintenance of ESA Markings.** The contractor will maintain all fencing, stakes, flags, and signage until the completion of construction. ESA fences, WEF, stakes, flags, and signage will be removed when construction is complete or the resource has been cleared according to agency permit conditions.

CM-GEN-13: Placement of Staging Areas. Construction staging areas for storage of equipment and materials will be set up in areas that will ultimately be occupied by permanent HST facilities, such as the station sites or the HMF site. Additional staging areas may be sited based on the contractor's needs, access to local road networks, and highway access. Prior to construction activities, the contractor under the supervision of a designated biologist, will locate staging areas for construction equipment that are outside of areas of sensitive biological resources, including habitat for federally listed species, habitats of concern, and wildlife movement corridors, to the maximum extent practicable. The designated biologist will prepare a memorandum documenting compliance with this measure.

CM-GEN-14: Seasonal Restriction on Storage of Material and Equipment in Areas Subject to Flooding. Material and equipment storage on the active floodplain of a river will be limited to the restricted period from April 15 to October 31. During November 1–April 14, equipment may enter into the restricted river channel areas but will be removed daily and stored outside the areas subject to flooding.

CM-GEN-15: Stockpiling and Redistributing Excavated Soil. Excavated materials will be stockpiled and redistributed as described below:

a. **Stockpiling of Excavated Materials.** Contractors will temporarily store excavated materials produced by ground-disturbing activities in designated stockpile areas at or near the excavation site, and within the project footprint or another authorized location.
b. **Handling of Topsoil.** The collection, stockpiling, and redistribution of topsoil will be conducted as described in the RRP.

CM-GEN-16: Construction Site Vehicle Traffic Routes. To minimize dust levels and the potential for construction equipment to strike federally listed species, the designated biologists and general biological monitors will restrict project vehicle traffic to routes established, monitored, and maintained as follows:

a. **Establish Traffic Routes.** The designated biologists and general biological monitors will establish vehicle traffic routes, which where feasible will be in construction areas, locations disturbed by previous activities to prevent further adverse effects, or on existing roads. Routes will be clearly flagged and marked by the contractor per the direction of the designated biologists and general biological monitors.
b. **Monitor and Maintain Traffic Routes.** The designated biologists and general biological monitors will require use of the established vehicle travel routes. The contractor will maintain their markings.

CM-GEN-17: Construction Speed Limit. A speed limit of 15 mph will be enforced during project construction for all vehicles operating on unimproved access roads and in temporary and permanent construction areas within the limit of direct effect.

CM-GEN-18: Monofilament Restrictions. During construction activities, the general biological monitor(s) will verify that the Contractor is not using plastic monofilament netting (erosion-control matting) or similar material in erosion control materials. Non-monofilament substitutes including coconut coir matting, tackified hydroseeding compounds, rice straw wattles, and reusable erosion, sediment, and wildlife control systems that have been approved by the regulatory agencies may be used.

CM-GEN-19: Avoidance of Entrapment. At the beginning and end of each work day, all excavated, steep-walled holes or trenches that are more than 8 inches deep with sidewalls steeper than a 1:1 (45 degree) slope will be covered at the close of each day with plywood or similar materials or provided a minimum of one escape ramp constructed of fill earth per 10 feet of trenching. Before such holes or trenches are filled, they will be thoroughly inspected for trapped wildlife by the general biological monitor(s). All culverts, pipes, or similar structures with a diameter of 3 inches or greater that are stored at a construction site will be inspected for wildlife before the pipe is subsequently used or moved.

CM-GEN-20: Work Stoppage. During construction activities, the designated biologists and general biological monitors will have stop work authority to protect any federally listed wildlife species within the project footprint. This work stoppage will be coordinated with the Authority or its designee. The contractor will suspend ground-disturbing activities in the construction area(s) where the potential construction activity could result in "take" of listed species; work may continue in other areas. The contractor will continue the suspension until the individual leaves voluntarily, is relocated to an approved release area using Service-approved handling techniques and relocation methods, or as required by the Service.

CM-GEN-21: Offsite Disposal of Materials. The contractor will dispose of waste materials associated with construction, including soil materials unsuitable for reuse, in local landfills permitted to take these types of materials, and in conformance with the Act.

CM-GEN-22: Post-Construction Compliance Report. A post-construction compliance report will be submitted to the Service upon completion of each construction package, as defined by the Authority-contractor design/build contracts. The post-construction compliance report will provide the following information:

a. Dates of project groundbreaking and completion
b. Pertinent information concerning the success of the project in meeting compensation and other conservation measures, and explanation of failure to meet such measures, if any
c. Known project effects on listed species
d. Observed incidences of injury or mortality of any listed species
e. Other pertinent information

San Joaquin Kit Fox Conservation Measures

CM-SJKF-1: Wildlife Crossings. The following measures are proposed to allow movement of kit foxes and maintain connectivity among populations of this species within and around the action area:

- Dedicated wildlife crossings will be constructed throughout wildlife corridors identified for movement of kit fox. The primary design for dedicated wildlife crossings will use one of two basic concrete structure types (box culverts or short span slab bridges) to provide an opening below the HST tracks. The choice of structure used to provide the opening will depend on the height of the embankment supporting the HST track at each location. The primary design, as outlined in the 2012 MF-BO, will provide a minimum opening 3 feet high, 10 feet wide, and up to 73 feet long, resulting in an openness factor of 0.41 as measured by (height x width)/length. Any crossings longer than 73 feet will have an openness factor of at least 0.41. Where feasible from an engineering perspective, and appropriate from an ecological perspective, dedicated wildlife crossings will be constructed with larger openings. The dimensions of these larger wildlife structures will be 6 feet high, 10 feet wide, and approximately 73 feet long.
- The length of the wildlife crossings will be reduced whenever possible to improve the openness factor and reduce cost. To accommodate variations in topography, the height of the structure could extend as much as 18 inches below-grade; however, at least 50 percent of the vertical clearance will be above grade. This will allow kit fox entering the crossing to see light coming from the opposite end of the crossing structure.
- At locations where stormwater features (ditches, swales, detention basins, etc.) are constructed parallel to the HST track embankment to control stormwater, they would be designed to terminate at the wildlife crossing to prevent water from ponding in the structure. The path would be shaped to drain to the sides, and small retention basins would be provided adjacent to the path to collect runoff. These features would keep the crossing passable during normal rain events.
- Right-of-way fencing will be diverted toward the toe of the slope, up the embankment, and above the entrance of the structure, thus allowing kit fox unimpeded access to the crossing structures. Before HST operations begin, the contractor will install security fencing enhanced with a semipermeable wildlife barrier from 6 inches below ground surface to 12 inches above ground surface that prevents amphibians, reptiles, and small mammals from moving into the right-of-way in areas of designated natural habitat. The design and location of wildlife-proof fencing will be determined in consultation with Service and CDFW. The agency-approved project biologist will verify that the installation is consistent with terms and conditions in the Service biological opinion and CDFW incidental take permit.
- For each crossing, four sections of corrugated metal pipe, 20 feet long and 10 inches in diameter, would be anchored to either the floor or the wall of the crossing. The openings of both ends of all corrugated metal pipes would be narrowed to a 4- to 6-inch diameter. Kit foxes will gain temporary refuge within the corrugated metal pipes in the event they find themselves in a culvert with a larger predator.

CM-SJKF-2: Pre-Construction Surveys. Pre-construction surveys for the kit fox will be conducted within the project footprint in suitable habitat areas (alkali desert scrub, annual grassland, pasture, and barren) and in additional areas identified by the biologist designated to identify known or potential kit fox dens. Pre-construction surveys will be conducted by a designated biologist no less than 14 days and no more than 30 days prior to the start of ground-disturbing activities and will be phased with project build-out. All dens recorded during the pre-construction survey will be mapped and characterized as to type such that their status can be later evaluated. Den types are defined as:

- Potential Den: any suitable subterranean hole within the range of the kit fox that has an opening of at least 4 inches and for which available evidence is insufficient to conclude that

it is currently being used or has been used by a kit fox, or is being used by another animal that precludes occupation by a kit fox. Potential dens include: (1) any suitable subterranean hole; or (2) any den or burrow of another species (e.g., coyote, badger, red fox, or ground squirrel) that otherwise has appropriate dimensions and characteristics for kit fox use;

- Known Den: any existing natural den or manmade structure that is currently being used or has been used at any time in the past by a kit fox;
- Natal (or Pupping) Den: any den used by kit foxes to whelp and/or rear their pups; and
- Atypical Den: any manmade structure which has been or is being occupied by a kit fox.
- Atypical dens may include pipes, culverts, and diggings beneath concrete slabs and buildings.

The designated biologist will notify the Service within 24 hours via telephone or e-mail if any kit fox known dens or natal dens are discovered within or immediately adjacent to any work area. Potential dens will be monitored for a minimum of four days with a trail camera to evaluate current use. If there is a risk that cameras may be stolen or vandalized, then at that site, monitoring may be conducted using tracking medium only with the prior concurrence of the Service. Without camera monitoring, any detected fox or small canid tracks would be considered kit fox tracks, unless additional information justifies a different interpretation. If no kit fox activity is detected during this period, any potential den within the construction footprint will be hand excavated and collapsed, or blocked by the designated biologist immediately following the monitoring period (i.e., during the morning after the last night of monitoring). Mechanical equipment under direct voice control of the designated biologist can be used to excavate dens in areas of hard soil, provided protective piping or other means are employed to protect any wildlife from harm resulting from den collapse. Reports for each survey will be submitted to the Service within 30 days of completion and before ground-disturbing activities. Inaccessible dens within 200 feet of construction activities, will be camera monitored where visible from within the project footprint. To maintain required exclusion distances from natal and known dens, observed but inaccessible natal and known dens would be documented.

CM-SJKF-3: Avoid Disturbance of Dens. Disturbance to all kit fox dens (natal, known, atypical, and potential) will be avoided to the maximum extent possible. Dens that will not be directly disturbed may be temporarily blocked during completion of construction activities in that area.

CM-SJKF-4: Avoidance of Dens during Breeding Season. During the breeding season (December 1 through July 31), all construction activities will be prohibited within the following limits:

- An atypical or potential den exclusion zone of 50 feet will be implemented in areas surrounding potential and atypical dens unless otherwise adequately determined to be unoccupied and subsequently removed (e.g. excavated, collapsed, or blocked).
- A known non-natal den exclusion zone of 100 feet will be implemented in areas surrounding occupied/non-occupied known dens.
- A natal den exclusion zone of 200 feet (or as approved by the Service) will be implemented in areas surrounding occupied or unoccupied natal dens.

Within the project footprint, exclusion zones around known and natal dens will be fenced with high-visibility construction fencing, and exclusion zones around atypical and potential dens will be staked and flagged or fenced with high-visibility construction fencing. Fencing will include openings for kit fox ingress/egress, artificial dens, or both, so as not to prevent access to the den by kit foxes. Where site conditions preclude establishment of construction exclusion fencing around known and natal

dens, other marking or exclusion methods will be identified and implemented in coordination with the Service.

CM-SJKF-5: Timing of Work near Occupied Dens. All construction activities near any occupied dens will cease one-half hour after sunset and will not begin earlier than one-half hour before sunrise, when feasible.

CM-SJKF-6: Work in Non-Disturbance Zones during Breeding and Pupping Season. If construction activities within the non-disturbance exclusion zone of known or natal kit fox dens cannot be avoided during the breeding and pupping season, the designated biologist will contact the Service to discuss additional measures that may be implemented to minimize effects to kit foxes.

CM-SJKF-7: Excavation of Atypical, Potential, and Known Non-Natal Dens. After the designated biologist has determined that an atypical or potential den is unoccupied, it may be excavated at any time of year. If a known non-natal kit fox den cannot be avoided during the breeding and pupping season and thus excavation of the den is being proposed, the designated biologist will seek the Service's approval. No disturbance or encroachment into the exclusion zone of the den will occur without prior specific approval from the Service. A minimum of 5 days of known non-natal den monitoring by a designated biologist (who may be assisted by general biological monitors under the direct, on-site, supervision of the designated biologist) using cameras and tracking medium is required to allow animals to relocate from known non-natal dens, during which time passive harassment measures (i.e., partially blocking den entrances with soil) may be pursued to encourage relocation. After a known non-natal den is determined to be unoccupied, it may be excavated at any time of year under the direct supervision of a designated biologist following Service approval.

CM-SJKF-8: Excavation of Vacated Natal Dens. Natal dens may be excavated after pups have vacated the den. If a kit fox is observed at the den during this period and construction activities within the non-disturbance exclusion zone of kit fox dens cannot be avoided, the designated biologist will contact the Service for approval to initiate passive harassment measures. A minimum of 5 days of den monitoring by a designated biologist using cameras (who may be assisted by general biological monitors under the direct supervision of the designated biologist) is required to allow animals to relocate. During this den monitoring, passive harassment measures (i.e., partially blocking den entrances with soil) may be pursued to encourage relocation (with prior Service concurrence). After the designated biologist has determined that the natal den is vacant (unoccupied), it may be carefully hand excavated during the time period stated above.

CM-SJKF-9: Artificial Dens. To offset the temporary impacts of ESA and WEF fencing on kit fox movement during construction, artificial dens for kit foxes will be installed along the outer perimeter of the ESA and WEF fencing, where applicable.

CM-SJKF-10: Pipe Inspections. All construction pipes, culverts, or similar structures with a diameter of 4 inches or greater that are stored at a construction site for one or more overnight periods will be thoroughly inspected for kit foxes before the pipe is subsequently buried, capped, or otherwise used or moved in any way. If a kit fox is discovered inside a pipe, that section of pipe will not be moved until the Service has been contacted for guidance.

CM-SJKF-11: Removal from the Project Area. If a kit fox does not vacate the project footprint after five days of implementation of passive harassment measures, or a kit fox has become accidentally trapped within the project footprint, a designated biologist, in accordance with agency

guidance, will contact the Service and CDFW to discuss capture and relocation of the kit fox, if appropriate.

Giant Kangaroo Rat Conservation Measures

CM-GKR-1: Pre-Construction Surveys of Suitable Habitat. A qualified, agency-approved biologist (designated by the agency-approved project biologist) will conduct a pre-construction assessment of suitable habitat 14 days prior to any activities within the project footprint and out 50 feet for potential GKR burrows or their sign. Should potential burrows or sign be located, either protocol level surveys will be conducted or burrows will be considered to be occupied. Surveys will be conducted according to the most recent agency-approved survey protocol for San Joaquin kangaroo rats (i.e., *Survey Protocol for Determining Presence of San Joaquin Kangaroo Rats* (March 2013) unless the Service develops specific survey protocols for GKR, in which case the most current protocols will be completed).

CM-GKR-2: Avoid Disturbance of Burrows. A buffer distance of at least 50 feet will be maintained around occupied burrows at least 14 days before the start of ground-disturbing activities.

CM-GKR-3: Timing of Work near Occupied Burrows. All construction activities within 50 feet of any occupied burrow will cease one-half hour before sunset and will not begin earlier than one-half hour after sunrise to avoid indirect impacts from artificial light to this nocturnal species.

CM-GKR-4: Relocation. If any burrow cannot be avoided, and it is determined that the burrow is occupied by a GKR, the animal will be allowed to leave the burrow and move to an area that will not be disturbed. The non-disturbance exclusion fence with one-way exit/escape points will be placed to exclude GKR from the construction area. The wildlife exclusion fence will be established around burrows in a manner that allows the species to leave the project footprint. Additional measures such as one or both of the following will be implemented after the exclusion fencing is installed.

- Vegetation will be cleared to the ground by hand or using hand-operated equipment to discourage the presence of GKR in the project footprint. The cleared vegetation will remain undisturbed by project construction equipment for 14 days to allow GKR passively to relocate through the one-way exit/escape points along the wildlife exclusion fencing.
- A qualified, agency-approved biologist, designated by the Project Biologist, will conduct GKR trapping and relocation as determined in coordination with the Service.

Blunt-Nosed Leopard Lizard Conservation Measures

CM-BNLL-1: Habitat Assessment. Within one year prior to the start of construction, a habitat assessment of the project footprint will be conducted by a designated biologist to identify all habitat suitable for the lizard within the project alignment. Prior to ground-disturbing activities, the designated biologist will submit a memorandum documenting the assessment for review and approval by the Service.

CM-BNLL-2: Protocol-Level Survey. A designated biologist(s) will conduct protocol-level surveys within the project footprint in areas identified as potential lizard habitat, per CM-BNLL-1. Surveys will be conducted no more than one year prior to ground-disturbing activities and will follow the CDFW's *Approved Survey Methodology for the Blunt-Nosed Leopard Lizard.* Surveying biologists

will also document burrows likely used by a lizard or with egg clutches, where feasible. Reports for each survey will be submitted to the Service within 30 days of completion.

CM-BNLL-3: Active Season Avoidance. During the active season (April 15 through October 15), in areas where lizards or lizard sign have been observed, the following measures will be implemented:

a. **Establishment of No-Work Buffers.** A designated biologist will establish 50-foot no-work buffers around active burrows and egg clutch sites identified during the protocol-level survey (CM-BNLL-2). The 50-foot no-work buffers will be established around the active burrow and clutch sites in a manner that allows for a connection between the burrow site and the suitable natural habitat adjacent to the footprint so that lizards may leave the project footprint after the young have hatched. Project activities within the 50-foot no-work buffers will be prohibited until the eggs have hatched and lizards have been allowed to leave the project footprint, as determined by the designated biologist.
b. **Monitoring and Maintenance of No-Work Buffers.** During construction activities, a Service-approved biologist or general biological monitor will monitor and maintain the 50-foot no-work buffers established per CM-BNLL-3a. The contractor as directed by the designated biologist or general biological monitor will maintain the 50-foot no-work buffers to minimize take of lizards, and their burrows/nests.
c. **Fencing of Project Footprint**. Unless prohibited from doing so by other regulatory authorizations, the project footprint will be delineated with high-visibility ESA fence and wildlife exclusion fence of a non-gaping, non-climbing, barrier using a rigid and non-climbable material where: (a) no-work buffers were established per CM-BNLL-3a, and the eggs have hatched and lizards have been allowed to leave the project footprint; and (b) in potentially suitable areas (alkali desert scrub, annual grassland, barren, valley foothill riparian) where no-work buffers were not established per Conservation Measure BNLL-3a. Such fencing will include one-way escape exits spaced every 100 feet.
d. **Monitoring and Maintenance of Fencing.** During construction activities, the wildlife exclusion fence and work area within it will be monitored daily by a general biological monitor and maintained by the contractor as directed by the general biological monitor to avoid the possibility for take of lizards, their burrows/nests, or the species' habitat outside of the project footprint.

CM-BNLL-4: Non-active Season Avoidance. During the non-active season (October 16 through April 14), suitable lizard burrows identified during the protocol-level survey, or otherwise observed, will be avoided by the Contractor. A 50-foot no-work buffer will be established around burrows to prevent impacts until the active season. The no-work buffer will be established by placing the high-visibility ESA fence and wildlife exclusion fence around the suitable burrow sites in a manner that allows for a connection between the burrow site and the suitable natural habitat adjacent to the footprint so that lizards can leave the project footprint during the active season. If construction activities are required during this period, the appropriate measures will be established through consultation with the Service.

CM-BNLL-5: Agency Notification. If lizards are observed during protocol-level surveys, pre-construction surveys, or the construction period, the designated biologist(s) and general biological monitor(s) will attempt to identify the active burrow(s), and the Service and CDFW will be immediately contacted. Appropriate measures to avoid take of the species will be established through consultation with the Service.

Giant Garter Snake Conservation Measures

CM-GGS-1: Maintenance of Construction Equipment near Wetlands. All construction equipment will be maintained to prevent leaks of fuels, lubricants, or other fluids and service and refueling procedures will be conducted in uplands at least 100 feet away from wetlands or waterways.

CM-GGS-2: Dewatered Habitat. Any dewatered snake habitat will remain dry for at least 15 consecutive days after April 15 and prior to excavating or filling of the dewatered snake habitat.

CM-GGS-3: Conduct Work during Active Season. To the extent practicable, construction activity within 200 feet of snake habitat will be confined to the period between May 1 and October 1. This is the active period for the snake and direct mortality is lessened because snakes are expected to actively move and avoid danger.

CM-GGS-4: Pre-Construction Survey. Within 24 hours prior to construction activities, a designated biologist will survey the work area for snakes. A survey of the work area will be repeated if a lapse in construction activity of 2 weeks or greater has occurred. If a snake is encountered during surveys or construction, cease activities until the biological monitor has determined that the snake will not be harmed or the snake leaves the work area on its own.

CM-GGS-5: Inactive Season Measures. If construction activities in snake habitat are necessary between October 2 and April 30, the need for additional avoidance and minimization measures will be evaluated in coordination with the Service, and identified measures will be implemented as necessary.

California Tiger Salamander Conservation Measures

CM-CTS-1: Pre-Construction Survey. Prior to ground-disturbing activities, a designated biologist will conduct a pre-construction survey of potential breeding and suitable upland habitat within and adjacent to the project footprint to evaluate the presence or absence of salamanders. Surveys will be conducted no more than 30 days before the start of ground-disturbing activities and will be phased with project build-out. If any salamanders are found, the designated biologist will immediately notify the Service.

CM-CTS-2: Exclusion Barriers. Within 1.24 miles of known or potential breeding habitat, exclusion barriers will be installed, monitored, and maintained along the perimeter of the project footprint where it is located adjacent to suitable salamander habitat, as follows:

a. **Installation of Exclusion Barriers.** The contractor as directed by a designated biologist will install exclusion barriers (e.g., silt fences) along the perimeter of the project footprint, unless prohibited from doing so by other regulatory authorizations. Exclusion barriers will be installed prior to initial ground-disturbing activities to minimize take of the salamander and destruction of their potential habitat outside of the project footprint. Exclusion fencing must be trenched into the soil at least four inches in depth, with the soil compacted against both sides of the fence for its entire length to prevent salamanders from passing under the fence. Barriers will be installed with turn-arounds at any access openings needed in the fencing, to redirect salamanders away from openings.
b. **Monitoring and Maintenance of Exclusion Barriers.** Exclusion fencing will be maintained by the contractor throughout the salamander's entire active period (November to

June) or until all construction activities are completed, whichever occurs first. Barriers must be inspected by the designated biologists or general biological monitors at least twice weekly on nonconsecutive days outside of the breeding season. Barriers will be inspected daily following any rain event, and during months when juvenile salamanders are most likely emigrating from their breeding ponds in search of burrows in surrounding upland habitat.

CM-CTS-3: Non-Disturbance Exclusion Zones around Breeding Habitat. A non-disturbance exclusion zone will be established, monitored, and maintained around breeding habitat as follows:

a. **Establishment of Non-Disturbance Exclusion Zones.** A non-disturbance/exclusion zone will extend 250 feet from the edge of breeding habitat. At the boundary of this zone, the contractor as directed by a designated biologist will install fencing composed of a combination of high-visibility ESA fence and WEF.
b. **Monitoring and Maintenance of Non-Disturbance Exclusion Zones.** Non-disturbance/exclusion zones will be monitored by the general biological monitor(s) to minimize take of salamanders and destruction of their potential habitat outside of the project footprint. The contractor, as directed by designated biologist(s) or general biological monitor(s), will maintain the fencing around the exclusion zone.

CM-CTS-4: Work within Non-Disturbance Exclusion Zones. Construction activities within Non-Disturbance Exclusion Zones, while breeding habitat is inundated, will be avoided to the extent possible. If construction activities are to occur within the Non-Disturbance Exclusion Zones during the wet season, the following steps will be taken:

- Prior to the start of construction, wet season surveys will be conducted by a designated biologist within the breeding habitat.
- If any life-stage of salamander is found, the designated biologist will immediately contact the Service to discuss additional measures to minimize take of the salamander.

CM-CTS-5: California Tiger Salamander Relocation Plan. If any salamanders are located in burrows within the project footprint or their burrows will be collapsed in preparation for project-related activities, the Authority will develop and implement a Salamander Relocation Plan that will be provided to the Service prior to the collapse of any burrows. A designated biologist will oversee the collapse of burrows and will be assisted by general biological monitors.

Vernal Pool Habitat and Invertebrate Conservation Measures

CM-VP-1: Non-Disturbance Exclusion Zones. Non-disturbance exclusion zones will be established, monitored, and maintained as follows:

a. **Establishment of Exclusion Zones.** The contractor, under supervision of the designated biologists, will erect exclusion fencing around the perimeter of a non-disturbance exclusion zone, where accessible, to minimize take of vernal pool crustaceans or destruction of their habitat outside of the project footprint where suitable habitat (e.g., vernal pools, seasonal wetlands) occurs and the species have potential to occur. Non-Disturbance exclusion zones will extend 250 feet from the edge of suitable habitat (e.g., vernal pools, seasonal wetlands) where the species have potential to occur.
b. **Monitoring and Maintenance of Exclusion Zones**. General biological monitor(s) will monitor the non-disturbance exclusion zone to minimize take of vernal pool crustaceans or destruction of their habitat outside of the project footprint where suitable habitat (e.g.,

vernal pools, seasonal wetlands) occurs and the species have potential to occur. The contractor will maintain the zone's fencing as directed by the general biological monitor(s) or designated biologist(s).

CM-VP-2: Seasonal Work Restriction. Initial ground-disturbing activities in wetlands and other waters of the U.S. (e.g., vernal pools, seasonal wetlands, seasonal riverine areas, and riparian areas) will be restricted to the dry season (June 2 to October 14), or when the habitat is dry (i.e., lacks flowing or standing water). If construction activities must occur during the October 15 - June 1 period within 250 feet of suitable habitat, erosion control materials will be installed to reduce sedimentation into vernal pools and other suitable habitat, with concurrence from the Service.

Federally-listed Plant Conservation Measures

CM-PLT-1: Protocol-Level Surveys. Protocol level surveys for federally listed plant species will be conducted by designated biologists prior to any ground-disturbing activities in suitable habitat for federally listed plant species.

CM-PLT-2: Salvage, Relocation, or Propagation and Monitoring Plan. Prior to construction (any ground-disturbing activity), the project biologist will prepare a salvage, relocation, and monitoring plan for federally listed plant species observed within the project footprint during protocol surveys. The plan would include provisions that address the techniques, locations, and procedures required for the collection, storage, and relocation of seed or plant material; collection, stockpiling, and redistribution of topsoil (and associated seed). The plan would include provisions for performance, maintenance, monitoring, implementation, and the annual reporting requirements. The plan will be submitted to the agency-approved project biologist for review and approval. The relocation or propagation of these plants and their seed will be performed at a suitable mitigation site, as appropriate for each species.

CM-PLT-3: Restoration of Disturbed Areas to Pre-Project Conditions. Areas that support federally listed plant species that will be temporarily disturbed will be restored to pre-construction conditions. Prior to disturbance, pre-construction conditions will be documented detailing species composition, species richness, percent cover of key species, and photo points will be established. Success criteria for restored areas will be submitted to the Service for review and approval.

CM-PLT-4: Documentation of Directly Affected Plants. All directly affected populations of federally listed plants will be documented. Documentation will include density and percent cover of the affected species; key habitat characteristics, including soil type, associated species, hydrology, and topography; and photo documentation of pre-construction conditions.

CM-PLT-5: Service Notification and Coordination. In the event that federally listed plants are identified in the project area through the protocol-level botanical surveys required by CM-PLT-1, the Service will be notified and the Authority will work with the Service to avoid, minimize, and potentially compensate for direct and indirect effects on the species.

CM-PLT-6: Salvage and Relocation of Affected Plants. Prior to ground-disturbing construction activities, seeds, plant materials, and top soil will be collected from areas with populations of federally listed plant species that are to be permanently lost. These materials will be salvaged, relocated, and used according to the salvage and relocation plan described by CM-PLT-2.

Valley Elderberry Longhorn Beetle Conservation Measures

CM-VELB-1: Construction Setback. Within the species' range as depicted on the map of the species occurrence in the Service's Environmental Conservation Online System, a no-activity buffer zone will be established around elderberry shrubs whose retention is feasible. Complete avoidance (i.e., no adverse effects) may be assumed when a 100-foot (or wider) buffer is established and maintained around elderberry plants containing stems measuring 1 inch or greater in diameter at ground level. In areas where encroachment on the 100-foot buffer has been approved by the Service, the contractor will provide a minimum setback of at least 20 feet from the dripline of each elderberry plant. In buffer areas, construction activities should be minimized, and any damaged area will be restored (with erosion control and appropriate native plants) following construction. The Service must be notified, and must approve in advance, any ground or vegetation disturbance in the buffer area, and the restoration of damaged areas must be approved by the Service based on a written description provided by the contractor.

CM-VELB-2: Signage. The agency-approved project biologist will erect signage every 50 feet along the edge of the 100-foot buffer area with the following information: "*This area is habitat of the valley elderberry longhorn beetle, a federally threatened species, and must not be disturbed. This species is protected by the Endangered Species Act of 1973, as amended. Violators are subject to prosecution, fines, and imprisonment.*" The signs will be installed prior to the start of construction, must be clearly readable from a distance of 20 feet, and must be maintained by the contractor throughout the duration of construction activities.

CM-VELB-3: Pre-Construction Surveys. Prior to vegetation or ground-disturbing activities within the species' range as depicted on the map of the species occurrence in the Service's Environmental Conservation Online System, an agency-approved project biologist will search all elderberry stems greater than 1 inch in diameter at ground level for beetle exit holes.

CM-VELB-4: Minimization Measures during Construction. If based on the surveys conducted under CM-VELB-3, beetles are determined to be present within the limit of direct effect, the following measures will be implemented:

- Dust control procedures, such as regular watering of disturbed soils and soil piles, and covering of soil piles, will be used throughout the construction period.
- No insecticides, herbicides, fertilizer, or other chemicals that might harm the beetle or its host plant will be used within the 100-foot buffer area.
- Elderberry plants with one or more stems measuring 1.0 inch or greater at ground level that cannot be avoided during construction will be transplanted according to the methods outlined in the *ANSI A300 Standards for Tree Care Operations* for arboriculture. Shrubs will be transplanted to a Service-approved conservation area during the dormancy period (November 1 to February 15). Each agency-approved conservation area will be a minimum of 1,800 square feet per transplanted shrub.

Compensatory Habitat

A mitigation plan was proposed by the Authority for the Merced to Fresno Section to compensate for the permanent loss of habitat and provide long-term habitat conservation for federally-listed species. The Draft MSIP was submitted to Service for review and comments in March 2012. An updated Draft MSIP was submitted in July 2012. The MSIP included: (1) a comprehensive approach designed to mitigate project effects on the kit fox, the salamander, the Conservancy fairy shrimp, the

vernal pool fairy shrimp, the tadpole shrimp, the beetle, the Colusa grass, the San Joaquin Valley Orcutt grass, the hairy Orcutt grass, the Greene's tuctoria, the owl's-clover and their respective habitats; (2) a proposed methodology for determining appropriate compensation; (3) an analysis of mitigation sites; and (4) a mitigation package to provide conservation value for, and mitigate the Merced to Fresno Section's effects on sensitive biological resources, including listed species.

The MSIP employed a comprehensive, landscape-scale approach to habitat conservation that seeks to increase the amount of conserved wetlands and protected habitat for special-status species, preserve and enhance important wildlife movement corridors, and consolidate and expand existing protected habitat.

The Draft MSIP included a proposal to secure conservation easements, and develop long-term management plans, for a number of permittee-responsible mitigation sites. The list of potential permittee-responsible mitigation sites identified in the Draft MSIP has not been finalized and is subject to augmentation with Service approval. The permittee-responsible mitigation sites were selected based on their relatively high conservation value (e.g., proximity to other protected habitats or conserved areas, location within important wildlife movement corridors, recovery areas, or designated critical habitat, the presence of listed species and/or suitable habitat, and ability to satisfy the requirements of the Service and other permitting agencies). The permanent protection of the permittee-responsible mitigation sites would also support goals identified in the recovery plan for vernal pool plants and crustaceans by protecting habitat within key vernal pool core areas; support goals identified in the recovery plan for San Joaquin kit fox by protecting habitat within key wildlife movement corridors; and protect habitat that the Service has deemed critical for the survival and recovery of listed vernal pool plants and crustaceans. For all proposed mitigation sites, long-term management plans, conservation easements, and funding analyses for the long-term endowments will be submitted to the Service for review and approval before the plans are finalized and implemented. The Authority may purchase habitat compensation credits at a Service-approved mitigation site or conservation bank in addition to securing permittee-responsible sites.

The Authority has proposed phasing of the mitigation strategy in accordance with the progress of construction of the Merced to Fresno Section. Effects associated with PP1 will be mitigated before or at the onset of construction of PP1. Implementation of permittee-responsible mitigation that is consistent with the MSIP for PP1 and each future phase of construction for the Merced to Fresno Section will commence on or before the commencement of construction for each respective project phase. The Authority anticipates that effects associated with PP1 and future permitting phases will be mitigated before or concurrently with each of those respective phases; when this is not feasible, the Authority will provide financial or other legal assurances deemed sufficient by the Service that guarantee performance of the phase-specific compensatory mitigation plan.

The Authority has proposed the following for the CV-Wye and RR-M portions of the CHST M-F Project:

Federally Listed Species/ Species Group	**Minimum Compensatory Habitat**
San Joaquin kit fox	1:1 ratio for natural lands[1] 0.1:1 for suitable urban or agricultural lands[2]
Blunt-nosed leopard lizard	1:1 ratio for permanent effects 0.5:1 ratio for temporary effects
Giant garter snake	1:1 ratio for aquatic habitat 0.1:1 ratio for upland habitat

California tiger salamander	1:1 ratio for permanent effects 0.5:1 ratio for temporary effects
Valley elderberry longhorn beetle	Compensatory mitigation will follow the Service's May 2017 *Framework for Assessing Impacts to the Valley Elderberry Longhorn Beetle.*
Vernal pool fairy shrimp and vernal pool tadpole shrimp	2:1 ratio for vernal pool habitat 1.1:1 ratio for seasonal wetland habitat
Federally-listed plant species	1:1 ratio based on actual acres of direct effects (i.e., acres of occupied habitat directly impacted)

[1]California Annual Grassland, Barren, Constructed Watercourse, Inactive Agriculture, Pasture, Ruderal
[2]Orchard, Row Crop

Analytical Framework for the Jeopardy Determination

Section 7(a)(2) of the Endangered Species Act requires that federal agencies ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of listed species. "Jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR § 402.02).

The jeopardy analysis in this biological opinion considers the effects of the proposed federal action, and any cumulative effects, on the rangewide survival and recovery of the listed species. It relies on four components: (1) the *Status of the Species*, which describes the rangewide condition of the species, the factors responsible for that condition, and its survival and recovery needs; (2) the *Environmental Baseline*, which analyzes the condition of the species in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the species; (3) the *Effects of the Action*, which determines the direct and indirect impacts of the proposed federal action and the effects of any interrelated or interdependent activities on the species; and (4) the *Cumulative Effects*, which evaluates the effects of future, non-federal activities in the action area on the species.

Action Area

The action area is defined in 50 CFR § 402.02, as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." For the purposes of the effects assessment, the action area includes the CHST-MF area footprint and lands surrounding it. The estimated length of the Merced to Fresno alignment will extend approximately 85 miles. The area affected by disturbance from noise and vibrations, dust, and lighting during project construction is expected to extend up to 1,000 feet from both sides of the track. Associated project structures, such as roadway improvements, overcrossings, related ancillary facilities, and other permanent project elements, are included in the estimated project action area for the CHST-MF Project. The action area is estimated to include a total of 30,709 acres, which will be considered for the purposes of this opinion (Table 4). The estimated project action area for the proposed LKMS project is 1,555.75 acres. Therefore, the total project action area for the Merced to Fresno alignment and the LKMS project combined is estimated to be 32,264.75 acres.

Table 4. Total Action Area Estimates

Area	Hybrid[a]	PP1	CV-Wye	RR-M	LKR
Area of Direct Effect[b] (acres)	3,496	1,788	2,872	391	1,555.75
Area of Indirect Effect[c] (acres)	24,588	9,036	14,075	2,547	0
Estimated Project Action Area (acres)	28,084	10,824	16,947	2,938	1,555.75

[a] The Hybrid Alternative included two Design Options for a portion of the CV-Wye. In addition, the CV-Wye extends farther west than what was evaluated in the 2012 M-F BO and RR-M has been adjusted. Therefore, this column no longer reflects the total anticipated impacts of the M-F Section and is included only for context.

[b] Includes all roadway improvements, overcrossings, and other related ancillary facilities, such as electrical substations and other elements

[c] 1,000-foot area of indirect effects on both sides of HST

Status of the Species

San Joaquin kit fox

The status of the kit fox has been assessed in the *Recovery Plan for Upland Species of the San Joaquin Valley, California* (Service 1998) (SJV Recovery Plan) and a 5-year review. For the most recent comprehensive assessment of the range-wide status of the kit fox, please refer to the *San Joaquin Kit Fox (Vulpes macrotis mutica) 5-Year Review: Summary and Evaluation* (Service 2010b). No change in the species' listing status was recommended in the 5-year review. While there has been continued loss of habitat throughout the various recovery areas identified in the 5-year review, to date no project has proposed a level of effect for which the Service has issued a biological opinion of jeopardy for the kit fox.

Giant kangaroo rat

The status of the GKR has been assessed in the SJV Recovery Plan and a 5-year review. For the most recent comprehensive assessment of the range-wide status of the kit fox, please refer to the *Giant kangaroo rat (Dipodomys ingens) 5-Year Review: Summary and Evaluation* (Service 2010c). No change in the species' listing status was recommended in the 5-year review. While there has been continued loss of habitat throughout the various recovery areas identified in the 5-year review, to date no project has proposed a level of effect for which the Service has issued a biological opinion of jeopardy for the GKR.

Blunt-nosed leopard lizard

The status of the lizard has been assessed in the SJV Recovery Plan and a 5-year review. For the most recent comprehensive assessment of the range-wide status of the kit fox, please refer to the *Blunt-nosed leopard lizard (Gambelia sila) 5-Year Review: Summary and Evaluation* (Service 2010d). No change in the species' listing status was recommended in the 5-year review. While there has been continued loss of habitat throughout the various recovery areas identified in the 5-year review, to date no project has proposed a level of effect for which the Service has issued a biological opinion of jeopardy for the lizard.

Giant gartersnake

The status of the snake has been assessed in the *Recovery Plan for the Giant Garter Snake (Thamnophis gigas)* (Service 2017a) (GGS Recovery Plan) and 5-year reviews. For the most recent comprehensive assessment of the range-wide status of the snake, please refer to the GGS Recovery Plan and the *Giant Garter Snake (Thamnophis gigas) 5-Year Review: Summary and Evaluation* (Service 2012a). No change

in the species' listing status was recommended in the 5-year review. While there has been continued loss of habitat throughout the various recovery areas identified in the GGS Recovery Plan, to date no project has proposed a level of effect for which the Service has issued a biological opinion of jeopardy for the snake.

Central California tiger salamander

The status of the salamander has been assessed in the *Recovery Plan for the Central California Distinct Population Segment of the California Tiger Salamander (Ambystoma californiense)* (Service 2017b) (CTS Recovery Plan) and a 5-year review. For the most recent comprehensive assessment of the range-wide status of the salamander, please refer to the CTS Recovery Plan and the *California Tiger Salamander Central California Distinct Population Segment (Ambystoma californiense) 5-Year Review: Summary and Evaluation* (Service 2014a). No change in the species' listing status was recommended in the 5-year review. While there has been continued loss of habitat throughout the various recovery areas identified in the 5-year review, to date no project has proposed a level of effect for which the Service has issued a biological opinion of jeopardy for the salamander.

Conservancy fairy shrimp

The status of the Conservancy fairy shrimp has been assessed in the *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (Service 2005) (Vernal Pool Recovery Plan) and 5-year reviews. For the most recent comprehensive assessment of the range-wide status of the Conservancy fairy shrimp, please refer to the *Conservancy Fairy Shrimp (Branchinecta conservatio) 5-Year Review: Summary and Evaluation* (Service 2012b). No change in the species' listing status was recommended in the 5-year review. While there has been continued loss of vernal pool habitat throughout the various vernal pool regions identified in the Vernal Pool Recovery Plan, to date no project has proposed a level of effect for which the Service has issued a biological opinion of jeopardy for the Conservancy fairy shrimp.

Vernal pool fairy shrimp

The status of the vernal pool fairy shrimp has been assessed in the Vernal Pool Recovery Plan and a 5-year review. For the most recent comprehensive assessment of the range-wide status of the vernal pool fairy shrimp, please refer to the *Vernal Pool Fairy Shrimp (Branchinecta lynchi) 5-Year Review: Summary and Evaluation* (Service 2007a). No change in the species' listing status was recommended in the 5-year review. While there has been continued loss of vernal pool habitat throughout the various vernal pool regions identified in the Vernal Pool Recovery Plan, to date no project has proposed a level of effect for which the Service has issued a biological opinion of jeopardy for the vernal pool fairy shrimp.

Vernal pool tadpole shrimp

The status of the tadpole shrimp has been assessed in the Vernal Pool Recovery Plan and a 5-year review. For the most recent comprehensive assessment of the range-wide status of the tadpole shrimp, please refer to the *Vernal Pool Tadpole Shrimp (Lepidurus packardi) 5-Year Review: Summary and Evaluation* (Service 2007b). No change in the species' listing status was recommended in the 5-year review. While there has been continued loss of vernal pool habitat throughout the various vernal pool regions identified in the Vernal Pool Recovery Plan, to date no project has proposed a level of effect for which the Service has issued a biological opinion of jeopardy for the tadpole shrimp.

Colusa grass

The status of the Colusa grass has been assessed in the Vernal Pool Recovery Plan and a 5-year review. For the most recent comprehensive assessment of the range-wide status of the Colusa grass, please refer to the *Colusa Grass (Neostapfia colusana) 5-Year Review: Summary and Evaluation* (Service 2008). No change in the species' listing status was recommended in the 5-year review. While there has been continued loss of vernal pool habitat throughout the various vernal pool regions identified in the Vernal Pool Recovery Plan, to date no project has proposed a level of effect for which the Service has issued a biological opinion of jeopardy for the Colusa grass.

San Joaquin Valley Orcutt grass

The status of the San Joaquin Valley Orcutt grass has been assessed in the Vernal Pool Recovery Plan and a 5-year review. For the most recent comprehensive assessment of the range-wide status of the San Joaquin Valley Orcutt grass, please refer to the *Orcuttia inequalis (San Joaquin Valley Orcutt Grass) 5-Year Review: Summary and Evaluation* (Service 2013). No change in the species' listing status was recommended in the 5-year review. While there has been continued loss of vernal pool habitat throughout the various vernal pool regions identified in the Vernal Pool Recovery Plan, to date no project has proposed a level of effect for which the Service has issued a biological opinion of jeopardy for the San Joaquin Valley Orcutt grass.

Hairy Orcutt grass

The status of the hairy Orcutt grass has been assessed in the Vernal Pool Recovery Plan and a 5-year review. For the most recent comprehensive assessment of the range-wide status of the hairy Orcutt grass, please refer to the *Hairy Orcutt Grass (Orcuttia pilosa) 5-Year Review: Summary and Evaluation* (Service 2009a). No change in the species' listing status was recommended in the 5-year review. While there has been continued loss of vernal pool habitat throughout the various vernal pool regions identified in the Vernal Pool Recovery Plan, to date no project has proposed a level of effect for which the Service has issued a biological opinion of jeopardy for the hairy Orcutt grass.

Greene's tuctoria

The status of the Greene's tuctoria has been assessed in the Vernal Pool Recovery Plan and a 5-year review. For the most recent comprehensive assessment of the range-wide status of the Greene's tuctoria, please refer to the Greene's tuctoria *(Tuctoria greenei) 5-Year Review: Summary and Evaluation* (Service 2007c). No change in the species' listing status was recommended in the 5-year review. While there has been continued loss of vernal pool habitat throughout the various vernal pool regions identified in the Vernal Pool Recovery Plan, to date no project has proposed a level of effect for which the Service has issued a biological opinion of jeopardy for the Greene's tuctoria.

Succulent owl's-clover

The status of the owl's-clover has been assessed in the Vernal Pool Recovery Plan and a 5-year review. For the most recent comprehensive assessment of the range-wide status of the owl's-clover, please refer to the *Castilleja campestris ssp. succulenta (Fleshy Owl's-Clover) 5-Year Review: Summary and Evaluation* (Service 2011). No change in the species' listing status was recommended in the 5-year review. While there has been continued loss of vernal pool habitat throughout the various vernal pool regions identified in the Vernal Pool Recovery Plan, to date no project has proposed a level of effect for which the Service has issued a biological opinion of jeopardy for the owl's-clover.

Hoover's spurge

The status of the Hoover's spurge has been assessed in the Vernal Pool Recovery Plan and a 5-year review. For the most recent comprehensive assessment of the range-wide status of the Hoover's spurge, please refer to the *Chamaesyce hooveri (Hoover's Spurge) 5-Year Review: Summary and Evaluation* (Service 2009b). No change in the species' listing status was recommended in the 5-year review. While there has been continued loss of vernal pool habitat throughout the various vernal pool regions identified in the Vernal Pool Recovery Plan, to date no project has proposed a level of effect for which the Service has issued a biological opinion of jeopardy for the Hoover's spurge.

Palmate-bracted bird's-beak

The status of the bird's-beak has been assessed in the SJV Recovery Plan and a 5-year review. For the most recent comprehensive assessment of the range-wide status of the bird's-beak, please refer to the *Palmate-bracted Bird's-beak (Cordylanthus palmatus = Chloropyron palmatum) 5-Year Review: Summary and Evaluation* (Service 2009c). No change in the species' listing status was recommended in the 5-year review. While there continues to be loss of habitat throughout its range, to date no project has proposed a level of effect for which the Service has issued a biological opinion of jeopardy for the bird's-beak.

San Joaquin woollythreads

The status of the woollythreads has been assessed in the SJV Recovery Plan and a 5-year review. For the most recent comprehensive assessment of the range-wide status of the woollythreads, please refer to the *Monolopia (=Lembertina) congdonii (San Joaquin woolly-threads) 5-Year Review: Summary and Evaluation* (Service 2010e). No change in the species' listing status was recommended in the 5-year review. While there continues to be loss of habitat throughout its range, to date no project has proposed a level of effect for which the Service has issued a biological opinion of jeopardy for the woollythreads.

Valley elderberry longhorn beetle

The status of the beetle has been assessed in a 5-year review and in response to a petition to delist. For the most recent comprehensive assessment of the range-wide status of the beetle, please refer to the *Withdrawal of the Proposed Rule To Remove the Valley Elderberry Longhorn Beetle From the Federal List of Endangered and Threatened Wildlife* (Service 2014b). While there continues to be loss of beetle habitat throughout its range, to date no project has proposed a level of effect for which the Service has issued a biological opinion of jeopardy for the beetle.

Environmental Baseline

Geography, topography, and climate

The Merced to Fresno Section is located within the San Joaquin Valley, which is the southern half of the Great Valley ecological subregion. The San Joaquin Valley trends northwest from the Tulare Basin at the southern end to the Sacramento–San Joaquin Delta at the northern end. The eastern edge of the valley meets the western slope of the Sierra Nevada, and the western edge of the valley meets the eastern slope of the Temblor and Diablo ranges that together constitute the southern interior Coast Range ecoregion. Elevations above mean sea level in the Action Area range from 160 feet near Downtown Merced to 300 feet north of Downtown Fresno. The topography throughout

the project action area is generally flat with slopes ranging from 0 percent to 2 percent. Drainage generally flows to the west and southwest.

The San Joaquin Valley has an arid to semi-arid climate. Summers are generally hot and dry, whereas winters are cool and wet. Mean annual temperatures range from a low of 36 degrees Fahrenheit (°F) in December to a high of 98°F in July (Western Region Climate Center [WRCC] 2010). The growing season (defined as a 50 percent probability of temperatures at or above 32°F) ranges from 261 days (March 3 to November 19) for Merced to 300 days (February 5 to December 1) for Fresno (Natural Resources Conservation Service 2002). Average annual precipitation is approximately 12.5 inches in the northern part of the project action area near Merced, and approximately 11.0 inches in the southern part of the project action area near Fresno (WRCC 2010). Approximately 80 percent of the annual rainfall in the project action area occurs between November and March.

The project action area lies within the southern portion of the San Joaquin River Basin, which extends from the Sacramento-San Joaquin Delta in the north to the northerly boundary of the Tulare Lake Basin in the south, and from the crest of the Sierra Nevada Range in the east to the crest of the Coast Ranges in the west. The basin encompasses approximately 13,500 square miles and includes large areas of high elevation along the western slope of the Sierra Nevada. As a result, the San Joaquin River experiences significant snowmelt runoff during the late spring and early summer. Flood flows typically occur between April and June.

The Merced to Fresno Section is located in three watershed sub-basins: the Middle San Joaquin–Lower Chowchilla, Fresno River, and Upper Dry. Most of the project action area is located to the north of the San Joaquin River in the Middle San Joaquin–Lower Chowchilla Watershed. The portion of the project action area to the south of the San Joaquin River is located in the Tulare-Buena Vista Lakes Watershed. Prominent water features in the project action area include Bear Creek, Miles Creek, Owens Creek, Duck Slough, Deadman Creek, Dutchman Creek, the Chowchilla River, Ash Slough, Berenda Slough, Berenda Creek, Dry Creek, the Fresno River, Cottonwood Creek, and the San Joaquin River. The natural hydrology of the region has been significantly altered through the construction of dams, storage reservoirs, diversion dams, canals, and groundwater pumping associated primarily with agricultural irrigation.

Land use

Agricultural lands account for approximately 75 percent of the land use within the project action area. Orchards, vineyards, fallow fields, row crops and field crops constitute 66 percent, while dairies, pastures, and inactive agriculture constitute an additional 10 percent. Urban areas, including large cities such as Merced and Fresno and several smaller cities between, constitute the second greatest land use within the project action area.

LKMS: Topography and Hydrology

The proposed LKMS is situated on alluvial terraces adjacent to the historic floodplain of the Chowchilla River. The elevation at the site ranges from 279 to 336 feet above mean sea level (msl). The Ranch is situated on alluvial terraces adjacent to the historical floodplain of the Chowchilla River. Elevations at the site range from 268 to 366 feet above msl. The northern portion of the Ranch is fairly level with well-developed mima mound topography and a high density of vernal pools. Continuing south, the elevation drops across rolling topography to the terrace bordering the Chowchilla River floodplain. The northeastern part of the site has more weakly developed mima mound topography and more widespread, larger vernal pools typically situated within low areas along swales. Along the northwestern part of the site, there is yet another elevation drop to the

terrace that borders the Chowchilla River floodplain. This area has more weakly developed mima-mound topography and more widespread, larger vernal pools typically situated within low areas along swales. The Chowchilla River floodplain is the lowest terrace in elevation. Immediately adjacent to the Chowchilla River on the southern side, the same topographic series of terraces repeats: a terrace with rolling topography closest to the river and then the elevation increases to a terrace with well-developed mima-mounds and a high density of vernal pools. On this higher elevation terrace, there is a portion of ground that was previously leveled for agriculture, but not deep-ripped.

The proposed LKMS is within the Chowchilla River Watershed of the Middle San Joaquin-Lower Chowchilla River hydrologic unit within the San Joaquin River Basin hydrologic unit (HUC: 18040001, USGS). The Chowchilla River is a minor tributary of the San Joaquin River that originates in the lower foothills of the Sierra Nevada (approximately 5,000 feet elevation) and flows southwest through the foothills and valley floor, where it forms the border of Merced and Madera counties, until it reaches the proposed LKMS. Currently, the main flow of the Chowchilla River is diverted for irrigation water through two adjacent sloughs (Ash Slough and Berenda Slough) by an upstream diversion dam to Berenda Reservoir. As a result, flows are erratic (depending on water releases) and, except for isolated pools in the river bottom, the riverbed is often dry during the spring and fall.

Overall, surface water within the proposed LKMS drains towards the Chowchilla River, which flows from east to west towards its confluence with the San Joaquin River and ends abruptly approximately 33 miles east of this confluence. This intermittent stream was historically primarily precipitation driven, and typically became dry during the summer months. However, now more of its flows are due to upstream water releases in the summer months, which are then diverted to the two sloughs for irrigation.

The only other sources of surface hydrology within the proposed LKMS are natural rainfall and overland surface flow during and following periods of heavy rain. Vernal pools within the proposed LKMS pond continuously or intermittently from late fall through spring or early summer. Duration and timing of ponding varies according to seasonal rainfall patterns. Smaller pools are more ephemeral, remaining ponded for a few to several weeks in winter or early spring. Larger vernal pools can remain inundated continuously from late fall into early summer. There are no well-developed creeks within the proposed LKMS, although there are numerous ephemeral drainages and vernal swales. These drainages flow for only short periods (typically 1 or 2 weeks) following heavy rains. Most of the drainages have only intermittently developed beds and banks. The vernal pools and grasslands within the proposed LKMS are above the 100-year flood zone of the Chowchilla River and are not subject to flooding from the river due to elevation and upstream water control structures.

LKMS: Geology

The geologic formations within the proposed LKMS are predominantly Turlock Lake, Riverbank, Modesto, and channel fill. Approximately one million years ago, the granitic outwash of the Chowchilla River covered the site in coarse, sandy material. This Turlock Lake Formation covered large portions of the eastern San Joaquin Valley. Approximately 100,000 years ago, a second granitic outwash covered large portions of the Turlock Lake Formation (mid Pleistocene). This newer formation is known as the Riverbank Formation. Since then, approximately 50,000 years ago, a third outwash covered the immediate floodplain area in the Modesto Formation.

Over time, weathering and erosion have re-exposed sections of Turlock Lake from under its cover of Riverbank. This process has left hilly mounds of Turlock Lake interspersed between patches of Riverbank. Additionally, the Chowchilla River and Ash Slough eventually cut swaths through the Modesto Formation areas, depositing channel fill and covering areas of the floodplain in sandy silt.

These processes have resulted in a site-wide mosaic of channel fill in the Chowchilla River and Ash Slough channels. The immediate floodplain area is covered in the Modesto Formation. Upslope, the outer floodplain is exposed bluffs and hills of the Turlock Lake Formation (cut out from under the Riverbank Formation). The upper portions of the proposed LKMS remain Riverbank Formation, still covering the ancient deposits of Turlock Lake. Turlock Lake consists of hilly, sloping terrain with coarse sandy loam soils (Whitney/Rocklin and Cometa series) and typically larger vernal pools scattered within swale bottoms near the edge of the Chowchilla River floodplain. The Riverbank Formation consists of fairly level terrain with gravelly clay loam soils (Madera and San Joaquin series), well-developed mima-mound topography, and a high-density of small to medium size vernal pools. The Modesto Formation consists of fairly level terrain with fine sandy loam soils deposited as alluvium along channels and terraces, and fewer vernal pools.

LKMS: Soils

A mosaic of soils associated with these geologic formations is present within the Lazy K Mitigation Site. Soil mapping units within the LKMS include the following soil types: Madera, San Joaquin, Whitney-Rocklin, Cometa, and Borden.

LKMS: Land Use

The ICA, the Preservation Area, and the RRA have historically been used for cattle and horse grazing. These areas have remained largely unchanged since at least 1946 (Vollmar Consulting 2009). The WRA was historically irrigated and used to pasture cattle and horses as needed. The LKMS is zoned for agricultural uses and has been registered since 1970 under the California Land Conservation Act of 1965 (Williamson Act). The LKMS (including the previously irrigated WRA) is not irrigated and is used for cattle and horse grazing. One stock pond exists in the WRA. Grazing typically occurs from November to May. Existing livestock grazing uses are proposed to be continued in a manner that maintains habitat value and high diversity of special-status species. Fifteen wells scattered across the Ranch provide water for irrigation, stock tanks, and domestic use.

Noise environment

The current existing noise environment in the project action area is influenced by Highway 99, UPRR and BNSF railroad traffic, local community noise, and local roadway traffic. The lowest measured decibels (dBA) was 46 and the peak measured dBA was 75 (e.g. operating a lawnmower at 50 feet). The typical measured dBA was in the mid-sixties (e.g. sound produced by an air conditioner unit at 50 feet) (Authority and FRA 2012a; page 3.4-4). At the northern end of the alignment in Atwater, passenger and freight trains dominate the noise exposure in areas close to the UPRR and BNSF tracks. In areas within close proximity to Santa Fe Avenue, local roadway traffic dominates the noise environment. Nearing Merced from the north, traffic on Highway 99 and freight trains on the UPRR railroad dominate the noise exposure, with roadway traffic contributing more noise near the city center where Highway 99, SR 59, and SR 140 converge. (Authority and FRA 2012a; page 3.4-25).

South of Merced, noise from Highway 99 and UPRR dominate the noise environment in unincorporated areas between Merced and Chowchilla. South of Chowchilla, noise from Highway 99 and UPRR dominates the existing noise environment at scattered residences. Upon entering Madera, the HST alignment moves farther from Highway 99, and the noise environment near Madera's city center is dominated by UPRR traffic and local community noise. The Madera Municipal Airport contributes aircraft noise to the environment (Authority and FRA 2012a; page 3.4-25).

In the unincorporated area between Madera and Fresno, SR 99 and UPRR traffic dominate the noise environment. Entering Fresno, the noise environment is dominated by freight trains and local roadway traffic. The UPRR runs through Fresno east of SR 99, and the UPRR rail yard is located between Ashlan Avenue and Clinton Avenue. In this area, the rail yard contributes to the noise environment along with Highway 99 and local community noise. South of the rail yard, the noise environment is dominated by UPRR traffic and local community noise. (Authority and FRA 2012a; page 3.4-25)

Fresno is the most densely populated city within the proposed MF alignment, with several highways, busy local roads, UPRR, and aircraft noise contributing to the noise environment. Highway 99, Highway 180, and Highway 41 are all near the proposed HST station site in Fresno. Aircraft noise from three local airports adds to the existing noise environment in the Fresno area. (Authority and FRA 2012a, page 3.4-25).

San Joaquin kit fox

The entire project action area occurs within the known geographic and historic range of the kit fox. The kit fox in Merced, Madera, and Fresno Counties exists among several extremely small fragmented populations that may be at or below the extinction threshold for this species (Service 2010b; B. Cypher, pers. comm., 2012). Kit fox populations exist among patches of suitable and sub-marginal habitat fragmented by highways, roads, urbanization, and agricultural land uses within these counties (Authority and FRA 2012b). The Service is aware of kit fox observations within intervening areas of suitable habitat in western Merced County between U.S. Highway 5 and State Highway 99 documented in thirteen California Natural Diversity Database (CNDDB) records (Occurrence #'s 47, 195, 369, 372, 600, 601, 602, 872, 876, 877, 878, 881, and 882; CNDDB 2012).

Connectivity among existing kit fox populations is limited by existing highways, roads, the BNSF rail line, urban development, and incompatible agricultural land uses (Service 2010b; Spencer et al. 2010). The proposed route for Merced to Fresno alignment will intersect with several movement corridors identified for this species (Service 2010b; Spencer et al. 2010). These corridors provide habitat to support the movement of kit fox among populations and core habitat areas that support denning and foraging for this species.

The kit fox, a wide-ranging species, has been reported throughout Merced, Madera, and Fresno Counties. Therefore, it is reasonably likely that kit fox may be present within the counties surrounding the Merced to Fresno alignment, and the species would use suitable habitats within the project action area. West of Highway 99 from the Hatfield State Recreation Area through western Fresno County, there are over 25 occurrences of kit fox recorded in the CNDDB, 10 of which were documented from 1975 through 2000 within 12 to 15 miles of the proposed route for Merced to Fresno alignment (CNDDB 2012). The majority of these occurrences report observations of one to two adults and/or juveniles in both natural habitat areas and agricultural lands.

The information documented in occurrence # 195 suggests the existence of a small kit fox population within dispersal range of the project action area (approximately 12 miles). Occurrence # 195 documents the results of surveys that were conducted over several days in late August, 1999, outside of the pupping season. During these surveys, several adult kit foxes, many tracks, scats, and about 67 potential dens were observed. This occurrence was located in the vicinity of Chamberlain Road south of the Merced National Wildlife Refuge within the Eastman Lake-Bear Creek corridor, identified as a critical for maintaining connectivity among kit populations in the SJV Recovery Plan. The remaining 15 occurrences, which were located approximately 20 to 30 miles west of the project action area were documented from 1920 to 1999. Several of these occurrences document individuals were taken for museum specimens during 1920. The occurrences recorded from 1971 through 1999 document isolated observations of only one or two adults, individual juveniles, a few dens, or road-killed individuals.

There are six documented occurrences of kit fox in the CNDDB located east of Highway 99, near Merced. Occurrence # 89 was a recorded in 1993 as a road mortality along Highway 99 near Herndon in Fresno County within the project action area. Two adult kit foxes were observed foraging in an almond orchard within 2.5 miles of the project action area during May, 2001 (occurrence #25). A single adult was observed in an area of annual grassland located approximately 5 miles from the project action area during April, 2001 (occurrence #24). Individual adults were also observed (occurrences #'s 26 and 30) within five miles of the project action area during 1999 and 2001. The sixth occurrence (CNDDB # 23), located approximately 5 miles northwest of Merced on private residential and agricultural lands, consisted of individual adults and juveniles observed during surveys conducted during 1999.

The Service is not aware of any recent or on-going studies in Merced, Madera, and Fresno Counties that could provide updated information regarding the current status of the kit fox within this portion of its range. Radio-telemetry studies of kit fox in these counties have not been conducted. Therefore, information regarding kit fox habitat use and movement within these counties is currently unavailable.

The kit fox has the potential to occur in areas of suitable and sub-marginal habitat throughout the project action area. Suitable foraging and breeding habitat for the kit fox in the project action area may be found in natural lands such as annual grassland, barren, and pasture and compatible-use agricultural lands. Approximately 46,448 acres of habitat highly suitable for occupancy by kit fox occurs within Merced, Madera, and Fresno counties (Table 5). Compatible-use agricultural lands constitute about 171,543 acres that provide suitable habitat for movement and foraging by this species (Table 5). Although the species may be observed using compatible-use agricultural lands throughout the Merced to Fresno Section, kit fox may have greater potential to den and breed in natural habitat found within conservation areas. Kit fox may occur within linkage areas and satellite recovery areas identified in the SJV Recovery Plan and the 5-year review which intersect with the project action area. Large blocks of natural areas identified in the California Connectivity Project linkages, within dispersal distance of the project action area, may provide high quality natal and non-natal denning habitat for the support kit fox (Spencer et al. 2010).

Table 5. Current estimates of suitable habitat for San Joaquin kit fox (Cypher, pers. comm., 2012).

County	Suitable Habitat/Natural Areas*	Compatible-Use Agricultural Lands **	Total Per County
Merced	10,761	80,523	91,284
Madera	3,015	33,310	36,325
Fresno	32,672	57,710	90,382
Totals Per Category	**46,448**	**171,543**	**217,991**

* Highly suitable for occupancy by San Joaquin kit fox; provides habitat for denning, breeding, and foraging.

** Suitable for movement of San Joaquin kit fox among areas of more suitable habitat; provides potential habitat for foraging and limited denning habitat.

Although agricultural lands may be suboptimal for kit fox breeding, individuals may use agricultural lands for foraging and dispersal. Grain crops and alfalfa, in particular, may host populations of prey species for kit fox. Agricultural lands within one mile of natural habitat may be used more frequently for foraging and dispersal than agricultural lands isolated from movement corridors and natural lands (Warrick et al 2007). Telemetry studies of kit fox in Kern County revealed use of a natural 196-foot wide grassland area within a 32 kilometer ROW along an aqueduct (Warrick et al 2007). Live trapping revealed high densities and diversity of rodents in this area and remains of murid rodents were found in 79 percent of kit fox scats. It is possible that kit fox may use similar areas, such as the ROW, and compatible-use agricultural lands within the project action area for foraging and denning. This same study also revealed that orchards were used disproportionately greater than their availability in the study area. Almond orchards are the most common agricultural crop within the project action area and may be used by local kit fox (Table 6, below).

Construction has been underway on PP1 since 2015. Since initiation of construction, additional ROW has been acquired and preconstruction surveys have been conducted prior to the start of work at all locations within suitable habitat for the kit fox. To date, no kit fox have been detected during monitoring of potential kit fox dens within PP1.

LKMS: San Joaquin kit fox

Kit foxes were not observed within the LKMS during extensive surveys conducted during 2001 (Vollmar Consulting 2009). However, the LKMS provides over 400 acres of upland habitat, which could support migration, denning, or foraging for this species. Kit foxes are capable of long-range dispersal, especially young foxes that are leaving their natal territories (generally from June to November). In addition, the LKMS is located within a designated kit fox migration corridor, critical for the survival and recovery of the species (Service 2010b).

Giant kangaroo rat

The historic range of GKR extended north to Los Banos in western Merced County (Service 1998). While the species may be extirpated in Merced County (Service 2010c), small, isolated colonies remain in Fresno County. The Panoche Junction – Oro Loma 115 kV Power Line and a portion of the Los Banos – Oro Loma – Canal 70 kV Power Line, EINU components of the CV-Wye portion

of the action area, are within the range of the GKR. Surveys have not been conducted in the action area. There are 17 known occurrences of the GKR in the CNDDB within 10 miles of the project footprint (CNDDB 2016). Due to the proximity of known occurrences, it is likely that GKR may be found in suitable habitat within the action area.

Blunt-nosed Leopard Lizard

The CV-Wye alignment and EINU activities are within the range of the lizard, and suitable habitat (barren, California annual grassland, valley sink scrub, and ruderal) has been mapped within the action area. Protocol-level surveys have not been conducted in the action area, as not all areas are currently accessible. There are 20 known occurrences of the lizard in the CNDDB within 10 miles of the proposed project (CNDDB 2019). Due to the proximity of known occurrences, it is likely that lizards may be found in suitable habitat within the action area.

Giant gartersnake

The CV-Wye alignment is within the range of the snake, and suitable aquatic (freshwater marsh, natural watercourse, open water, and palustrine forested wetlands) and upland (California annual grassland and pasture within 200 feet of aquatic) habitats have been mapped within the action area. Protocol-level surveys have not been conducted in the action area. There are 13 known occurrences of the snake in the CNDDB within 10 miles of the project footprint (CNDDB 2016), including one occurrence located within the construction footprint (occurrence # 161). Due to the proximity of known occurrences, it is likely that snakes may be found in suitable habitat within the action area. However, snakes are only known to persist in the San Joaquin Valley in small numbers (Service 2012a).

Central California tiger salamander

There are 80 salamander occurrences documented within portions of Merced, Madera, and Fresno counties that surround the project action area, including several within vernal pools within, and immediately adjacent to, the Great Valley Conservation Bank north of the Chowchilla River located approximately 2 to 3 miles from the project action area (occurrence #'s 307, 901, 989, 990, 991, and 1021) (CNDDB 2012). Four occurrences have been documented within 1.25 miles of the project action area (occurrence #'s 306, 307, 309 and 684). Two occurrences located within the project action area are presumed extirpated, one located near Fresno and another close to Madera (occurrence #'s 583 and 616, respectively). Salamander larvae were identified in vernal pool habitat near the intersection of White Rock Road and Santa Fe Avenue located about 0.5 mile northwest of the Great Valley Conservation Bank during special-status plant surveys in 2011 (Authority and FRA 2011). Protocol-level surveys for this species have not been conducted within the entire project action area.

Evidence of hybridization with non-native tiger salamanders was detected in 10 central California tiger salamander larvae sampled from ponds within occurrence # 901, which is located immediately adjacent to Great Valley Conservation Bank (Fitzpatrick et al. 2010; Bielfeldt, pers. comm., 2012). Occurrence #'s 307, 989, 990, and, 991 are located within 0.25 to 0.80 mile of occurrence # 901. While it is not known whether hybrid central California tiger salamanders have spread among other breeding ponds near occurrence #901, the combination of proximity to known hybrid locations, the known dispersal distance of adult and juvenile salamanders, and the documented transmission of these hybrid alleles across the landscape make it reasonably likely that hybridization could be introduced to nearby breeding ponds.

Potentially suitable aquatic and upland habitat has been identified within the project action area. Preliminary habitat surveys identified suitable habitat for all life-history stages of the salamander, such as vernal pools and other seasonal wetlands, California annual grasslands, and some agricultural lands, such as pastures and dry land grain crops that support small burrowing mammals, throughout the project action area. However, many areas of suitable upland habitat may be fragmented and isolated from suitable breeding habitat as a result of urbanization, highways, roads, lands subjected to certain types of agricultural practices, and other areas subject to incompatible land uses and development. For example, agricultural fields may be regularly disked or turned, which may destroy burrows and potentially crush or smother salamanders. Agricultural lands may also be subject to frequent rodenticide application, which may directly kill small mammal species and reduce burrow availability for salamanders (upland refugia) in fallowed or pasture land.

During construction on PP1, salamanders have been discovered at multiple locations, including large numbers at Avenue 12 and Road 27. Due to the proximity of known occurrences, it is likely that salamanders may be found in suitable habitat in the remainder of the M-F Section.

LKMS: central California tiger salamander

Salamander larvae were detected within 26 pools in the LKMS during surveys conducted in 2001 (Vollmar Consulting 2009). These larvae were observed in large, deep pools (approximately 12 inches to more than 24 inches deep) that remain inundated for at least 100 days in most years. These pools occur primarily within the Turlock Lake Formation. A few of the pools within the Riverbank Formation also support this species. A stock pond within the WRA that was not surveyed for salamander larvae may provide aquatic habitat for the species.
The extensive ground squirrel burrows, predominantly on the Turlock Lake Formation, likely provide upland habitat for adult salamanders. These burrows are very common throughout grassland portions of the PA, providing easy access to breeding pools. Suitable burrows are found only intermittently along the berms in the WRA. Therefore, although suitable upland habitat for salamander is present within the WRA, it is not as prevalent as elsewhere within the LKMS.

Conservancy fairy shrimp

Wetland delineation surveys identified seasonal wetlands and vernal pools within the CV-Wye and RR-M portions of the project action area that could provide habitat for Conservancy fairy shrimp. However, protocol-level surveys for this species have not been conducted within the project action area. Therefore, the status of this species within the project action area is not known at this time. There are six occurrences of Conservancy fairy shrimp documented within Merced County, two of which are located with 2 to 6 miles of the project action area (occurrence #'s 34 and 35) (CNDDB 2012). It is reasonably likely that Conservancy fairy shrimp may exist within the project action area because suitable habitat is present and CNDDB records indicate the presence of this species within close proximity. In the May 21, 2015, amendment to the 2012 M-F BO, the Service determined that no suitable habitat for the Conservancy fairy shrimp would be lost due to the construction of PP1.

LKMS: Conservancy fairy shrimp

Approximately 22.70 acres of vernal pool habitat in the LKMS occur within designated core area for the Conservancy fairy shrimp. However, this species has not been observed during any of the surveys of the site conducted from 2006 to 2009 (Vollmar Consulting 2009).

Vernal pool fairy shrimp

Wetland delineation surveys identified other seasonal wetlands and vernal pools within the project action area that could provide habitat for vernal pool fairy shrimp. However, protocol-level surveys for this species have not been conducted within the project action area. Therefore, the status of this species within the project action area is not known at this time. There are 184 occurrences of vernal pool fairy shrimp documented within Merced, Madera, and Fresno Counties, including four occurrences located within the project action area (occurrence #'s 12, 153, 181, and 310; CNDDB 2012). Vernal pool fairy shrimp were captured from a pool located on the south side of Avenue 13, about 0.1 mile east of the UPRR tracks in 1994 (occurrence # 12). Vernal pool fairy shrimp were observed in at least three of eight vernal pools during a 1993 survey (occurrence # 153). An adult vernal pool fairy shrimp was collected from a roadside vernal pool adjacent to railroad tracks in 1997 (occurrence # 181). Twenty-five adult and juvenile vernal pool fairy shrimp were discovered in tire tracks near a seasonal wetland that had become inundated during 1997 (occurrence # 310). It is reasonably likely that the vernal pool fairy shrimp is present within the project action area because suitable habitat is present and presence of this species within the action area has been documented in CNDDB records.

LKMS: vernal pool fairy shrimp

Vernal pool fairy shrimp were observed in 37 vernal pools within LKMS during comprehensive surveys of the site conducted from 2006 to 2009 (Vollmar Consulting 2009). This species occurs primarily in the PA, but several pools in the ICA and along the southern edge of the WRA also support vernal pool fairy shrimp.

Vernal pool tadpole shrimp

Wetland delineation surveys identified seasonal wetlands and vernal pools within the project action area that could provide habitat for the tadpole shrimp. However, protocol-level surveys for this species have not been conducted within the project action area. Therefore, the status of the taedpole shrimp within the project action area is not known at this time. There are 34 occurrences of tadpole shrimp documented within Merced County (CNDDB 2012). Eleven of these occurrences are located within 5 to 6 miles of the project action area (occurrence #'s 2, 3, 81, 123, 130, 187, 195, 244, 262, 263, and 264). None of these occurrences are located within the project action area. It is reasonably likely the tadpole shrimp is present within the project action area because suitable habitat is present and CNDDB records indicate the presence of this species within close proximity.

LKMS: vernal pool tadpole shrimp

Tadpole shrimp were found in 53 wetlands across many geologic formations within the PA and ICA. The majority of these observations occurred within the Turlock Lake Formation. Critical Habitat Unit 15 (Merced Unit) for tadpole shrimp has been designated throughout much of the LKMS.

Colusa grass

Potentially suitable vernal pool habitat for Colusa grass has been identified within the project action area. Protocol-level surveys for this species have not been conducted within the entire project action area because of limited access to properties where suitable habitat may exist. Therefore, the status of this species within the project action area is not known at this time. There are 22 occurrences of Colusa grass documented within Merced County (CNDDB 2012). Distances among these

occurrences range from 0.5 to 5.5 miles, and average about 2 to 3 miles. All of these occurrences are located within Merced County. The closest occurrences are located 4 to 5 miles from the project action area (occurrence #'s 39 and 42). Critical habitat for this species is located approximately 2 miles southwest of the Merced to Fresno Section. It is reasonably likely that the Colusa grass is present within the project action area because suitable habitat is present and CNDDB records indicate the presence of this species within close proximity.

No habitat for the Colusa grass was identified on PP1 or within the CV-Wye; however, a small amount of suitable habitat was identified in the RR-M portion of the M-F Section. Colusa grass was not identified during a plant survey conducted on PP1 in 2011 on properties where permission to enter was granted. Botanical surveys conducted within vernal pool habitat on a small portion of the CV-Wye in 2015 did not detect Colusa grass.

LKMS: Colusa Grass

It is likely that most of the pools in the LKMS do not maintain the prolonged inundation period required for Colusa grass. However, appropriate soils are present, and it is possible that some of the larger pools may provide potential habitat for this species (Vollmar Consulting 2009). It is reasonably likely that the Colusa grass is present within the LKMS because suitable habitat is present.

San Joaquin Valley Orcutt grass

Potentially suitable vernal pool habitat for San Joaquin Valley Orcutt grass has been identified within the project action area. Protocol-level surveys for this species have not been conducted within the entire project action area because of limited access to properties where suitable habitat may exist. Therefore, the status of this species within the project action area is not known at this time. There are over 24 occurrences of San Joaquin Valley Orcutt grass documented within several miles of the project action area, including one possibly extirpated occurrence (CNDDB 2012). A single occurrence is located within the project action area (occurrence # 10), where San Joaquin Valley Orcutt grass was identified within dry vernal pools along Santa Fe Avenue, which appears to be isolated from the four closest occurrences of this species, which are located 2 to 4 miles away (occurrence #'s 38, 39, 51, and 62). Given the distance of occurrence # 10 from other known locations of this species, it is likely that the existing plants constitute a small, but demographically and genetically discreet population of San Joaquin Valley Orcutt grass. It is reasonably likely that the San Joaquin Valley Orcutt grass is present within the project action area because suitable habitat is present and an occurrence of this species within the action area has been documented in CNDDB records.

San Joaquin Valley Orcutt grass was not identified during a plant survey conducted on PP1 in 2011 on properties where permission to enter was granted. San Joaquin Valley Orcutt grass is not expected to occur within the CV-Wye or RR-M portions of the proposed project due to these portions being on the margin of the known range of the species and the distance from known occurrences.

LKMS: San Joaquin Valley Orcutt grass

Most pools in the LKMS are smaller than the pool size typically required for this species. However, the appropriate soils are present within the LKMS, and a population of San Joaquin Valley Orcutt grass exists adjacent to the site to the north. It is possible that some of the larger pools may provide

habitat for this species (Vollmar Consulting 2009). It is reasonably likely that the San Joaquin Valley Orcutt grass is present within the LKMS because suitable habitat is present and CNDDB records indicate the presence of this species within close proximity.

Hairy Orcutt grass

Potentially suitable vernal pool habitat for hairy Orcutt grass has been identified within the project action area. Protocol-level surveys for this species have not been conducted within the entire project action area because of limited access to properties where suitable habitat may exist. Therefore, the status of this species within the project action area is not fully known at this time. Eight occurrences of hairy Orcutt grass have been documented within 10 miles of the project action area (CNDDB 2012), including one (occurrence #19) within the construction footprint in pools east of the BNSF Railway along Avenue 15. The nearest critical habitat unit for this species is located 2.61 miles northeast of the Merced to Fresno Section. It is reasonably likely that the hairy Orcutt grass is present within the project action area because suitable habitat is present and a population of this species within the action area has been documented in CNDDB records.

Hairy Orcutt grass was not identified during a plant survey conducted on PP1 in 2011 on properties where permission to enter was granted; however, it has since been documented in three vernal pools within the construction footprint in May 2016 and June 2017. Hairy Orcutt grass is not expected to occur within the CV-Wye or RR-M portions of the proposed project due to these portions being on the margin of the known range of the species and the distance from known occurrences.

LKMS: hairy Orcutt grass

Most pools in the LKMS are smaller than the pool size typically required for hairy Orcutt grass. However, the soils within the LKMS are suitable, and it is possible that some of the larger pools may provide habitat for this species (Vollmar Consulting 2009). It is reasonably likely that the hairy Orcutt grass is present within the LKMS because suitable habitat is present.

Greene's tuctoria

Potentially suitable vernal pool habitat for Greene's tuctoria has been identified within the project action area. Protocol-level surveys for this species have not been conducted within the entire project action area because of limited access to properties where suitable habitat may exist. Therefore, the status of this species within the project action area is not known at this time. Nine occurrences of Greene's tuctoria have been documented within 10 miles of the project action area (CNDDB 2012). Two occurrences have been reported in vernal pools near Santa Fe Avenue north of the Chowchilla River, located within 2.5 miles of the project action area (Occurrence #'s 14 and 28). An estimated population of 10,000 plants within a hectare of vernal pool habitat was observed in 1981 (occurrence # 28). However, no plants were observed during a 1986 survey. An unknown number of Greene's tuctoria plants were observed in a vernal pool in 1980, but no plants were observed during subsequent surveys conducted in 1986 (occurrence # 13). It was noted that the hydrology of the vernal pool had been altered by construction of an elevated railroad grade. There are two additional occurrences north of the Chowchilla River about 1 to 2 miles east of Santa Fe Avenue in vernal pool habitat located within the Great Valley Conservation Bank (occurrence #'s 46 and 54). Over 30 individuals were documented during a field survey conducted in 2000 (occurrence # 46). Approximately 200 plants were observed during a 2010 field survey (occurrence # 54). It is reasonably likely that the Greene's tuctoria is present within the project action area because suitable habitat is present and CNDDB records indicate the presence of this species within close proximity.

No habitat for the Greene's tuctoria was identified on PP1 or within the CV-Wye however, a small amount of suitable habitat was identified in the RR-M portion of the M-F Section. Greene's tuctoria was not identified during a plant survey conducted on PP1 in 2011 on properties where permission to enter was granted. Botanical surveys conducted within vernal pool habitat on a small portion of the CV-Wye in 2015 did not detect Greene's tuctoria.

LKMS: Greene's tuctoria

Occurrences of Greene's tuctoria have been documented on adjacent property north the LKMS (CNDDB 2014). Given the location of the LKMS, documented occurrences on adjacent property, presence of suitable soils, and the presence of numerous smaller and shallower pools, it is reasonably likely that Greene's tuctoria occurs within the LKMS.

Succulent owl's-clover

Potentially suitable vernal pool habitat for the owl's-clover has been identified within the project action area. The owl's-clover was not identified during a plant survey conducted on PP1 in 2011 on properties where permission to enter was granted. However, protocol-level surveys for this species have not been conducted within the entire project action area because of limited access to properties where suitable habitat may exist. Therefore, the status of this species within the project action area is not known at this time. There are 59 occurrences of owl's-clover documented in the CNDDB within 10 miles of the project action area (CNDDB 2012). Two of these occurrences are located within 1.5 to 2 miles of the project action area (occurrence #'s 62 and 97). It is reasonably likely that the owl's-clover may exist within the project action area because suitable habitat is present and CNDDB records indicate the presence of this species within close proximity.

LKMS: Succulent owl's-clover

The owl's-clover was observed in 21 vernal pools and swales within both the PA and the ICA. The occurrences were predominantly observed in pools within the Riverbank Formation.

Palmate-bracted bird's-beak

The CV-Wye alignment and EINU activities are within the range of the bird's-beak, and suitable habitat (California annual grassland and valley sink scrub) has been mapped within the action area. Protocol-level surveys have not been conducted in the action area, as not all areas are currently accessible. Extant occurrences in the CNDDB are located within 10 miles of the CV-Wye alignment centerline, the Panoche Junction – Oro Loma 115 kV Power Line, and the Los Banos – Oro Loma – Canal 70 kV Power Line (CNDDB 2016). Due to the proximity of known occurrences, it is likely that the bird's-beak may be found in suitable habitat within the action area.

San Joaquin woollythreads

The Los Banos – Oro Loma – Canal 70 kV Power Line is within the range of the woollythreads, and suitable habitat (annual grassland and valley sink scrub) has been mapped within this portion of the action area. Protocol-level surveys have not been conducted in the action area, as not all areas are currently accessible. Five extant occurrences in the CNDDB are located within 10 miles of the Los Banos – Oro Loma – Canal 70 kV Power Line (CNDDB 2016). Due to the proximity of known occurrences, it is likely that the woollythreads may be found in suitable habitat within the action area.

Valley elderberry longhorn beetle

The northern portion of the action area overlaps with the range of the beetle in Merced County. Surveys have not been completed; however, riparian habitat which may support the beetle is found within this portion of the action area. The entirety of PP1 is outside the range of the beetle.

LKMS: valley elderberry longhorn beetle

Protocol-level surveys for the beetle have not been conducted in the LKMS; however, elderberry shrubs were incidentally observed within the Riparian Restoration Area during vegetation surveys (Vollmar Consulting 2009). However, there is a documented occurrence of the beetle along the Chowchilla River less than one mile east of the LKMS (occurrence # 121; CNDDB 2014). It is reasonably likely that the beetle is present within the project action area because suitable habitat is present and CNDDB records indicate the presence of this species within close proximity.

Effects of the Proposed Action

The CHST-MF Project will result in temporary and permanent loss of habitat for the kit fox, the GKR, the lizard, the snake, the salamander, the beetle, the Conservancy fairy shrimp, the vernal pool fairy shrimp, the tadpole shrimp, the beetle, the Colusa grass, the San Joaquin Valley Orcutt grass, the hairy Orcutt grass, the Greene's tuctoria, the owl's-clover, the Hoover's spurge, the bird's-beak, and the woollythreads.

San Joaquin kit fox

Construction-related effects

An estimated 1,910.50 acres of suitable habitat (grassland and compatible-use agricultural lands) for the kit fox will be permanently lost as a result of the CHST-MF Project (Table 6). However, these habitats occur as fragments or patches throughout the relatively narrow, linear project action area, primarily within Merced and Madera Counties. Approximately 194.07 acres of the 1,910.50 acres (~10 percent) of suitable habitat is considered to be highly suitable for use by the kit fox. The remaining 1,716.43 acres consists primarily of compatible-use agricultural lands (Table 6). The 194.07 acres of highly suitable habitat that will be permanently lost as a result for the CHST-MF Project represents significantly less than one percent of remaining combined highly suitable habitat within Merced, Madera, and Fresno counties (Table 5; Cypher, pers. comm., 2012). Habitat loss and alteration may occur through degradation and placement of hardscape over suitable denning or foraging habitat. It is reasonably likely that construction activities will result in the destruction of dens. Alteration and loss of suitable foraging and denning habitat will result in increased vulnerability of kit fox to predation and a reduction in prey availability.

Table 6. Estimated permanent habitat loss for the San Joaquin kit fox.

Habitat Type (acres)	Hybrid[a]	PP1	CV-Wye[b]	RR-M[b]	Total
Highly Suitable (Denning, Breeding, and Foraging)					
Annual Grassland	49.87	16.70	-	-	-
Barren	42.19	29.85	-	-	-
Pasture	13.12	1.88	-	-	-
Total	105.18	48.43	106.30	39.34	194.07
Suitable (Foraging and Movement)					
Inactive Agriculture	181.61	122.97	-	-	-
Fallow Field	236.78	86.69	-	-	-
Field Crop	257.38	37.62	-	-	-
Orchard	387.02	191.60	-	-	-
Rural Residential	111.09	43.88	-	-	-
Ruderal	-	0.27	-	-	-
Total	1,173.88	483.03	1,020.30	213.10	1,716.43
Grand Total	1,279.06	531.46	1,126.60	252.44	1,910.50

[a] The Hybrid Alternative included two Design Options for a portion of the CV-Wye. In addition, the CV-Wye extends farther west than what was evaluated in the 2012 M-F BO and RR-M has been adjusted. Therefore, this column no longer reflects the total anticipated impacts of the M-F Section and is included only for context.
[b] The biological assessment for the CV-Wye did not provide values separated by habitat type. In addition to the habitat types indicated, highly suitable also includes constructed watercourse and valley sink scrub and suitable includes ruderal.

The proposed construction activities have the potential to expose kit fox to a range of adverse effects. Loud noise, lighting, and vibration caused by construction vehicles, equipment, and operation of the HST may disrupt normal breeding, feeding, or sheltering behaviors of kit fox individuals. However, the Authority has proposed to implement conservation measures such as minimizing the total area disturbed by project activities, enforcement of speed limits, and properly constructed exclusionary fencing, which will reduce the potential for mortality, injury, or harassment of the kit fox. Preconstruction surveys for kit fox will reduce the potential for injury or mortality as well. Therefore, injury or mortality from entrapment, behavioral disruption from noise and vibrations, or collision with construction equipment and vehicles is not expected to occur.

In the event that kit fox do not vacate the project action area after passive harassment measures have been implemented, as described in the conservation measures for this species, or a kit fox has become accidently trapped within the project action area, the Authority will contact the Service. Capture and relocation of kit fox is not currently proposed or authorized as a conservation measure for this project.

Movement and connectivity

Maintaining current connectivity among existing kit fox populations among habitats and populations is crucial for minimizing the threat of extinction. Therefore, the Authority has proposed construction of dedicated wildlife crossings to ensure connectivity for the kit fox within areas identified as movement corridors and linkages to core recovery areas. Elevated portions of the alignment, bridges over riparian corridors, road overcrossings and undercrossings, and drainage structures (e.g., large-diameter culverts 60 to 120 inches) may also facilitate movement of kit foxes. Dedicated wildlife crossings for the kit fox will be spaced at approximately 0.3-mile intervals within the Eastman Lake-Bear Creek Essential Connectivity Area. Wildlife crossings in areas where adjacent land uses are relatively conducive to wildlife movement (e.g., grazing land; grain, hay, and idle pasture) will be constructed approximately every 2.5 miles. The spacing and location of

dedicated wildlife crossings for the Merced to Fresno Section was based on (1) existing land uses; (2) existing and proposed infrastructure not associated with the CHST-MF Project; (3) previously identified wildlife movement corridors; and (4) consistency with the SJV Recovery Plan.

Existing highways, roads, the BNSF rail line, urban development, and incompatible agricultural land uses may restrict movement of individuals and connectivity among existing kit fox populations (Service 2010b; Spencer et al. 2010). Greater than 75 percent of the HST (~60 miles) will be installed at-grade. Portions of at-grade tracks will occur through areas that currently facilitate connectivity. Security fencing will be installed wherever the tracks are at-grade. Without the incorporation of wildlife crossing structures into the project design, the installation of long expanses of at-grade tracks with security fencing could potentially result in loss and fragmentation of habitat and severely limit connectivity among kit fox habitats and populations, and preclude recolonization of currently unoccupied historic habitat. Therefore, the proposed wildlife crossings are crucial for maintaining connectivity among existing kit fox populations within and around the project action area.

The proposed design for all wildlife-designated crossing structures for the HST consists of box culverts and short-span slab bridges, located below the HST tracks. Box culverts will be installed where the track elevation is 9.5 feet or greater above the grade of the existing ground, and a short-span bridge will be installed when tracks are less than 9.5 feet above that grade. The proposed crossing structures will provide an opening that is either 3 feet or 6 feet high, 10 feet wide, and 73 feet long (OF = 0.41 or 0.82, respectively). The invert or bottom of the structure opening may extend below the existing grade to accommodate variations in the topography. However, all wildlife crossings will have at least 50 percent of the vertical clearance above grade of the approaches to the opening. This will allow kit foxes entering the crossing to see through to the opening at the opposite end of the structure.

The Merced to Fresno alignment will also include 18 to 20 smaller hydraulic crossings. Hydraulic crossings include bridges at Miles Creek, Owens Creek, Duck Slough, Deadman Creek, Dutchman Creek, Chowchilla River, Ash Slough, Berenda Slough, Berenda Creek, Dry Creek, Schmidt Creek and Cottonwood Creek. Other viable crossings include elevated portions of track over Berenda Slough, the Fresno River, and the San Joaquin River. These small hydraulic crossings may provide opportunity for movement of kit fox under the HST.

Exposure to predators and infectious diseases

The wildlife crossings may be used by other motile species such as coyotes, bobcats, feral cats and stray dogs to gain access across the HST tracks. Therefore, it is likely that kit foxes may experience increased encounters with potential predators, when using the proposed crossing structures. There may be potential for mortality if kit fox encounter predators while traveling parallel to the rail line in search of a crossing opportunity. However, artificial escape structures will be installed within the crossing structures that will provide temporary escape. Therefore, the potential for encounters with predators within and around wildlife crossings will be minimized through installation of the proposed wildlife crossings and artificial denning habitat, and mortality from predation is not expected to occur within these structures.

The installation of the proposed wildlife crossing structures and escape dens, as described above, will also provide refuge that will allow kit fox to minimize or avoid contact with infected animals carrying transmissible infectious diseases when using the crossing structures. Raccoons, coyotes, skunks, red foxes, gray foxes, feral cats, and stray dogs may occur at higher densities than kit fox

within and around the project action area where an interface between agricultural lands and urban development exists within and around the Cities of Fresno, Madera, Chowchilla, and Merced. These animals, especially raccoons and other small species may use the proposed crossing structures. For example, raccoons were detected at highway undercrossings in southern California more frequently than any other wild mammal species (Ng et al. 2004). Skunks, cats, and dogs were also detected using these undercrossings as well. These wild and domestic animals may carry transmissible infectious diseases, such as rabies, canine distemper virus, sarcoptic mange, and canine parvovirus (Cypher et al. 1998; Burton and Doblar 2004; Riley et al. 2004; Cummings et al. 2009). The number of crossing structures proposed and spacing intervals will provide sufficient opportunities for movement of kit foxes across the HST and minimize the probability of exposure to infected animals. Therefore, it is extremely unlikely for kit fox to be exposed to infected animals while using the proposed wildlife crossing structures.

Exposure to increased noise levels

Kit fox currently experience noise disturbance from Highway 99 traffic and operation of trains on the BNSF rail line. Approximately 20 to 24 trains are operated on both the UPRR and BNSF railroads. Of these, 12 are passenger Amtrak trains which operate about every hour and a half generally during daytime hours with the last train arriving into Fresno from the north at around 10:00 p.m. The remaining 10 to 12 trains operated on these railroads are freight trains. The operation of the Merced to Fresno Section may result in additional noise disturbance that may temporarily impair behavioral patterns of this species and their prey. According to the proposed schedule for train operations, northbound and southbound trains will travel in each direction at least two to three times per hour from 5:00 a.m. to 12:00 a.m. (up to 57 train passages per day). However, noise disturbance from operation of the HST will not occur during nocturnal activities of kit fox in areas adjacent to the alignment from 12:00 am through 5:00 a.m. (~5 hours).

The FRA has established noise exposure limits for all wildlife at a sound exposure level (SEL) of 100 dBA from passing trains. Construction equipment, such as bulldozers, may produce noise in the range of 85 dBA (Burgland and Lindvall 1995). Assuming no intervening structures and maximum speeds of 220 mph, the Authority has estimated that 100 dBA SEL will occur within 100 feet from the trackway centerline for at-grade crossings, and estimated 15 feet from the centerline for elevated sections on structures. This noise level is comparable to a helicopter operating at the same distance (Service 2006). It is expected that the 100 dBA SEL would be exceeded consistently throughout all alternatives for an estimated 50 feet outside the at-grade crossings on both sides.

All areas of the HST that are at-grade within suitable habitat are expected to experience increased noise exposure that may exceed the 100 dBA SEL threshold and potentially elicit a temporary startle, avoidance or negative behavior from kit fox and their prey. However, kit fox studied in Bakersfield, California, which appear to have adapted to the urban environment, have been observed denning near major roads (Bjurlin et al. 2005). Several kit fox were also observed using culverts and other road structures as dens in this same study. Therefore, it is likely that kit fox will become quickly adapted to the increased noise disturbance generated by operation of the HST.

Effects associated with rodent control programs

The Service recognizes that rodent control programs to prevent small mammals, such as ground squirrels, from undermining the stability of the ground below the HST facilities through burrowing activity may be necessary as part of a regular maintenance program. The Authority will not use chemical rodenticides for track or alignment, particularly in rural areas. To the maximum extent

feasible, the Authority will utilize non-toxic rodent control measures to maintain HST facilities. If rodenticides are needed to maintain any buildings or structures, an integrated pest management plan that includes best management practices for avoiding and minimizing off-site impacts on kit fox and other species that might result from use of rodenticides will be prepared and implemented by the Authority and submitted to the Service for review and approval.

Conservation measures for the San Joaquin kit fox

The Authority has proposed to mitigate for the maximum estimated permanent habitat loss through the acquisition of permittee-responsible mitigation sites that will be protected in perpetuity through conservation easements or through the purchase of credits at a Service-approved conservation bank. These lands will be protected and managed for the conservation of the kit fox in perpetuity. These protected lands will provide habitat for breeding, feeding, or sheltering commensurate with or better than habitat lost as a result of the proposed project. As described in the MSIP, implementation of the mitigation proposal would preserve land within the Eastman Lake-Bear Creek Essential Connectivity Area, which is a terrestrial wildlife movement corridor that traverses the Merced to Fresno HST alignment (Spencer et al. 2010). Linking the natural areas in the Eastman Lake-Bear Creek Essential Connectivity Area with the natural areas east of State Route 99 is listed as a recovery action for kit fox in the SJV Recovery Plan. Two of the proposed permittee-responsible mitigation sites identified in the July 2012 Draft MSIP, both of which support potential foraging and dispersal habitat for this species, are located within this Essential Connectivity Area. Permanent protection of these lands will help maintain the geographic distribution of the species and contribute to its survival and recovery.

LKMS: Construction Activities for Habitat Restoration

Construction activities associated with the proposed wetland and riparian restoration will occur within 115.18 acres of the 1,555.75-acre LKMS. Noise and vibration generated by construction equipment may discourage kit from using these areas during restoration activities. Disturbance to kit foxes generated by use of construction equipment and construction activities are expected to be minimal and temporary because the proposed habitat restoration will occur over a short duration (less than 3 months) during the summer months, and there is sufficient alternative habitat available for use and movement by the kit fox within and around the LKMS. The Authority has proposed conservation measures, such as use of Service-approved biological monitors, enforcement of speed-limits, and daily inspections of construction areas, to avoid injury and mortality of kit fox.

The FRA/Authority are proposing preservation of 233.67 acres of highly suitable habitat within the LKMS and the Essential Connectivity Area as compensatory mitigation for unavoidable permanent loss of 54.29 acres of highly suitable habitat and 250.18 acres of suitable habitat (total acres = 304.47) that will occur from PP1 of the CHST-MF Project. The highly suitable habitat within the LKMS will support breeding, foraging, and denning for the kit fox, and will be protected and managed for the conservation of this species in perpetuity.

Giant kangaroo rat

Approximately 0.06 acre of annual grassland that provides habitat for the GKR was mapped along the Los Banos – Oro Loma – Canal 70 kV Power Line. Construction-related operation of equipment and vehicles may directly crush GKR and/or their burrows. Noise and vibrations from the equipment could disturb any GKR in the action area, causing them to leave the area and experience reduced fitness due to increased pressure from competition and/or predation. However,

the Authority has proposed conservation measures, including pre-construction surveys, avoidance of burrows, and biological monitoring that will minimize these adverse effects. Trapping and relocation of any GKR discovered within the project area may also occur in accordance with the proposed conservation measures. The 0.06 acre of habitat for the GKR will be permanently lost due to construction of the proposed project.

Blunt-nosed Leopard Lizard

Approximately 41.99 acres of suitable habitat (barren, California annual grassland, valley sink scrub, and ruderal) for the lizard has been mapped within the northern portions of the action area (Table 7).

Table 7. Estimated permanent habitat loss for the blunt-nosed leopard lizard.

Area	PP1	CV-Wye	EINU	RR-M	Total
Suitable Habitat (acres)	0	27.14	0.06	14.79	41.99

Construction-related operation of equipment and vehicles may directly crush lizards and/or their burrows. Noise and vibrations from the equipment could disturb any lizards in the action area, causing them to leave the area and experience reduced fitness due to increased pressure from competition and/or predation. However, the Authority has proposed conservation measures, including pre-construction surveys, seasonal avoidance, and biological monitoring that will minimize these adverse effects.

The 41.99 acres of habitat for the lizard will be permanently lost due to construction of the proposed project. However, the Authority has proposed to provide habitat to compensate for this loss though the acquisition of permittee-responsible mitigation sites that will be protected in perpetuity with conservation easements. These lands will be protected and managed for the conservation of the lizard in perpetuity. These protected lands will provide habitat for breeding, feeding, or sheltering commensurate with or better than habitat lost as a result of the proposed project.

Giant gartersnake

Approximately 14.80 acres of suitable habitat for the snake has been mapped within the CV-Wye portion of the action area, including 5.53 acres of aquatic habitat and 9.27 acres of upland habitat.

Construction-related operation of equipment and vehicles may directly crush snakes and/or burrows in which snakes are sheltering. Vibrations from the equipment could disturb any snakes in the action area, causing them to leave the area and experience reduced fitness due to increased pressure from competition and/or predation. However, the Authority has proposed conservation measures, including pre-construction surveys, work during the active season, and biological monitoring that will minimize these adverse effects.

The 14.80 acres of habitat for the snake will be lost due to construction of the proposed project. However, the Authority has proposed to provide habitat to compensate for this loss though the acquisition of permittee-responsible mitigation sites that will be protected in perpetuity with conservation easements. These lands will be protected and managed for the conservation of the lizard in perpetuity. These protected lands will provide habitat for breeding, feeding, or sheltering commensurate with or better than habitat lost as a result of the proposed project.

Vernal pool habitat for central California tiger salamander, Conservancy fairy shrimp, vernal pool fairy shrimp, vernal pool tadpole shrimp, Colusa grass, San Joaquin Valley Orcutt grass, hairy Orcutt grass, Greene's tuctoria, succulent owl's-clover, and Hoover's spurge

For the purposes of the impact assessment for vernal pool habitat, the Authority has considered that permanent effects will occur as a result of excavation or fill to vernal pool habitat within the footprint of the HST, and any vernal pool habitat within 250 feet of the footprint. Adverse effects from HST construction and operation activities may be caused by erosion, soil compaction, increased siltation/sedimentation, fractures in the hardpan soils, destruction of native vegetation, and significant alteration of hydrology for vernal pools or seasonal wetlands that provide habitat for vernal pool species. The hydrology of vernal pools may be altered from the loss of a watershed, up-slope destruction of the water restricting layer, and changes in surface topography. Published scientific works conducted in vernal pool landscapes have proven that vernal pools depend not just on rain falling into the pool basin and water flowing overland, but also water flowing below the soil surface (Rains et al. 2006; Rains et al. 2008; Williamson et al. 2005). The proposed project may result in up-slope and or down-slope destruction of the water restricting soil layers and changes in surface topography. When functioning properly, this perched groundwater system flows from the upland landscape to vernal pools and stabilizes vernal pool water levels, causing them to be inundated over larger areas for longer period of time than would be the case if they were recharged only by precipitation (Rains et al. 2006). This subsurface flow occurs on top of the claypan or hardpan that equipment has been perforated or excavated. Excavation of areas with higher elevation inter-mound areas or hardpan perforation in lower areas effectively serves to drain this water from the soil before it enters the vernal pools. Therefore, altered hydrology of seasonally inundated depressions such as vernal pools that provide seasonal breeding habitat for the salamander, Conservancy fairy shrimp, vernal pool fairy shrimp, tadpole shrimp, Colusa grass, San Joaquin Valley Orcutt grass, hairy Orcutt grass, Greene's tuctoria, owl's-clover, and Hoover's spurge are reasonably likely to occur as a result of the proposed project.

Further effects to vernal pool habitat include the introduction or further spread of invasive plant species that could potentially affect pool hydrology, and long-term degradation of both vernal pool and upland plant communities. It may be difficult to limit the spread of existing non-native plant species within vernal pool habitat during construction activities. Some invasive species may inadvertently be introduced through seeds carried on workers clothing and shoe wear. However, the introduction of plant species into vernal pool and wetland habitat by construction equipment and vehicles will be limited, to the maximum extent feasible, through implementation of the WCP. All disturbed areas of upland habitat will be restored and revegetated with native plants and seeds following construction under the guidance of the RRP. Construction vehicles and equipment will be mostly limited to existing roads and other developed areas within the project action area.

The implementation of BMPs and the SWWPP will minimize and help to avoid adverse effects from fuel or chemical spills, sedimentation, and runoff from construction areas into vernal pool and wetland habitat for the vernal pool species. Therefore, adverse effects to vernal pool habitat from spills, sedimentation, and runoff are not expected to occur.

Central California tiger salamander

Effects associated with construction activities

We do not anticipate significant mortality or injury of salamanders to occur, because upland and aquatic habitat for this species occurs intermittently throughout the long, linear project footprint and

conservation measures have been proposed by the Authority, including exclusion fencing and relocation. These small, cryptic animals are at risk from being crushed by project related equipment or vehicles, or construction debris within the action area. The collapse of small mammal burrows could expose individuals to predation or adverse environmental conditions. Salamanders could fall into trenches, pits, or other excavations, and may be directly killed or unable to escape and be subjected to desiccation, entombment, or starvation. This disturbance and displacement may increase the potential for predation, desiccation, competition for food and shelter, or strike by vehicles on roadways. However, implementation of conservation measures proposed specifically for the salamander, such as minimizing the total area disturbed by project activities, conducting pre-construction surveys, and inspecting burrows to make sure individuals are not inadvertently crushed, providing escape ramps in trenches, and properly constructed exclusionary fencing will minimize mortality, injury, or harassment.

Access to suitable upland dispersal and refugia habitat such as grasslands and pastures will become restricted or permanently lost due to permanent structures associated with the CHST-MF Project. Migration and breeding behavior of the salamander within the project action may be altered as a result of these effects.

Effects associated with operation of the HST

Operation of the Merced to Fresno Section may result in injury or mortality to salamanders within the right-of-way. Security fencing along at-grade tracks will not prohibit salamanders from accessing the right-of-way. Salamanders may access at-grade tracks or track ballast during seasonal migrations between aquatic and upland habitats. This may allow some salamanders to gain access across the tracks to upland and wetland habitats, and potential mates. However, operation of the train and routine maintenance activities on the right-of-way may occur during nocturnal rain events when salamanders are known to be most active.

Implementation of the proposed conservation measures will significantly reduce adverse effects to salamanders during project construction, maintenance, and operational activities. However, some salamanders may still occur because they may be difficult for operators of maintenance equipment and vehicles to observe.

The CHST-MF Project will result in the permanent loss of up to 9.27 acres of aquatic breeding habitat and 269.90 acres of upland habitat for the salamander (Table 8). In addition, 87.49 acres of upland habitat will be temporarily lost during construction. However, the Authority has proposed to provide habitat to compensate for this loss though the acquisition of permittee-responsible mitigation sites that will be protected in perpetuity with conservation easements or the purchase of credits at a Service-approved conservation bank. These lands will be protected and managed for the conservation of the salamander in perpetuity. These protected lands will provide habitat for breeding, feeding, or sheltering commensurate with or better than habitat lost as a result of the proposed project.

Table 8. Estimated habitat loss for the central California tiger salamander.

Habitat Type - Impact Type (acres)	Hybrid[a]	PP1	CV-Wye	RR-M	Total
Aquatic – Direct	15.34	5.79	0.69	0.09	6.57
Aquatic – Indirect	9.87	2.70	0	0	2.70
Aquatic – Total	25.21	8.49	0.69	0.09	9.27
Upland – Direct	63.24	123.29	106.54	40.07	269.90
Upland – Temporary	-	-	44.03	43.46	87.49
Upland – Total	179.84	123.29	150.57	83.53	357.39

[a] The Hybrid Alternative included two Design Options for a portion of the CV-Wye. In addition, the CV-Wye extends farther west than what was evaluated in the 2012 M-F BO and RR-M has been adjusted. Therefore, this column no longer reflects the total anticipated impacts of the M-F Section and is included only for context.

LKMS: Construction Activities for Habitat Restoration:

Construction activities associated with the proposed wetland and riparian restoration will occur within 115.18 acres of the 1,555.75-acre LKMS. Disturbance to upland habitat during construction activities is expected to be minimal within the PA because established routes for movement of equipment will be designated and monitored by the Service-approved biologist. Pre-construction surveys for potentially occupied burrows will be used to designate acres to be avoided by construction equipment and workers. Some salamanders may be relocated from occupied burrows within upland habitat that will be disturbed by construction activities. Salamanders that are not detected during pre-construction surveys may be crushed within their burrows by construction equipment.

Disturbance to salamanders generated by use of construction equipment and construction activities are expected to be minimal and temporary because the proposed habitat restoration will occur over a short duration (less than 3 months) during the summer months. The Authority has proposed conservation measures, such as use of Service-approved biological monitors and daily inspections of construction areas to avoid injury and mortality of salamanders.

Conservancy fairy shrimp, vernal pool fairy shrimp, and vernal pool tadpole shrimp

Vernal pool habitat occurs within the project action area that may be suitable for Conservancy fairy shrimp, vernal pool fairy shrimp, and tadpole shrimp. The Service anticipates that direct and indirect effects to these species will occur in areas where vernal pool habitat is identified within the project action area. Effects to each of these listed branchiopod species was calculated by summing the acreage of potentially suitable vernal pool habitats within the project action area, and linking these habitats to CNDDB records for each species within specific USGS 7.5-minute quadrangles as they occur within the Merced to Fresno Section of the HST (Table 9). The construction and operation of the Merced to Fresno Section may result in direct effects on populations of Conservancy fairy shrimp, vernal pool fairy shrimp, and tadpole shrimp through degradation or loss of seasonally inundated depressions such as vernal pools that support the reproductive cycle of these species. Direct adverse effects, such as harm or mortality from heavy equipment, may also occur during construction of the Merced to Fresno alignment. Construction of the Merced to Fresno Section may result in disruption of upland areas surrounding vernal pool branchiopod habitat that may alter water retention and flow within the landscape and influence the timing and intensity of inundation necessary to support the life cycle of these species.

Table 9. Estimated permanent habitat loss for Conservancy fairy shrimp, vernal pool fairy shrimp, and vernal pool tadpole shrimp.

Species	Hybrid[a]			PP1			CV-Wye			RR-M	Total
Impact (acres)	Direct	Indirect	Total	Direct	Indirect	Total	Direct	Indirect	Total	Direct	
Conservancy Fairy Shrimp	12.90	6.69	19.59	0	0	0	0.69	1.18	1.87	0.05	1.92
Vernal Pool Fairy Shrimp	16.08	11.22	27.30	8.83	7.60	16.43	0.69	1.18	1.87	0.05	18.35
Vernal Pool Tadpole Shrimp	16.08	11.22	27.30	8.83	7.60	16.43	0.69	1.18	1.87	0.05	18.35

[a] The Hybrid Alternative included two Design Options for a portion of the CV-Wye. In addition, the CV-Wye extends farther west than what was evaluated in the 2012 M-F BO and RR-M has been adjusted. Therefore, this column no longer reflects the total anticipated impacts of the M-F Section and is included only for context.

Conservation measures for the Conservancy fairy shrimp, the vernal pool fairy shrimp, and the vernal pool tadpole shrimp

Implementation of the proposed conservation measure, such as installation of exclusion fencing around vernal pool habitat and use of erosion control materials, will reduce adverse effects to Conservancy fairy shrimp, vernal pool fairy shrimp, and tadpole shrimp during project construction, maintenance, and operations.

It is expected that all vernal pool and wetland habitat for the Conservancy fairy shrimp, the vernal pool fairy shrimp, and the tadpole shrimp within the alignment foot print and 250 feet of the footprint will be permanently lost as a result of the direct and indirect effects that will occur from construction of the HST. Up to 18.35 acres of suitable vernal pools for the vernal pool fairy shrimp and the vernal pool tadpole shrimp may be permanently lost as a result of the proposed CHST-MF Project (Table 9). A 1.92-acre subset of this total is suitable vernal pool habitat for the Conservancy fairy shrimp.

The Authority has proposed to mitigate for the direct effects to habitat for the Conservancy fairy shrimp, the vernal pool fairy shrimp, and the tadpole shrimp through acquisition of permittee-responsible mitigation sites within Merced, Madera, and Fresno counties that will be protected in perpetuity through conservation easements and/or through purchase of credits at a Service-approved conservation banks. These lands will be protected and managed for the conservation of the Conservancy fairy shrimp, the vernal pool fairy shrimp, and the tadpole shrimp and provide habitat for breeding, feeding, or sheltering commensurate with or better than habitat lost as a result of the proposed project.

Three of the proposed permittee-responsible mitigation sites identified in the July 2012 Draft MSIP, including the LKMS, are located within designated critical habitat for one or more of these species; the acquisition of this designated critical habitat would protect habitat that Service has deemed critical for the survival and recovery of these species. Three of the proposed permittee-responsible mitigation sites identified in the July 2012 Draft MSIP, including the LKMS, are also located within core areas identified in the Vernal Pool Recovery Plan. Vernal pool regions are discrete units that identify areas targeted for the recovery and conservation objectives of vernal pool species; core areas are distinct areas within each vernal pool region that provide the features, populations, and distinct geographic and/or genetic diversity necessary for the recovery of a species. The protection of both occupied and suitable habitat within these core areas is identified as important criteria for the delisting and/or recovery of these species. Implementing the mitigation proposal described in the July 2012 Draft MSIP would preserve and restore vernal pool habitat in the same recovery area affected by constructing and operating the Merced to Fresno Section, and permanently protect

designated critical habitat for two of the listed wildlife species. Permanent protection of these lands will help maintain the geographic distribution of the species and contribute to the survival and recovery of these species.

Colusa grass, San Joaquin Valley Orcutt grass, hairy Orcutt grass, Greene's tuctoria, succulent owl's-clover, and Hoover's spurge

Direct and indirect effects to Colusa grass, San Joaquin Valley Orcutt grass, hairy Orcutt grass, Greene's tuctoria, owl's-clover, and Hoover's spurge will be presumed where vernal pool habitat occurs within the project action area. Effects to each of these listed plant species was calculated by summing the acreage of potentially suitable vernal pool habitats within the project action area, and linking these habitats to CNDDB records for each plant species within specific USGS 7.5-minute quadrangles as they occur within the Merced to Fresno Section of the HST (Table 10). The proposed project will result in the permanent loss of vernal pool for Colusa grass, San Joaquin Valley Orcutt grass, hairy Orcutt grass, Greene's tuctoria, succulent owl's-clover, and Hoover's spurge.

Effects associated with construction

Construction and operation of the Merced to Fresno Section may result in adverse effects to small, isolated populations of vernal pool plants that occur within the project action area (Table 10). Vernal pool habitat for these plants within the project action area will be permanently affected through the spread of non-native invasive plant species introduced as seeds and propagules. The introduction and/or spread of non-native plants increase competition for resources (i.e., sun, water, soil nutrients), which may negatively affect flowering success, pollination, seeding, and germination (Gerhardt and Collinge 2003). The introduction of non-native plant species may also significantly alter habitat heterogeneity by out-competing native plants, thereby further facilitating successful invasion of the non-natives. Successful invasion of non-native plant species could result in permanent degradation of suitable habitat for the Colusa grass, the San Joaquin Valley Orcutt grass, the hairy Orcutt grass, the Greene's tuctoria, the owl's-clover, and the Hoover's spurge and negatively affect the fitness of populations that occur within the project action area.

Effects associated with operation and maintenance activities

In some areas, where the track is at-grade and drainage swales will be constructed, suitable habitat for Colusa grass, San Joaquin Valley Orcutt grass, hairy Orcutt grass, Greene's tuctoria, owl's-clover, and Hoover's spurge may occur within swales and portions of the right-of-ways, which may become recolonized by these species. If operation and maintenance activities occur where any of these species have recolonized, or immediately adjacent to the right-of-way, indirect effects may occur where ground disturbing, clearing, or grubbing are necessary, negative effects similar to those described for construction activities may occur during maintenance activities. However, Colusa grass, San Joaquin Valley Orcutt grass, hairy Orcutt grass, Greene's tuctoria, owl's-clover, Hoover's spurge, and other native vegetation, will be allowed to reestablish after construction in some areas (primarily associated with temporary construction easements), from the natural soil seed bank.

Conservation measures for Colusa grass, San Joaquin Valley Orcutt grass, hairy Orcutt grass, Greene's tuctoria, and succulent owl's-clover

Implementation of the proposed conservation measure, such as pre-construction surveys, installation of exclusion fencing around vernal pool habitat, and use of erosion control materials, will

reduce adverse effects to Colusa grass, San Joaquin Valley Orcutt grass, hairy Orcutt grass, Greene's tuctoria, owl's-clover, and Hoover's spurge during project construction, maintenance, and operations.

It is expected that all vernal pool and wetland habitat for the Colusa grass, San Joaquin Valley Orcutt grass, hairy Orcutt grass, Greene's tuctoria, owl's-clover, and Hoover's spurge within the alignment foot print and 250 feet of the footprint will be permanently lost as a result of the direct and indirect effects that will occur from construction of the HST. Acreages of suitable vernal pool and wetland habitat for these species that may be permanently lost as a result of the proposed CHST-MF Project are presented in Table 10.

Table 10. Estimated permanent habitat loss for vernal pool plant species.

Species	Hybrid[a]			PP1			CV-Wye			RR-M	Total
Impact (acres)	Direct	Indirect	Total	Direct	Indirect	Total	Direct	Indirect	Total	Direct	
Colusa grass	0.14	0.07	0.21	0	0	0	0	0	0	0.05	0.05
Greene's tuctoria	12.07	2.19	14.26	0	0	0	0	0	0	0.05	0.05
Hairy Orcutt grass	13.35	7.46	20.81	0.44	0.53	0.97	0	0	0	0.05	1.02
San Joaquin Valley Orcutt grass	12.39	7.85	20.24	0	0.11	0.11	0	0	0	0.05	0.16
Succulent owl's-clover	7.11	6.33	13.44	-	-	0.18	0.19	0.04	0.23	0.05	0.46
Hoover's spurge	0	0	0	0	0	0	0.19	0.04	0.23	0.05	0.28

[a] The Hybrid Alternative included two Design Options for a portion of the CV-Wye. In addition, the CV-Wye extends farther west than what was evaluated in the 2012 M-F BO and RR-M has been adjusted. Therefore, this column no longer reflects the total anticipated impacts of the M-F Section and is included only for context.

The Authority has proposed to mitigate for the maximum estimated permanent habitat loss for each of these species through acquisition of permittee-responsible mitigation sites within Merced, Madera, and Fresno counties that will be protected in perpetuity through conservation easements, and/or through purchase of credits at a Service-approved conservation bank. These lands will be protected and managed for the conservation of the Colusa grass, San Joaquin Valley Orcutt grass, hairy Orcutt grass, Greene's tuctoria, owl's-clover, and Hoover's spurge and provide habitat for breeding, feeding, or sheltering commensurate with or better than habitat lost as a result of the proposed project.

Two of the proposed permittee-responsible mitigation sites identified in the July 2012 Draft MSIP, including the LKMS, are located within designated critical habitat for two of these species; the acquisition of this designated critical habitat would protect habitat that the Service has deemed critical for the survival and recovery of these species. Three of the proposed permittee-responsible mitigation sites identified in the July 2012 Draft MSIP, including the LKMS, are also located within core areas identified in the Vernal Pool Recovery Plan. Vernal pool regions are discrete units that identify areas targeted for the recovery and conservation objectives of vernal pool species; core areas are distinct areas within each vernal pool region that provide the features, populations, and distinct geographic and/or genetic diversity necessary for the recovery of a species. The protection of both occupied and suitable habitat within these core areas is identified as important criteria for the delisting and/or recovery of these species. Implementing the mitigation proposal described in the July 2012 Draft MSIP would preserve and restore vernal pool habitat in the same recovery area affected by constructing and operating the Merced to Fresno Section, and permanently protect designated critical habitat for two of the listed wildlife species. Permanent protection of these lands

will help maintain the geographic distribution of the species and contribute to the survival and recovery of these species.

Palmate-bracted bird's-beak

Approximately 78.72 acres of suitable habitat (California annual grassland and valley sink scrub) for the bird's-beak has been mapped within the CV-Wye portion of the action area and 5.94 acres in the RR-M portion of the action area, for a total of 84.66 acres.

Construction-related operation of equipment and vehicles may directly remove bird's-beak plants and smother their seeds. However, the Authority has proposed conservation measures, including pre-construction surveys and a rare plant salvage and relocation plan that will minimize these adverse effects.

Of the 84.66 acres of habitat for the bird's-beak, 16.78 acres will be temporarily disturbed and 67.88 acres will be permanently lost due to construction of the proposed project. However, the Authority has proposed to provide habitat to compensate for this loss though the acquisition of permittee-responsible mitigation sites that will be protected in perpetuity with conservation easements. These lands will be protected and managed for the conservation of the bird's-beak in perpetuity. These protected lands will provide habitat for reproduction and nutrition commensurate with or better than habitat lost as a result of the proposed project.

San Joaquin woollythreads

Approximately 4.32 acres of suitable habitat (California annual grassland and valley sink scrub) for the woollythreads has been mapped within the footprint of the EINU activities of the CV-Wye portion of the action area. Construction-related operation of equipment and vehicles may directly remove woollythreads plants and smother their seeds. However, the Authority has proposed conservation measures, including pre-construction surveys and a rare plant salvage and relocation plan that will minimize these adverse effects. The 4.32 acres will be temporarily disturbed and restored to pre-disturbance conditions following construction.

Valley elderberry longhorn beetle

Approximately 11.55 acres of suitable riparian habitat that could support elderberry shrubs and the beetle will be permanently affected as a result of the CHST-MF Project. At least, three elderberry shrubs have been identified within the project footprint that may be lost and could be subject to Service transplantation guidelines. Other elderberry stands that may be identified within the project action area may be subject to removal or damage during construction activities. Indirect adverse effects to beetles and their habitat may extend up to 100 feet from both sides of the project footprint during construction of the HST. Surveys for the beetle and suitable habitat for this species have not been completed throughout most of the project action area because of limited access.

The construction footprint and areas extending up to 100 feet from the edge of the project footprint have the potential to directly and indirectly affect elderberry shrubs and thus potential habitat for beetle. However, the extent of effect to beetle habitat will be determined through the amount of elderberry shrubs and stems that will be directly or indirectly affected.

Negative effects to elderberry shrubs may directly affect the survival of the beetle because they are host-specific to this plant species. Beetle populations may be temporarily affected, both directly and

indirectly, by construction, maintenance, and operational activities within the project action area. Construction, maintenance, and operational activities may result in direct effects on the beetle through the removal or partial destruction of elderberry shrubs within the project action area. Permanent installation of impermeable surfaces (e.g. concrete) may alter site hydrology (e.g. alterations in water flow patterns, inundation patterns, ground water, or water quality), which can negatively affect plant survival and result in subsequent loss of habitat for the beetle. Beetle mortality may occur from collisions or crushing by vehicles and equipment; human destruction or disturbance of occupied elderberry shrubs; or destruction of native riparian habitat

Implementation of the proposed conservation measures will significantly reduce adverse effects to the beetle during project construction, maintenance, and operations. All disturbed areas will be restored and revegetated with native plants and seeds following construction under the guidance of the RRP. The Authority will follow compensatory mitigation measures provided within the *Framework for Assessing Impacts to the Valley Elderberry Longhorn Beetle (Desmocerus californicus dimorphus)* (Service 2017c). The Authority has proposed to implement compensatory mitigation for this species at mitigation sites identified in the July 2012 Draft MSIP. These sites include conservation banks located in Sacramento or San Joaquin Counties or other permittee-responsible sites, if available. These sites will be acquired, protected in perpetuity through conservation easements, protected and managed for the conservation of the beetle, and provide habitat for breeding, feeding, or sheltering commensurate with or better than habitat lost as a result of the proposed project. Implementation of these mitigation measures and proposed revegetation of disturbed areas will enhance and protect habitat that will support the survival and recovery of the beetle.

Cumulative Effects

Cumulative effects include the effects of future State, Tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Habitat loss, fragmentation, as a result of increased agriculture, development, and urbanization pose the greatest conservation threats to the kit fox, the salamander, the Conservancy fairy shrimp, the vernal pool fairy shrimp, the tadpole shrimp, the beetle, the Colusa grass, the San Joaquin Valley Orcutt grass, the hairy Orcutt grass, the Greene's tuctoria, the owl's-clover, and the Hoover's spurge. The Service does not have specific information regarding future non-federal actions within the project action area. However, increased agriculture, urbanization, and human development is reasonably likely to result in increased loss of habitat and a reduction in available food resources to support these species.

Encroachment from residential developments and infrastructure to support increased population expansion could result in further habitat loss and fragmentation for the kit fox, the GKR, the lizard, the snake, the salamander, the beetle, the Conservancy fairy shrimp, the vernal pool fairy shrimp, the tadpole shrimp, the beetle, the Colusa grass, the San Joaquin Valley Orcutt grass, the hairy Orcutt grass, the Greene's tuctoria, the owl's-clover, the Hoover's spurge, the bird's-beak, and the woollythreads.

Conclusion

San Joaquin kit fox

Even with the implementation of the proposed Conservation Measures, the Service still believes that there is a likelihood of adverse effects to the kit fox from the proposed project. However, after reviewing the current status of the kit fox, the environmental baseline for the project area, the effects of the proposed project, and the cumulative effects, it is the Service's biological opinion that the CHST-MF Project, as proposed, is not likely to jeopardize the continued existence of this listed species. This is because the FRA and Authority have proposed to install dedicated wildlife crossings and other structures to maintain current levels of connectivity among populations of this species and the amount of anticipated habitat loss will occur primarily in compatible-use agricultural lands. Protection of habitats within the permittee-responsible mitigation sites as identified in the July 2012 Draft MSIP would preserve and restore suitable habitat for the kit fox. Permanent protection of these lands through conservation easements will provide beneficial effects for this species and contribute to its survival and recovery.

Giant kangaroo rat

After reviewing the current status of the GKR, the environmental baseline for the action area, the effects of the proposed project, and the cumulative effects, it is the Service's biological opinion that the CHST-MF Project, as proposed, is not likely to jeopardize the continued existence of the GKR. The Service reached this conclusion because the project-related effects to the GKR, when added to the environmental baseline and analyzed in consideration of the lack of cumulative effects, will not rise to the level of precluding recovery or reducing the likelihood of survival of the species. The habitat that will be lost represents a very small proportion of habitat available throughout the full range of the GKR.

Central California tiger salamander, Conservancy fairy shrimp, vernal pool fairy shrimp, vernal pool tadpole shrimp, and valley elderberry longhorn beetle

Even with the implementation of the proposed Conservation Measures, the Service still believes that there is a likelihood of adverse effects to the salamander, Conservancy fairy shrimp, vernal pool fairy shrimp, tadpole shrimp, and beetle from the proposed project. However, after reviewing the current status of these species, the environmental baseline for the project area, the effects of the proposed project, and the cumulative effects, it is the Service's biological opinion that the CHST-MF Project, as proposed, is not likely to jeopardize the continued existence of any of these listed species. This is because the amount of anticipated habitat loss is of such a limited scale relative to the status of these species in and around the action area and range-wide. Protection of habitats within the permittee-responsible mitigation sites identified in the July 2012 Draft MSIP would preserve and restore vernal pool habitat in the same recovery area affected by constructing and operating the Merced to Fresno Section, and permanently protect designated critical habitat for two of the listed wildlife species. Permanent protection of these lands through conservation easements will provide beneficial effects for these species and contribute to their survival and recovery.

Colusa grass, San Joaquin Valley Orcutt grass, hairy Orcutt grass, Greene's tuctoria, succulent owl's-clover, and Hoover's spurge

Even with the implementation of the proposed Conservation Measures, the Service still believes that there will be adverse effects to the Colusa grass, the San Joaquin Valley Orcutt grass, the hairy

Orcutt grass, the Greene's tuctoria, the succulent owl's-clover, and the Hoover's spurge. After reviewing the current status of these species, the environmental baseline for the project area, the effects of the proposed project, and the cumulative effects, it is the Service's biological opinion that the CHST-MF Project, as proposed, is not likely to jeopardize the continued existence of any of these listed species. This is because only a very small proportion of habitat for the species will be permanently lost as a result of the project, relative to the status of the species in and around the action area and range-wide. Protection of habitats within the permittee-responsible mitigation sites identified in the July 2012 Draft MSIP would preserve and restore vernal pool habitat in the same recovery area affected by constructing and operating the Merced to Fresno Section, and permanently protect designated critical habitat for two of the listed plant species. Permanent protection of these lands through conservation easements will provide beneficial effects for these species and contribute to their survival and recovery.

Palmate-bracted Bird's-beak

After reviewing the current status of the bird's-beak, the environmental baseline for the action area, the effects of the proposed project, and the cumulative effects, it is the Service's biological opinion that the CHST-MF Project, as proposed, is not likely to jeopardize the continued existence of the bird's-beak. The Service reached this conclusion because the project-related effects to the bird's-beak, when added to the environmental baseline and analyzed in consideration of the lack of cumulative effects, will not rise to the level of precluding recovery or reducing the likelihood of survival of the species. The habitat that will be lost represents a very small proportion of habitat available throughout the full range of the bird's-beak. In addition, the compensatory habitat proposed will ensure that habitat for the species will be protected and managed in perpetuity.

San Joaquin woollythreads

After reviewing the current status of the woollythreads, the environmental baseline for the action area, the effects of the proposed project, and the cumulative effects, it is the Service's biological opinion that the CHST-MF Project, as proposed, is not likely to jeopardize the continued existence of the woollythreads. The Service reached this conclusion because the project-related effects to the woollythreads, when added to the environmental baseline and analyzed in consideration of the lack of cumulative effects, will not rise to the level of precluding recovery or reducing the likelihood of survival of the species. The habitat that will be temporarily disturbed represents a very small proportion of habitat available throughout the full range of the woollythread and will not be permanently lost.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harass is defined by Service regulations at 50 CFR 17.3 as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Harm is defined by the same regulations as an act which actually kills or injures wildlife. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action

is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by the Authority so that they become binding conditions of any contract(s) or agreement(s)as appropriate, for the exemption in section 7(o)(2) to apply. The Authority has a continuing duty to regulate the activity covered by this incidental take statement. If the Authority (1) fails to assume and implement the terms and conditions or (2) fails to require contractors to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to any contract(s) or agreement(s) issued by the Authority, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Authority must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

Sections 7(b)(4) and 7(o)(2) of the Act generally do not apply to listed plant species. However, limited protection of listed plants from take is provided to the extent that the Act prohibits the removal and reduction to possession of federally-listed endangered plants or the malicious damage of such plants on areas under federal jurisdiction, or the destruction of endangered plants on non-federal areas in violation of State law or regulation or in the course of any violation of a State criminal trespass law.

Amount or Extent of Take

San Joaquin kit fox

The Service anticipates that incidental take of individual kit foxes will be difficult to detect or quantify due to the fact that the species is nocturnal and spends much of its time in underground dens. Surveys have not been conducted within the entirety of the action area. Therefore, the amount of habitat for this species that will be impacted as a result of the proposed project will be used as a surrogate for quantifying take. The Service anticipates that all kit foxes inhabiting the 1,910.50 acres of suitable habitat inside the construction footprint and within 1,000 feet of the project will be subject to incidental take in the form of harm as construction activities progress for PP1, the CV-Wye, RR-M, and the LKMS. Because of the conservation measures proposed by the Authority, the Service believes that harm of individual kit fox within the action area will be low.

Kit fox are highly mobile and may use the action area for foraging, sheltering, reproducing, or a combination of those activities. This makes it difficult to estimate the number of individuals that may be taken within the 1,910.50 acres of habitat within the construction footprint. Therefore, the Service is providing a mechanism to quantify when we would consider take exceeded as a result of the proposed project. Because we expect that the proposed conservation measures will detect known dens and that kit foxes will be allowed to vacate the construction footprint, we will use the detection of one (1) individual injured or killed as a measurable threshold that indicates that the kit fox is being affected at a level where conservation measures and project implementation need to be evaluated and possibly modified.

Upon implementation of the Reasonable and Prudent Measures, this level of incidental take will be exempt from the prohibitions described under section 9 of the Act. Accordingly, the Service concludes that incidental take of the kit fox will be considered exceeded if one or more of the following conditions are met: (1) more than one individual kit fox is injured or killed at any time during construction of the proposed project; or (2) more than 1,910.50 acres of suitable habitat is

permanently impacted by the proposed project. Under these circumstances, as provided in 50 CFR §402.16, reinitiation of formal consultation would be required.

Giant kangaroo rat

The Service anticipates that incidental take of the GKR will be difficult to detect or quantify due to the fact that the species is nocturnal and spends almost all of its time in underground burrow systems. Surveys have not been conducted within the CV-Wye portion of the action area where the GKR is expected to occur. Therefore, the amount of habitat for this species that will be impacted as a result of the proposed project will be used as a surrogate for quantifying take. The Service anticipates that all GKR inhabiting the 0.06 acre of habitat within the action area will be subject to incidental take in the form of capture and harm due to trapping and construction-related activities. Because of the conservation measures proposed by the Authority, the Service believes that harm of individual GKR within the action area will be low.

Due to the fact that densities of the GKR may fluctuate annually (Service 1989), making it difficult to estimate the number of individuals that may be taken within the 0.06 acre of habitat, the Service is providing a mechanism to quantify when we would consider take exceeded as a result of the proposed project. We will use the capture of ten (10) individuals or the mortality of one (1) individual as a measurable threshold that indicates that the GKR is being affected at a level where conservation measures and project implementation need to be evaluated and possibly modified. Upon implementation of the Reasonable and Prudent Measures, this level of incidental take will be exempt from the prohibitions described under section 9 of the Act. Accordingly, the Service concludes that incidental take of the GKR will be considered exceeded if one or more of the following conditions are met: (1) more than ten individual GKR are captured during Service-approved trapping and relocation; (2) more than one individual GKR is killed at any time during construction of the proposed project; or (3) more than 0.06 acre of suitable habitat is permanently impacted by the proposed project. Under these circumstances, as provided in 50 CFR §402.16, reinitiation of formal consultation would be required.

Blunt-nosed leopard lizard

The Service anticipates that incidental take of the lizard will be difficult to detect or quantify due to the fact that lizards spend much of the year underground, they can be difficult to locate due to their cryptic appearance, and finding a dead or injured individual is unlikely due to their relatively small size. Surveys have not been conducted within the CV-Wye or RR-M portions of the action area where the lizard is expected to occur. Therefore, the amount of habitat for this species that will be impacted as a result of the proposed project will be used as a surrogate for quantifying take. The Service anticipates that all lizards inhabiting the 41.99 acres of habitat within the action area will be subject to incidental take in the form of harm due to construction-related activities. Because of the conservation measures proposed by the Authority, the Service believes that harm of individual lizards within the action area will be low.

Due to the fact that densities of the lizard may fluctuate annually and vary among sites (Service 1998), making it difficult to estimate the number of individuals that may be taken within the 41.99 acres of habitat, the Service is providing a mechanism to quantify when we would consider take exceeded as a result of the proposed project. We will use the observed injury or mortality of ten (10) individuals as a measurable threshold that indicates that the lizard is being affected at a level where conservation measures and project implementation need to be evaluated and possibly modified.

Upon implementation of the Reasonable and Prudent Measures, this level of incidental take will be exempt from the prohibitions described under section 9 of the Act. Accordingly, the Service concludes that incidental take of the lizard will be considered exceeded if one or more of the following conditions are met: (1) more than ten individual lizards is killed at any time during construction of the proposed project; or (2) more than 41.99 acres of suitable habitat is permanently impacted by the proposed project. Under these circumstances, as provided in 50 CFR §402.16, reinitiation of formal consultation would be required.

Giant gartersnake

The Service anticipates that incidental take of the snake will be difficult to detect or quantify due to the fact that snakes are particularly skittish and spend much of their time underground when not in the water. Surveys have not been conducted within the CV-Wye portion of the action area where the snake is expected to occur. Therefore, the amount of habitat for this species that will be impacted as a result of the proposed project will be used as a surrogate for quantifying take. The Service anticipates that all snakes inhabiting the 14.80 acres of habitat within the action area will be subject to incidental take in the form of harm due to construction-related activities. Because of the conservation measures proposed by the Authority, the Service believes that harm of individual snakes within the action area will be low.

Due to the fact that snake population densities are unknown in the action area, making it difficult to estimate the number of individuals that may be taken within the 14.80 acres of habitat, the Service is providing a mechanism to quantify when we would consider take exceeded as a result of the proposed project. Snakes persist in low numbers in the San Joaquin Valley (Service 2012a); therefore, we will use the observed injury or mortality of two (2) individuals as a measurable threshold that indicates that the snake is being affected at a level where conservation measures and project implementation need to be evaluated and possibly modified.

Upon implementation of the Reasonable and Prudent Measures, this level of incidental take will be exempt from the prohibitions described under section 9 of the Act. Accordingly, the Service concludes that incidental take of the snake will be considered exceeded if one or more of the following conditions are met: (1) more than two individual snakes are injured or killed at any time during construction of the proposed project; or (2) more than 14.80 acres of suitable habitat is permanently impacted by the proposed project. Under these circumstances, as provided in 50 CFR §402.16, reinitiation of formal consultation would be required.

Central California tiger salamander

It is not possible to quantify the number of individual salamanders that will be impacted as a result of PP1 of the CHST-MF the proposed project. Specifically, when salamanders are not in their breeding ponds, they inhabit the burrows of ground squirrels or other rodents or may be moving from one location to another, and may be difficult to locate due to their cryptic appearance and behavior; they may be located a distance from the breeding ponds; and the finding of an injured or dead individual is unlikely because of their relatively small body size. Loss of these species also may be difficult to quantify due to seasonal fluctuations in their numbers, random environmental events, changes in water regime at their breeding ponds, or additional environmental disturbances. Therefore, the amount of habitat for this species impacted by the project will be used as a surrogate for quantifying take. The Service anticipates that all salamanders within 9.27 acres of suitable aquatic breeding habitat and 357.39 acres of suitable upland habitat that will be permanently or temporarily lost will be subject to incidental take in the form of capture or harm.

Upon implementation of the Reasonable and Prudent Measures, this level of incidental take will be exempt from the prohibitions described under section 9 of the Act. Accordingly, the Service concludes that incidental take of the salamander will be considered exceeded the following condition is met: (1) more than 9.27 acres of aquatic habitat or 3557.39 acres of upland habitat is impacted by the proposed project. Under these circumstances, as provided in 50 CFR §402.16, reinitiation of formal consultation would be required.

Conservancy fairy shrimp

The Service anticipates that incidental take of the Conservancy fairy shrimp will be difficult to quantify due to the fact that it is not possible to know how many individuals occupy any wetland feature, how many eggs are in the soil of any wetland feature, or how many individuals or eggs will occupy any wetland feature later in time. Surveys have not been conducted throughout the action area. Therefore, the amount of habitat for this species will be used as a surrogate for quantifying take. The Service anticipates that all Conservancy fairy shrimp and their eggs within 1.92 acre of wetland features within the action area will be subject to incidental take in the form of capture and harm.

Upon implementation of the Reasonable and Prudent Measures, this level of incidental take will be exempt from the prohibitions described under section 9 of the Act. Accordingly, the Service concludes that incidental take of the Conservancy fairy shrimp will be considered exceeded if more than 1.92 acre of suitable habitat is permanently impacted by the proposed project. Under these circumstances, as provided in 50 CFR §402.16, reinitiation of formal consultation would be required.

Vernal pool fairy shrimp and vernal pool tadpole shrimp

The Service anticipates that incidental take of the vernal pool fairy shrimp and tadpole shrimp will be difficult to quantify due to the fact that it is not possible to know how many individuals occupy any wetland feature, how many eggs are in the soil of any wetland feature, or how many individuals or eggs will occupy any wetland feature later in time. Surveys have not been conducted throughout the action area. Therefore, the amount of habitat for these species will be used as a surrogate for quantifying take. The Service anticipates that all vernal pool fairy shrimp and tadpole shrimp and their eggs within 18.35 acres of wetland features within the action area will be subject to incidental take in the form of capture and harm.

Upon implementation of the Reasonable and Prudent Measures, this level of incidental take will be exempt from the prohibitions described under section 9 of the Act. Accordingly, the Service concludes that incidental take of the vernal pool fairy shrimp and the tadpole shrimp will be considered exceeded if more than 18.35 acres of suitable habitat is permanently impacted by the proposed project. Under these circumstances, as provided in 50 CFR §402.16, reinitiation of formal consultation would be required.

Valley elderberry longhorn beetle

The Service anticipates that incidental take of the beetle will be difficult to detect due to the fact that it is not possible to know how many larvae inhabit any one elderberry shrub providing habitat for the beetle. The beetle spends most of its time in the larval stage living within the stems of the elderberry shrub, and the life cycle of the beetle takes one or two years to complete. Beetle larval use of an elderberry shrub is not readily apparent, and in early stages of development beetle larvae can

be present in stems that have no evidence of exit holes. The removal of the elderberry shrubs could result in harm to all larvae inhabiting the stems.

Following the *Framework for Assessing Impacts to the Valley Elderberry Longhorn Beetle (Desmocerus californicus dimorphus)* (Service 2017c), any elderberry shrubs discovered within the 11.55 acres of riparian habitat in the action area will be transplanted. The survival rate of transplanted elderberry shrubs is estimated to be 72.8% in the first year following shrub relocation (Holyoak et al. 2010). The Service anticipates that 27.2% of any elderberry shrubs transplanted may not survive, and that the remaining shrubs may experience damage to stems either accidentally or from targeted trimming. Therefore, the Service anticipates that all beetle larvae in the shrubs that do not survive, as well as any beetle larvae in stems greater or equal to 1-inch in diameter in the remaining shrubs that may be trimmed or damage, will be subject to incidental take in the form of harm.

Upon implementation of the Reasonable and Prudent Measures, this level of incidental take will be exempt from the prohibitions described under section 9 of the Act. Accordingly, the Service concludes that incidental take of the beetle will be considered exceeded the following condition is met: (1) more than 11.55 acres of riparian habitat containing elderberry shrubs is impacted by the proposed project. Under these circumstances, as provided in 50 CFR §402.16, reinitiation of formal consultation would be required.

Effect of the Take

The Service has determined this level of anticipated take is not likely to result in jeopardy to the San Joaquin kit fox, the giant kangaroo rat, the blunt-nosed leopard lizard, the giant gartersnake, the Central California distinct population segment of the salamander, the Conservancy fairy shrimp, the vernal pool fairy shrimp, the vernal pool tadpole shrimp, or the valley elderberry longhorn beetle.

Reasonable and Prudent Measure

All necessary and appropriate measures to avoid or minimize effects on the kit fox, the GKR, the lizard, the snake, the salamander, the Conservancy fairy shrimp, the vernal pool fairy shrimp, the tadpole shrimp, and the beetle resulting from implementation of this project have been incorporated into the project's proposed conservation measures. Therefore, the Service believes the following reasonable and prudent measure is necessary and appropriate to minimize incidental take of these species:

1. All conservation measures, as described in the biological assessments and restated here in the Project Description section of this biological opinion, shall be fully implemented and adhered to. Further, this reasonable and prudent measure shall be supplemented by the terms and conditions below.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the Authority must ensure compliance with the following terms and conditions, which implement the reasonable and prudent measure described above. These terms and conditions are nondiscretionary.

1. The Authority shall ensure that it and all of its contractors fully implement and adhere to the proposed conservation measures. All terms and conditions that apply to contractor activities shall be conditioned in contracts for the work.

2. In order to monitor whether the amount or extent of incidental take anticipated from implementation of the project is approached or exceeded, the Authority shall adhere to the following reporting requirements. Should this anticipated amount or extent of incidental take be exceeded, the Authority must immediately reinitiate formal consultation as per 50 CFR 402.16.
    a. For those components of the action that will result in habitat degradation or modification whereby incidental take in the form of harm is anticipated, the Authority shall provide weekly updates to the Service with a precise accounting of the total acreage when the following habitats are impacted: (1) natural grasslands (Table 6); (2) compatible-use agricultural lands (Table 6); (3) upland habitat for the California tiger salamander (Table 8); (4) vernal pool habitat for vernal pool species (Tables 9 to 10); and (5) riparian habitat for the beetle. Updates shall also include any information about changes in project implementation that result in habitat disturbance not described in the *Description of the Proposed Action* and not analyzed in this biological opinion.
    b. For those components of the action that may result in direct encounters between listed species and project workers and their equipment whereby incidental take in the form of harm, injury, or death is anticipated, the Authority shall immediately contact the Service's Sacramento Fish and Wildlife Office (SFWO) at (916) 414-6600, to report the encounter. If an encounter occurs after normal working hours, the Authority shall contact the SFWO at the earliest possible opportunity the next working day. When injured or killed individuals of the listed species are found, the Authority shall follow the steps outlined in the *Salvage and Disposition of Individuals* section.
    c. A post-construction report detailing compliance with the project design criteria and proposed conservation measures described under the *Description of the Proposed Action* section of this biological opinion shall be provided to the Service within 30 calendar days of completion of the project. The report shall include: (1) dates of project groundbreaking and completion; (2) pertinent information concerning the success of the project in meeting compensation and other conservation measures; (3) an explanation of failure to meet such measures, if any; (4) known project effects listed species, if any; (5) observed incidences of injury to or mortality of any listed species, if any; and, (6) any other pertinent information.
3. Before construction for any phase begins, the Authority will provide a phase-specific final mitigation plan that implements mitigation consistent with the draft MSIP and that identifies long-term management measures, appropriate conservation instruments, and appropriate financial assurances (e.g., proof of credit purchase from Service-approved conservation banks) to the Service for each phase of construction. The Authority will also submit all proposed conservation easements or similar instruments, management plans, and financial assurances to the Service for review and approval prior to initiation of construction activities.
4. The Authority shall follow all compensatory mitigation measures provided within the *Framework for Assessing Impacts to the Valley Elderberry Longhorn Beetle (Desmocerus californicus dimorphus)* (Service 2017c).
5. The Authority shall require the use of appropriate California native species in vegetation and habitat enhancement efforts.
6. The Authority will submit the LTMP to the Service for review and approval prior to its implementation. The LTMP will provide details regarding maintenance, management of invasive plant species, cattle grazing, monitoring for Federally-listed species, and pesticide use.
7. The LTMP will include long-term monitoring and reporting requirements for the preserved vernal pools, as well as the restored vernal pools once the performance standards required by

SWRCB and USACE for the restored vernal pools have been met. Long-term monitoring will provide data to inform adaptive management actions to ensure the Conservation Values of the LKMS, including the preserved vernal pool/grassland complex, are maintained.

Salvage and Disposition of Individuals

Injured listed species must be cared for by a licensed veterinarian or other qualified person(s), such as the Service-approved biologist. Dead individuals must be sealed in a resealable plastic bag containing a paper with the date and time when the animal was found, the location where it was found, and the name of the person who found it, and the bag containing the specimen frozen in a freezer located in a secure site, until instruction s are received from the Service regarding the disposition of the dead specimen. The Service contact person is the San Joaquin Valley Division Chief of the Endangered Species Program at the SFWO at (916) 414-6544.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities that can be implemented to further the purposes of the Act, such as preservation of endangered species habitat, implementation of recovery actions, or development of information and data bases.

1. The Service recommends the Authority develop and implement the appropriate restoration measures in areas designated in the *Recovery Plan for Upland Species of the San Joaquin Valley, California* (Service 1998) and the *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (Service 2005).
2. The Authority should incorporate "environmentally friendly" erosion and stabilization techniques whenever possible in this project, such as use of biodegradable materials constructed from natural fibers (e.g. coconut fiber).
3. Sightings of any listed or sensitive animal species should be reported to the CNDDB of the CDFW. A copy of the reporting form and a topographic map clearly marked with the location the animals were observed also should be provided to the Service.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION--CLOSING STATEMENT

This concludes formal consultation on the California High-Speed Train System: Merced to Fresno Section Project. As provided in 50 CFR §402.16, reinitiation of formal consultation is required and shall be requested by the federal agency or by the Service where discretionary federal agency involvement or control over the action has been retained or is authorized by law and:

(a) If the amount or extent of taking specified in the incidental take statement is exceeded;

(b) If new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered;

(c) If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion; or

(d) If a new species is listed or critical habitat designated that may be affected by the identified action.

If you have any questions regarding this biological opinion, please contact Nina Bicknese, Senior Fish and Wildlife Biologist (nina_bicknese@fws.gov) or Patricia Cole, Chief, San Joaquin Valley Division, at the letterhead address, (916) 414-6544, or by email (patricia_cole@fws.gov).

Sincerely,

Jennifer M. Norris, Ph.D.
Field Supervisor

ec:
Stephanie Perez, Federal Railroad Administration, Washington, D.C.
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Julie Vance, California Department of Fish and Wildlife, Fresno, CA
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APPENDIX C: NATIONAL MARINE FISHERIES SERVICE BIOLOGICAL OPINION

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
650 Capitol Mall, Suite 5-100
Sacramento, California 95814-4700

Refer to NMFS No: WCR--2018-10897/ WCRO-2018-00285

September 3, 2019

Mr. Mark McLoughlin
Director of Environmental Services
California High Speed Rail Authority
770 L Street
Suite 620
Sacramento, California 95814

Re: Endangered Species Act Section 7(a)(2) Biological and Conference Opinion, and

Dear Mr. McLoughlin:

Thank you for your letter of October 3, 2018, requesting re-initiation of formal consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to Section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) for California High Speed Rail Merced to Fresno Section, including the Central Valley Wye addition.

The enclosed biological opinion is based on our review of the proposed action as detailed in the provided biological assessment, and its effects on the federally listed threatened California Central Valley steelhead (*Oncorhynchus mykiss*) distinct population segment and a nonessential experimental population of threatened Central Valley spring-run Chinook salmon (*O. tshawytscha*) evolutionarily significant unit, in accordance with Section 7 of the ESA. Based on the best available scientific and commercial information, NMFS concludes that the project is not likely to jeopardize the continued existence of the federally listed species, or jeopardize the reintroduction of nonessential experimental population Central Valley spring-run Chinook salmon into the San Joaquin River. NMFS has included an incidental take statement with reasonable and prudent measures and non-discretionary terms and conditions that are necessary and appropriate to avoid, minimize, or monitor the incidental take of federally listed fish that will occur with project implementation.

Thank you, also, for your request for consultation pursuant to the essential fish habitat (EFH) provisions in Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA)(16 U.S.C. 1855(b)) for this action. This biological opinion also includes NMFS's review of the potential effects of the proposed action on EFH for Pacific Coast Salmon, as

designated under the MSA. The document concludes that the project will adversely affect the EFH of Pacific Coast Salmon in the action area and has included EFH Conservation Recommendations.

As required by section 305(b)(4)(B) of the MSA, the Authority must provide a detailed response in writing to NMFS within 30 days after receiving an EFH Conservation Recommendation. Such a response must be provided at least 10 days prior to final approval of the action if the response is inconsistent with any of NMFS EFH Conservation Recommendations unless NMFS and the Authority have agreed to use alternative time frames for the Authority's response. The response must include a description of measures proposed by the agency for avoiding, minimizing, mitigating, or otherwise offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the Conservation Recommendations, the Authority must explain its reasons for not following the recommendations, including the scientific justification for any disagreements with NMFS over the anticipated effects of the action and the measures needed to avoid, minimize, mitigate, or offset such effects (50 CFR 600.920(k)(1)). In your response to the EFH portion of this consultation, we ask that you clearly identify the number of Conservation Recommendations accepted.

Please contact Katie Schmidt at the Central Valley Office in Sacramento at (916) 930-3685, or katherine.schmidt@noaa.gov, if you have any questions concerning this consultation, or if you require additional information.

Sincerely,

Maria Rea
Assistant Regional Administrator
California Central Valley Office

Enclosure

cc: To the File No. 151422-WCR2018-SA00467

John Hunter, john.hunter@hsr.ca.gov
Chris Gurney, Christopher.Gurney@nfwf.org

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
650 Capitol Mall, Suite 5-100
Sacramento, California 95814-4700

Endangered Species Act Section 7(a)(2) Biological and Conference Opinion, and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the

California High Speed Rail Merced to Fresno Section, including the Central Valley Wye

NMFS Consultation Number: WCR-2018-10897/WCRO-2018-00285

Action Agency: California High Speed Rail Authority

Affected Species and NMFS' Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?	Is Action Likely To Jeopardize the Species?	Is Action Likely to Adversely Affect Critical Habitat?	Is Action Likely To Destroy or Adversely Modify Critical Habitat?
California Central Valley steelhead (*Oncorhynchus mykiss*) distinct population segment (DPS)	Threatened	Yes	No	N/A[1]	N/A
Central Valley spring-run Chinook salmon (*O. tshawytscha*), Non-essential experimental population	Threatened	N/A[2]	No	N/A[1]	N/A

Fishery Management Plan That Identifies Essential Fish Habitat in the Project Area	Does Action Have an Adverse Effect on EFH?	Are EFH Conservation Recommendations Provided?
Pacific Coast Salmon	Yes	Yes

Consultation Conducted By: National Marine Fisheries Service, West Coast Region

Issued By:

Maria Rea
Assistant Regional Administrator

Date: **September 3, 2019**

[1] California Central Valley steelhead and Central Valley spring-run Chinook salmon critical habitats do not occur within the action area.
[2] Within the action area, non-essential experimental population Central Valley spring-run Chinook salmon are governed by a final rule under Endangered Species Act Section 10(j) and only a jeopardy determination can be made regarding a project's impact on the population. While take of this population is exempt from Section 9 prohibitions within the action area, the California High Speed Rail Authority has agreed to treat this population as a threatened species and receive this conferencing opinion to minimize or avoid impacting this population.

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°C	degrees Celsius
°F	degrees Fahrenheit
2012 NMFS BiOp	NMFS conference and biological opinion on the California High-Speed Train System for the Merced to Fresno section 2012 (PCTS# 2011/05974)
2016 NMFS MSA	NMFS Magnuson-Stevens Fishery Conservation and Management Act consultation and revised EFH response to the California High Speed Rail Merced to Fresno section 2016 (PCTS#WCR-2016-5387)
AMM	avoidance and minimization measure
Authority	California High Speed Rail Authority
BA	biological assessment
BMP	best management practice
BOR	Bureau of Reclamation
CCV	California Central Valley
CCVO	California Central Valley Office, NMFS
CDEC	California Data Exchange Center
CDFW/CDFG	California Department of Fish and Wildlife
cfs	cubic feet per second
CIDH	cast-in-drilled-hole
CMs	conservation measures
CRs	Conservation Recommendations
CV	Central Valley
CVP	Central Valley Project
CWA	Clean Water Act
dB	decibels
Delta	Sacramento-San Joaquin River Delta
DPS	distinct population segment
DQA	Data Quality Act
EFH	essential fish habitat
EINU	electrical interconnection and network upgrades
EIR/EIS	environmental impact report/environmental impact statement
EnSA	environmentally sensitive area
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act
ESU	evolutionary significant unit
FHWG	Fisheries Hydroacoustic Working Group
FR	Federal Register
FRA	Federal Railway Administration
HAPCs	Habitat Areas of Particular Concern
HSR	high speed rail
ILF	in-lieu fee
ITS	incidental take statement
LID	low impact development
LWM	large woody material
MSA	Magnuson-Stevens Fishery Conservation and Management Act

NEP	non-essential experimental population
NEPA	National Environmental Policy Act
NFWF	National Fish and Wildlife Foundation
NMFS	National Marine Fisheries Service
NRDC	National Resources Defense Council
NTU	nephelometric turbidity unit
OHWM	ordinary high water mark
opinion	biological opinion
PAHs	polyaromatic hydrocarbons
PFMC	Pacific Fishery Management Council
PG&E	Pacific Gas & Electric
RMS	root-mean-square
ROW	right-of-way
RPM	reasonable and prudent measures
RST	rotary screw trap
SEL	sound exposure level
SJR	San Joaquin River
SJRRP	San Joaquin River Restoration Program
SPCCP	spill prevention control and countermeasures plan
SR	State Route
SRA	shaded riverine aquatic
SWE	snow water equivalent
SWPPP	stormwater pollution prevention plan
SWRCB	State Water Resources Control Board
THMFP	total trihalomethane formation potential
TMDL	Total Maximum Daily Load
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
VSP	viable salmonid population
WOUS	Waters of the United States

1. INTRODUCTION

This Introduction section provides information relevant to the other sections of this document and is incorporated by reference into Sections 2 and 3 below.

1.1 Background

The National Marine Fisheries Service (NMFS) prepared the biological opinion (opinion) and incidental take statement (ITS) portions of this document in accordance with Section 7(b) of the Endangered Species Act (ESA) of 1973 (16 USC 1531 et seq.), and implementing regulations at 50 CFR 402.

We also completed an essential fish habitat (EFH) consultation on the proposed action, in accordance with section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801 et seq.) and implementing regulations at 50 CFR 600.

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (DQA) (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). A complete record of this consultation is on file at the NMFS California Central Valley Office (CCVO), titled: "Endangered Species Act Section 7(a)(2) Biological and Conference Opinion, and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response, for the California High Speed Rail Merced to Fresno Section, including the Central Valley Wye".

1.2 Consultation History

On September 23, 2009, the California High Speed Rail Authority (Authority) requested technical assistance regarding potential effects from the Merced to Fresno section of the high speed rail (HSR) system on special-status anadromous fish pursuant to Section 7 of the ESA, as well as the effects on EFH following the requirements of the MSA.

On November 17, 2010, the Authority requested a species list from NMFS for the waterways between the cities of Merced to Fresno, California.

On February 1, 2011, a species list letter was sent from NMFS indicating that at the time construction begins on the HSR, the San Joaquin River Restoration Program (SJRRP) will have been implemented and the Authority should consider the effects of the HSR system on:

- California Central Valley (CCV) steelhead (*Oncorhynchus mykiss*) distinct population segment (DPS),
- Non-essential experimental population (NEP) Central Valley (CV) spring-run Chinook salmon (*O. tshawytscha*) and through extension, the entire evolutionary significant unit (ESU),
- Pacific Coast Salmon EFH.

On March 14, 2011, the Federal Railway Administration (FRA) sent a memorandum of understanding to NMFS and to the United States Fish and Wildlife Service (USFWS) designating the Authority to act on behalf of the FRA as a non-federal representative and the Authority has assumed FRA's responsibilities under Federal environmental laws.

Between this time and September 2011, multiple meetings and document exchanges occurred between the Authority, NMFS, and other resource agency representatives.

On October 17, 2011, NMFS received a draft biological assessment (BA) for the Merced to Fresno section of the HSR (NMFS 2012).

On April 17, 2012, NMFS concluded formal consultation on the Merced to Fresno section of the HSR project and for the construction of the HSR viaduct crossing over the San Joaquin River (SJR) north of Fresno. NMFS issued a Section 7 ESA biological and conference opinion, and EFH conservation recommendations (PCTS# 2011/05974), to the Authority and the FRA (this consultation hereto after referred to as the 2012 NMFS BiOp). The 2012 NMFS BiOp included required ESA terms and conditions and EFH conservation recommendations (CRs) to offset adverse impacts and reduce the amount of take attributed to the proposed action (NMFS 2012).

On June 16, 2016, a meeting was held between the Authority and NMFS staff, as the construction of the Merced to Fresno section covered by the 2012 NMFS BiOp was scheduled to begin within months from the meeting date. NMFS advised that because the project had been modified substantially compared to the project description submitted in the 2011 BA, and that construction effects had likely increased from those considered in the 2012 NMFS BiOp, that the consultation should be reinitiated regarding the HSR viaduct construction over the San Joaquin River specifically.

On July 27, 2016, the Authority requested technical assistance regarding guidance assessing the potential effects and impacts associated with a redesign of the HSR viaduct crossing over the SJR, and the inclusion of the temporary trestle and additional falsework, in relation to the construction activities previously addressed in the 2012 NMFS BiOp.

On August 2, 2016, NMFS responded with a technical assistance letter, advising that: 1) the Authority may proceed with construction actions associated with the HSR crossing over the SJR and still retain their ESA take coverage without needing to re-initiate the ESA consultation, if they adhered to the take limitations stated in the terms and conditions of the 2012 NMFS BO; 2) the Authority should instead request re-initiation of the EFH consultation regarding this action to account for the additional impacts to Pacific Coast Salmon EFH beyond those considered in the EFH section of the 2012 NMFS BiOp; and 3) NMFS could better serve the Authority's consultation needs if addressed in a programmatic fashion, thus the Authority should consider entering into a programmatic consultation agreement with NMFS regarding future actions.

On August 8, 2016, the Authority sent NMFS a letter requesting re-initiation of the MSA consultation portion of the 2012 NMFS BiOp, to include an extensive in-river support trestle, cofferdams, and a hydraulic analysis of these structures.

On August 16, 2016, NMFS concluded the MSA consultation for the SJR viaduct crossing (PCTS#WCR-2016-5387) and provided the Authority with a revised EFH response and modified

EFH CRs (hereto after referred to as 2016 NMFS MSA) more appropriate to offset impacts and restore the Pacific Coast Salmon habitat affected by the project (NMFS 2016e).

On November 7, 2016, NMFS provided the Authority letter correspondence as proof of receipt of the Authority's response to receiving the 2016 NMFS MSA EFH CRs as an outcome of the reinitiation of the 2016 MSA consultation.

On December 12, 2017, NMFS sent the FRA and cc'd the Authority comments regarding the envisioned environmental review timelines for HSR projects presented at a multi-agency meeting on October 26, 2017. In response to Executive Order 13783, the Department of Commerce is committing to improvement in processing times of informational consultation, reducing steps in the review process, and increasing the use of programmatic and batched consultations, increasing tracking management, and potentially seeking legislative amendments to improve efficiency.

On January 24, 2018, the Authority requested a species list from NMFS regarding the action area for the CV Wye, a proposed addition to the Merced to Fresno section of the HSR system.

On January 25, 2018, NMFS provided the Authority with a species list for the CV Wye Section of the HSR. It identified that CCV steelhead and NEP spring-run Chinook salmon were expected to occur in the action area, and also that the action area contained EFH for Pacific Coast Salmon.

On August 16, 2018, NMFS replied to a letter from the Authority notifying NMFS of their intent to re-initiate the 2012 NMFS formal ESA Section 7 consultation and the 2016 NMFS MSA consultation in the near future via formal consultation as the Merced to Fresno section now included a new design component, the CV Wye, west of Chowchilla, California. NMFS agreed that construction activities at the SJR viaduct crossing north of Fresno may proceed while the consultations are re-initiated, as long as the construction proceeds as proposed without further changes and that all best management practices (BMPs), avoidance and minimization measures (AMMs), terms and conditions, and EFH CRs previously identified were followed or fulfilled.

On October 3, 2018, the Authority sent NMFS a request to re-initiate formal consultation pursuant to section 7 of the ESA of 1973, as amended (16 U.S.C. 1531 *et seq*.) and the MSA regarding the Merced to Fresno section of the HSR, including new design component CV Wye. The re-initiation package included a request letter, a BA for the Merced to Fresno Section: CV Wye (Authority and FRA 2018), with Appendix A: HSR System Infrastructure summary, Appendix B: Conservation Measures Crosswalk, Appendix C: Preliminary Compensatory Mitigation Plan for the section, and Appendix D: USFWS and NMFS species lists. More information was transmitted via a CD-ROM that contained construction plan views of the SJR viaduct crossing and the new CV Wye waterway crossings, the 2016 SJR Restoration and Revegetation Plan, the 2017 SJR Viaduct Pile Driving Underwater Sound Monitoring Report, site photos of the SJR viaduct crossing construction in progress, and three underwater fish field surveys reporting salmonids were not detected within the project area of the SJR viaduct crossing north of Fresno. The request letter identified that the proposed project may adversely affect:

- CCV steelhead (*Oncorhynchus mykiss*) DSP,
- NEP CV spring-run Chinook salmon (*O. tshawytscha*) and the CV spring-run Chinook salmon ESU, and
- Pacific Coast EFH.

On October 16, 2018, NMFS sent the Authority an insufficiency letter and requested that more information before consultation could be initiated.

On October 29, 2018, NMFS re-initiated the 2012 NMFS BiOp and 2016 NMFS MSA, having received the lacking information via in-person meetings and emails with Authority staff and contractors.

On March 25, 2019, NMFS and Authority staff agreed to a consultation extension date of June 28, 2019, to account for time lost due to the 35-day federal government furlough and internal Authority/FRA delays.

1.3 Proposed Federal Action

Under ESA implementing regulations, "action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (50 CFR 402.02). Under MSA implementing regulations, Federal action means any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by a Federal agency (50 CFR 600.910). The Authority has assumed the FRA's environmental permitting responsibilities through the signing of a memorandum of understanding signed March 14, 2011, and the Authority has also applied for National Environmental Policy Act (NEPA) assignment May 2, 2018 (83 FR 19395). The FRA is funding the environmental review and preliminary engineering for the HSR system, as well as the construction activities of the first section to break ground (the Merced to Fresno section). On July 23, 2019, the Authority was granted NEPA assignment by the FRA and the State of California Governor Gavin Newsom.

The Authority proposes to construct a HSR system that would connect the major population centers of San Francisco-Bay Area with the Los Angeles metropolitan region at final build out (Authority and FRA 2018). The HSR system as a whole would be an electronically powered, steel-wheel-on-steel-passenger rail system with state of the art safety, signaling, and automated train control systems. The trains would be capable of operating at speeds up to 220 miles per hour on a fully grade-separated, dedicated track alignment.

The Merced to Fresno section of the HSR is one of a total of ten sections that will create the state-wide HSR system. This section consists of approximately 80 miles of straight track, 2 railroad passenger stations, associated railway support facilities, power transmission lines, right-of-way (ROW), and access roads. As the first section to be implemented on the ground, it is currently under construction throughout Merced, Madera, and Fresno counties, having received ESA consultations in 2012 from both NMFS (NMFS 2012) and USFWS prior to breaking ground. The previously reviewed project components regarding interactions with anadromous species under NMFS jurisdiction include the viaduct crossing of the HSR over the SJR, north of

Fresno, California. At the time of this writing, this viaduct crossing consists of an elevated structure supported by two cast-in-drilled-hole (CIDH) concrete column extensions that straddle the river at ordinary high water mark (OHWM). Temporary cofferdams and an in-water temporary support trestle were required to complete this structure. The temporary cofferdams and trestle are currently still in place though they are slated for removal during the 2019 construction season as viaduct structure construction has been completed and the site moves into the clean-up and restoration phases.

The CV Wye component was added to the Merced to Fresno section, which consists of tracks that follow the State Route (SR) 152 north to Road 11, has the same purpose as a roadway 'roundabout' that will enable trains to turn west to the Bay Area, or continue north to Merced or south to Bakersfield, and vice versa for all directions. This design component also includes associated electrical interconnection and network upgrades (EINU) necessary to operate the HSR system. The CV Wye component alone is comprised of approximately 51 miles of dual HSR track, 24 road over- and under-crossings, and railway support structures like traction power substations, switching/paralleling stations, and maintenance-of-way facilities. The EINU include: 1) new 230 kilovolt (kV) tie-line double circuit to the existing Wilson substation, 2) reconfiguring of existing 230 kV at the Wilson substation within the fence line, 3) network upgrades to 16.9 miles of existing Panoche-Junction-Oro Loma 115 kV powerline, 4) network upgrades to 13.3 miles of existing Los Banos-Oro Loma-Canal 70 kV powerline, and 5) expansion of existing El Nido substation by approximately 3 acres. The HSR ROW would also be fenced to prevent public access, with a minimum of 100 feet of separation between the two tracks and the fence.

Parts of the Merced to Fresno section that are reasonably certain to interact with species under NMFS jurisdiction are crossings of above-grade or elevated track segments that span over waterways. Specifically, the construction of the HSR crossings over the SJR (both the viaduct north of Fresno that is already constructed and the crossing west of Chowchilla, California, that is still in its design phase) and the HSR crossing over the Eastside Bypass west of Chowchilla, parallel to the San Joaquin River channel (Reach 4A) also in its design phase. All of these components will be analyzed in this opinion. For a full description of the construction activities and components of the other parts of the proposed action (i.e., EINU, state highway and local roadway modifications, freight/passenger railroad modifications, traction power substations components, and communication system installation), see Authority and FRA (2018): Chapter 2.

The precast segmental construction method is proposed for the elevated track sections. In this construction method, large concrete bridge segments would be mass-produced at a temporary on-site casting yard. Precast segments would then be transported atop already completed portions of the elevated track and installed using a special gantry crane positioned within the HSR footprint. These precast segments would be installed on supports like pre-cast, pre-stressed concrete box girders, CIDH box girders, or steel box girders (final design components may be any of these options). The height of the elevated track sections, or viaducts, depends on the height of existing structures below or at the 100-yr flood height, and may range from 35 to 90 feet above grade. Support columns would be spaced 100 to 120 feet apart on average.

Pre-construction activities include geotechnical investigations, identification and creation of staging areas, site preparation and demolition, relocation of utilities and other infrastructure (i.e.,

electric wiring, water canals, natural gas lines, petroleum pipelines), and implementation of temporary, long-term, or permanent road closures. Major construction activities are likely to include earthwork, excavation, construction support systems (trestles), bridge and aerial segment construction, and railroad systems construction (track work, traction electrification, signaling, and communication infrastructure placement). During peak construction, work may be underway at several locations along the route, with overlap between various elements. Working hours and personnel presence onsite will vary depending on the type of work being performed. According to BA Figure 2-2, page 2-7 (Authority and FRA 2018), construction site mobilization may begin in Year 1 of the schedule and aerial track laying would not be complete until Year 5 after start. The Authority intends to build the proposed action using sustainable methods that 1) minimize the use of nonrenewable resources, 2) minimize the effects on the natural environment, 3) protect environmental diversity, and 4) emphasize the use of renewable resources in a sustainable manner.

Proposed Conservation Measures

The Authority proposes to employ a variety of BMPs and AMMs, also known as conservation measures (CMs), to reduce or avoid adverse impacts to a variety of listed species and the habitats upon which they depend. The following CMs directly apply to listed species under NMFS jurisdiction (CCV steelhead and spring-run Chinook salmon) though other CMs will also be employed. A full description of all CMs proposed by the Authority is available in the BA, Chapter 2.6.1 General Conservation Measures (Authority and FRA 2018).

1. The following CMs apply to the design of the HSR crossings (CM-FISH-1). The Authority will implement general habitat protection measures to protect and minimize project effects on salmonid habitat:

    a. The design of the SJR and Eastside Bypass viaduct crossings will consider the increase in river flows planned by the SJRRP, and to maintain or effectively minimize any appreciable changes in scour, sediment transport, deposition, or changes in geomorphic processes that could alter habitat conditions in a manner that would impede the re-establishment of CV spring-run Chinook salmon in the SJR.

    b. The design-build team will work with NMFS to establish design hydrology and demonstrate minimal hydraulic effects from design.

    c. The Authority, along with the design-build team, will provide final SJR and Eastside Bypass crossing plans to NMFS prior to any site preparation or mobilization of construction work. If the design would affect salmonids in a manner or to an extent not previously considered, ESA Section 7 consultation would be reinitiated.

2. The following CMs apply to general construction activities (CM-FISH-1). The Authority will implement general habitat protection measures to protect and minimize effects on salmonid habitat during construction:

a. Minimize clearing, grading, and cut-and-fill activities to the extent possible through design.

b. Design night lighting of overwater structures (if required) such that illumination of the surrounding water is avoided.

c. Locate temporary construction areas (e.g., staging, storage, parking, and stockpiling areas) outside of channels and riparian areas wherever feasible.

3. The following CMs apply to bank stabilization activities (CM-FISH-1). The following measures will be implemented during design and construction to minimize habitat disturbance from bank stabilization activities:

    a. Temporarily fence areas of natural riparian vegetation with high visibility environmentally sensitive area fence to protect it from work activities.

    b. Use "soft" approaches to bank erosion control to the extent possible (i.e., vegetative plantings and placement of large woody debris). Avoid hard bank protection methods (e.g., revetment) wherever feasible.

    c. Avoid the use of wood treated with creosote or copper-based chemicals in bank stabilization efforts.

    d. Use quarry stone, cobblestone, or their equivalent for erosion control along rivers and streams, complemented with native riparian plantings or other natural stabilization alternatives that would maintain a natural riparian corridor, where feasible. Cobble size, types, and spacing of riparian plantings, and other details on riparian restoration activities will be provided in the Restoration and Revegetation Plan described under CM-GEN-6.

    e. Revegetate temporarily disturbed areas with native plants to resemble the existing vegetation.

4. The following CM applies to weed control: Avoid the use of pesticides within the SJR and Eastside Bypass (i.e., the wetted channel and associated floodplain between the crests of the bordering levees).

5. The following CMs are designed to limit impacts to CCV steelhead and CV spring-run Chinook use of the project areas (CM-FISH-2). Near-water and in-water work will be conducted within specified work windows based on date, channel inundation, and water temperature. Work windows will include the general time periods when effects on migrating juvenile and adult CCV steelhead and CV spring-run Chinook salmon would be minimal. Additionally, in-water work will be allowed when salmonid use is temperature limited (defined at one week of average water temperature of 75 degrees Fahrenheit (°F) or more), and work will be allowed in the channel and on the floodplain when channels are dry and ponded.

a. Near-water work is defined as construction activities other than impact pile driving occurring within the floodplain but not in the wetted channel (i.e., located between the wetted channel and the landside toe of the bordering levee).

b. In-water work is defined as all in-water work within the wetted channel and impact pile driving within the floodplain.

c. For in-water work at the SJR Reach 1A viaduct crossing north of Fresno, by SR-99, the construction work window will be **June 15 – October 31**.

d. For in-water work at the Reach 4A crossing of the SJR and the Eastside Bypass, the construction work window will be **June 1 – December 1** (Authority and FRA 2018), Table 4).

e. For near-water work at the Reach 4A crossing of the SJR and the Eastside Bypass, the construction work window will be **April 30 – December 1**.

f. If channels are dry or ponded (lacking continuous flow and connectivity), or water temperatures average 75°F or more for seven consecutive days, in-water and near-water work may proceed outside of the work windows stated above. NMFS will be consulted with to verify work can proceed if these conditions are present during construction.

6. The following CMs apply to pile driving (CM-FISH-1). If pile driving is necessary, the following measures will be implemented during design and construction to minimize its impacts on fish habitat and use:

    a. Select piles that are made of alternate materials and that produce less-harmful sounds, if feasible.

    b. Drive piles as far as possible with vibratory or other methods that produce lower levels of sound before using an impact hammer.

    c. Restrict pile driving to daylight hours from one hour after sunrise to one hour before sunset.

    d. During construction, a qualified fisheries biologist experienced with salmonid identifications will conduct snorkel surveys to confirm fish presence immediately prior to any in-water work. Surveys will be conducted again if there are multi-day pauses in in-water construction activities.

    e. Monitor piles daily for accumulated debris and remove debris to minimize hydraulic impacts.

7. The following CMs apply to managing underwater pressures caused by pile driving (CM-FISH-3).

a. If in-water pile driving occurs in the wetted channel during the in-water work window, one of the following means of attenuating underwater sound will be implemented: 1) A cofferdam will be established around the pile driving area to keep it dewatered during impact pile driving, 2) a pipe with a larger diameter than the driven pile will be set to keep the area between the pile and the pipe completely dewatered with an air barrier, or 3) a bubble curtain will be maintained around the driven pile.

b. NMFS will be consulted regarding the measure(s) to install piles and notified of the selected measure(s).

c. During implementation of any of these measures and installation of driven piles, underwater sound monitoring will be conducted. If underwater sound monitoring indicates that underwater sound exceeds 205 peak strike decibels (dB) (estimated at 10 meters from the driven pile), or that the daily accumulated SEL is calculated to have exceeded 187 dB (estimated at 10 meters from the driven pile), NMFS will be notified within 24 hours and construction will cease until corrections are made to the attenuation apparatus/protocol so that the thresholds are not exceeded.

8. The following CMs apply to water diversion (CM-FISH-4). Construction within waterways may require temporary dewatering to minimize potential impacts on fisheries through pile driving, minimize potential erosion, sediment loss, scour, or increases in turbidity, and allow in-the-dry construction.

    a. If deemed necessary by NMFS, the contractor will construct cofferdams around the proposed work area or areas. Cofferdams will be kept to the minimum footprint necessary.

    b. The cofferdams will be constructed of sheet piles, gravel-filled sandbags, or comparable material. The temporary fill used to construct the cofferdam will be kept to the minimum footprint necessary.

    c. The cofferdams will be constructed over Visqueen or similar material to facilitate clean-up and removal of materials.

    d. Upon completion of construction, all temporary fills associated with the dewatering including sandbags and/or rock will be removed and the area restored to preconstruction contours.

9. The following CMs apply to fish rescue (CM-FISH-5), associated with temporary dewatering efforts.

    a. If construction requires the installation of cofferdams or dewatering, a fish rescue plan will be developed by the Authority in coordination with NMFS. The fish rescue plan will be approved by NMFS prior to starting work that may result in fish stranding. The plan will include the following content:

i. Fish rescue and relocation will be conducted by a qualified fisheries biologist with a current CDFW Scientific Collecting Permit.

ii. The fish rescue plan will also contain methods for minimizing the risk of stress and mortality from capture and handling of fish removed from the construction sites and returned to adjacent waterways.

b. Implementation of the fish rescue plan will include measures to minimize potential adverse effects on listed fish species (if present) associated with fish stranding during dewatering activities.

i. The fish rescue effort will be implemented during the dewatering of the areas behind the cofferdam(s) and will involve capture and return of those fish to suitable habitat within the adjacent waterways.

ii. A fisheries biologist will be on-site during initial pumping (dewatering) to confirm compliance with the fish rescue plan.

iii. The area will first be seined, followed by electrofishing to remove fish that are behind the cofferdam.

iv. The progress of dewatering will be monitored and allow for the fish rescue to occur prior to completely closing the cofferdam and again when water depths reach approximately 2 feet.

v. NMFS will be notified at least 48 hours prior to the start of fish rescue efforts.

vi. Information on the species, number, and sizes of fish collected will be recorded during the fish rescue and provided in a letter report to be submitted to NMFS within 30 days of the fish rescue.

Compensatory Mitigation

The Authority commits to balancing project objectives with minimizing impacts on waters of the United States (WOUS) and other sensitive environmental resources, and has selected the preliminary Preferred Alternative route based on assessing the environmental impact of each proposed route. The Authority has also created a preliminary compensatory mitigation plan that identifies potential mitigation options to offset anticipated impacts on regulated WOUS, special-status species listed as threatened or endangered under the ESA, the California Endangered Species Act, and certain non-listed special status species identified in the Draft Supplemental Environmental Impact Report/Environmental Impact Statement (EIR/EIS) as requiring compensatory mitigation for the CV Wye of the California HSR system. The preliminary compensatory mitigation plan identifies options that would offset permanent, unavoidable losses of regulated waters and achieve a “no net loss” of wetlands as: 1) mitigation banks, 2) in-lieu fee (ILF) programs, 3) conservation banks, and 4) permittee-responsible mitigation.

While the compensatory mitigation plan identified potential mitigation bank sites for other listed species, no mitigation banks approved by NMFS to offer salmonid restoration or conservation credits have service areas that serve the action area. Therefore, the Authority's compensatory mitigation plan identifies that participation in an ILF program will serve as an option to offset unavoidable impacts to habitats used by CCV steelhead and CV spring-run Chinook salmon in this action area. The National Fish and Wildlife Foundation (NFWF) provides a mitigation option that can be used by permittees to compensate for authorized impacts to aquatic resources over the geographic area under the jurisdiction of U. S. Army Corps of Engineers (USACE) Sacramento District (NFWF 2019), the ILF program. NMFS has also approved of the ILF program to offset authorized impacts to anadromous resources listed under the ESA. Therefore, the Authority has committed to meet their compensatory mitigation obligations to NMFS through participating in the NFWF ILF fee program instead of buying from, or establishing, a mitigation bank.

Specifically, the Authority's participation in the ILF program has earmarked to go towards the Mendota Wetland Restoration Project (NFWF and WRA Environmental Consultants 2019), at this time. The project site is 130 acres total, with 26.10 acres of aquatic resources being offered by re-establishing the seasonal floodplain/wetland habitat. The site is situated on the south bank of a meander bend of the SJR immediately downstream of the Chowchilla Bifurcation Structure. The site is bound to the north and west by the active channel of the SJR, Reach 2A.

Table 1. Project impact acreage estimates and in-lieu fee restored acreage compensatory mitigation targets for the HSR Merced to Fresno plus CV Wye section.

Site	Project Impact Type	Impact Acreage	Ratio (*X*:1)	Mitigation Acreage
SJR Reach 1A (Fresno, CP1)	Permanent	1.66	3	4.98
SJR Reach 1A (Fresno, CP1)	Temporary	1.62	3	4.86
Eastside Bypass (CV Wye)[1]	Permanent	1.36	1	1.36
Eastside Bypass (CV Wye)[1]	Temporary	2.72	0	0
SJR Reach 4A (CV Wye)	Permanent	0.36	3	1.08
SJR Reach 4A (CV Wye)	Temporary	0.71	3	2.13
Total	**—**	**8.43**	**—**	**14.41**

Long-term HSR operations and maintenance after construction

The Authority will regularly perform maintenance along the track and railroad right-of-way, as well as on the power systems, train control, signalizing, communications, and other vital systems required for the safe operation of the HSR system. The Authority expects maintenance methods to be comparable to those of existing European and Asian HSR systems, adapted to the specifics of the California HSR system, with inspection and maintenance for some project elements

occurring several times per week (e.g. track and overhead power system) and some inspection occurring only a few times a year (e.g. structural inspection, vegetation control within the ROW). The FRA will specify standards of maintenance, inspection, and other items in a set of regulations to be issued in the next several years.

Periodic maintenance of the support piers in all crossings is required to ensure their integrity over time. The Authority proposes to perform underwater inspections on a 60-month cycle. Inspections will be performed by personnel that have appropriate certifications for diving. For EINU components, no changes to existing operation and maintenance activities are anticipated with CV Wye implementation. Electrical lines are inspected yearly, or as needed when driven by an event or incident, such as an emergency. A detailed ground inspection is required every other year, with a subsequent aerial patrol between those years. The routine annual inspections, detailed ground inspections, and aerial patrols would not change from existing conditions with project implementation. As maintenance needs arise, repairs and preventative maintenance would continue to be fulfilled by the Pacific Gas & Electric (PG&E) transmission line crew (approximately five trained employees). Potential take of protected species by PG&E during operations and maintenance would continue to be covered under the existing PG&E San Joaquin Valley Operation & Maintenance Habitat Conservation Plan (PG&E 2007).

Interrelated and Interdependent Actions

"Interrelated actions" are those that are part of a larger action and depend on the larger action for their justification. "Interdependent actions" are those that have no independent utility apart from the action under consideration (50 CFR 402.02). The *Endangered Species Act Consultation Handbook* (USFWS and NMFS 1998) provides NMFS and USFWS with applicable guidance on how to analyze whether an activity is interrelated to or interdependent with the proposed action:

> As a practical matter, the analysis of whether other activities are interrelated to, or interdependent with, the proposed action under consultation should be conducted by applying a "but for" test. The biologist should ask whether another activity in question would occur "but for" the proposed action under consultation. If the answer is "no," that the activity in question would not occur but for the proposed action, then the activity is interrelated or interdependent and should be analyzed with the effects of the action.

The other HSR section would not be built but for the proposed action currently under consideration; thus, they should be considered interrelated to, or interdependent with, the proposed action: the Merced to Fresno plus CV Wye section.

The purpose of building a HSR system verses another type of transportation system was to connect major metropolitan hubs to the larger cities of the CCV, which currently have limited interconnectivity, with an additional goal to deliver passengers within approximately two hours of departure despite the vast distances. Currently, members of the public typically use highways to travel between these hubs, and the roads are usually clogged by automotive traffic. While each of the ten sections would theoretically be able to function independently between its own station hubs, an infrastructure project of this size would not have been undertaken simply to connect the cities of each section for such a limited distance. For passengers wishing to travel from

downtown San Francisco to residences in Fresno, or vice versa, multiple sections must be completed and connected to make a daily trip feasible. Since the functionality of a state-wide high speed transportation system would not be possible without each section, the concept of the HSR system as a whole operating system will also be analyzed for adverse effects to the CCV steelhead ESU and CV spring-run Chinook salmon NEP, though at later dates when each section is submitted for ESA review prior to completing the NEPA process and awarding construction contracts.

2. ENDANGERED SPECIES ACT: BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

The ESA establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat upon which they depend. As required by Section 7(a)(2) of the ESA, each Federal agency must ensure that its actions are not likely to jeopardize the continued existence of endangered or threatened species, or adversely modify or destroy their designated critical habitat. Per the requirements of the ESA and its implementing regulations, Federal action agencies consult with NMFS on their actions that may affect listed species, and ESA Section 7(b)(3) requires that, at the conclusion of consultation, NMFS provides an opinion stating how the agency's actions would affect listed species and their critical habitats. If incidental take is reasonably certain to occur, Section 7(b)(4) requires NMFS to provide an ITS that specifies the impact of any incidental taking and includes non-discretionary reasonable and prudent measures (RPMs) and terms and conditions to minimize such impacts.

The effects analysis of the proposed action for NEP CV spring-run Chinook salmon is only included in this BO because it was requested by the Authority for conferencing purposes. There will be no take issued for CV spring-run Chinook salmon as part of this BO, and take of the NEP of CV spring-run Chinook salmon is not addressed in the ITS. The analysis on NEP CV spring-run Chinook salmon is for informational purposes only.

2.1 Analytical Approach

This opinion includes both a jeopardy analysis and an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of "jeopardize the continued existence of" a listed species, which is "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

This opinion also relies on the definition of "destruction or adverse modification," which "means a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features" (50 CFR 402.02).

We use the following approach to determine whether a proposed action is likely to jeopardize listed species or adversely modify or destroy critical habitat:

- Identify the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action.
- Describe the environmental baseline in the action area.
- Analyze the effects of the proposed action on both species and their habitat using an "exposure-response-risk" approach.

- Describe any cumulative effects in the action area.
- Integrate and synthesize the above factors by: (1) Reviewing the status of the species; and (2) adding the effects of the action, the environmental baseline, and cumulative effects to assess the risk that the proposed action poses to species.
- Reach a conclusion about whether species are jeopardized.
- If necessary, suggest a Reasonable and Prudent Alternative to the proposed action.

Designated critical habitat for CCV steelhead or CV spring-run Chinook salmon does not occur within the action area of the proposed project, therefore there will not be analyses of impacts to their critical habitats.

2.1.1 Conservation Banking and ILF Participation in the Context of the ESA Environmental Baseline

Conservation or mitigation banks, or participation in the NFWF's ILF program, present a unique situation in terms of how they are used in the context of the Effects Analysis (Section 2.5) and the Environmental Baseline (Section 2.4) in ESA Section 7 consultations. When NMFS is consulting on a proposed action that includes conservation bank credit purchases, it is likely that physical restoration work at the bank site has already occurred and/or that a Section 7 consultation occurred at the time of bank establishment. When ILF payments are made, the payments are used as funding for physical restoration work at a site selected to benefit all species identified as impacted by fee-payees, and Section 7 consultation will be forthcoming but before the selected site is restored.

For these reasons, it is appropriate to treat the beneficial effects of the bank as accruing in connection with and at the time of specific credit purchases, not at the time of bank establishment or at the time of restoration work. This means that, in formal consultations on projects within the service area of a conservation bank, the beneficial effects of a conservation bank should be accounted for in the Environmental Baseline after a credit transaction has occurred. More specifically, the Environmental Baseline section should mention the bank establishment (and any consultation thereon) but, in terms of describing beneficial effects, it should discuss only the benefits attributable to credits already sold. In addition, in consultations that include credit purchases as part of the proposed action, the proportional benefits attributable to those credit purchases should be treated as effects of the action. Conversely, where a proposed action does not include credit purchases, it will not receive any direct offset associated with the bank. This approach preserves the value of the bank for its intended purposes, both for the value of the credits to the bank proponent and the conservation value of the bank to listed species and their critical habitat.

A traditional interpretation might suggest that the overall ecological benefits of the conservation bank or ILF program actions belong in the Environmental Baseline. Under this interpretation, where proposed actions include credit purchases or fee payments, it would not be possible to attribute their benefits to the proposed action, without double-counting. Such an interpretation does not reflect the unique circumstances that conservation banks and the ILF program serve.

Specifically, conservation banks are established based on the expectation of future credit purchases. Conservation banks areas would not be created and their beneficial effects would not occur in the absence of this expectation. Similarly, sites purchased, restored, and maintained by NFWF's ILF program may not have offered benefits to certain species unless earmarked to target those specific offsets during the restoration site selection and the ecological design stage, all of which may not have been put into motion without the action agency making ILF fee payments.

This opinion will analyze the beneficial effects of the credit or fee transactions associated with the proposed action. The beneficial effects associated with the remainder of the credits at the bank that have not been subject to a transaction or restoration sites under consideration but not yet implemented by NFWF's ILF program (and their associated potential ecological benefits) will not be considered in the Environmental Baseline nor in the effects of the action.

2.2 Rangewide Status of the Species and Critical Habitat

This opinion examines the status of each species that would be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' current "reproduction, numbers, or distribution" as described in 50 CFR 402.02.

The descriptions of the status of species in this opinion are a synopsis of the detailed information available on NMFS's West Coast Regional website (http://www.westcoast.fisheries.noaa.gov/). Table 2 below identifies the federally listed species with the potential to occur in the action area and the species' associated DPS or ESU listing. The website links listed below Table 2 lead to websites that provide more detailed information regarding species life history and geographical distribution, as well as the Federal Register (FR) Notices for species listing and critical habitat designation.

Table 2. ESA Listing History.

Species	ESU or DPS	Original Final FR Listing	Current Final Listing Status
Steelhead (*O. mykiss*)	California Central Valley DPS	3/19/1998 63 FR 13347 Threatened	1/5/2006 71 FR 834 Threatened
Spring-run Chinook salmon (*Oncorhynchus tshawytscha*)*	Central Valley ESU	9/16/1999 64 FR 50394 Threatened	6/28/2005 70 FR 37160 Threatened

* NEP spring-run Chinook salmon reintroduced to the San Joaquin River 10(j) designated 12/31/2013 (78 FR 79622)

More detailed CCV steelhead DPS and critical habitat listing information can be found at NOAA Fisheries West Coast Region's protected species CCV steelhead page, and more detailed information concerning CV spring-run Chinook salmon ESU and their critical habitat listing

information can be found at NOAA Fisheries West Coast Region's protected species CV spring-run Chinook salmon page.

2.2.1 CCV steelhead DPS status

Individuals of the federally listed DPS of CCV steelhead may occur in the action area and may be affected by the proposed action, though its critical habitat does not occur within the action area. Detailed information regarding DPS listing and critical habitat designation history, designated critical habitat, DPS life history, and viable salmonid population (VSP) parameters can be found in the 2015 5-year status review (NMFS 2016a).

Historical CCV steelhead run sizes are difficult to estimate given the paucity of data, but may have approached one to two million adults annually. By the early 1960s, the CCV steelhead run size had declined to about 40,000 adults (McEwan 2001). Current abundance data for CCV steelhead are limited to reports of returns to hatcheries (Coleman National Fish Hatchery, Feather River Fish Hatchery) and redd surveys conducted on a few rivers such as American River and Clear Creek. The hatchery data are the most reliable because redd surveys for steelhead are often made difficult by high flows and turbid water usually present during the winter-spring spawning period.

CCV steelhead returns to Coleman National Fish Hatchery increased from 2011 to 2014 (see the 2015 5-year status review (NMFS 2016a) for further information). After hitting a low of only 790 fish in 2010, 2013 and 2014 averaged 2,895 fish in returns. Wild adults counted at the hatchery each year represent a small fraction of overall returns, but their numbers have remained relatively steady, typically 200 to 300 fish each year. Numbers of wild adults returning each year ranged from 252 to 610 from 2010 to 2014.

The returns of CCV steelhead to the Feather River Fish Hatchery experienced a sharp decrease from 2003 to 2010, with only 679, 312, and 86 fish returning in 2008, 2009 and 2010, respectively. In recent years, however, returns have experienced an increase, with 830, 1,797, and 1,505 fish returning in 2012, 2013, and 2014, respectively. Overall, steelhead returns to hatcheries have fluctuated so much from 2001 to 2015 that no clear trend is present.

An average of 143 redds have been counted on the American River from 2002 to 2015 (Hannon 2005, Chase 2010). An average of 178 redds have been counted in Clear Creek from 2001 to 2015 following the removal of Saeltzer Dam, which allowed steelhead access to additional spawning habitat. The Clear Creek redd count data range from less than 50 to just over 400 observed redds, and indicate a slight upward trend in abundance since 2006 (Schaefer *et al.* 2019).

Occasional catches in trawl surveys provide further information on juvenile steelhead abundance. An estimated 100,000 to 300,000 naturally produced juvenile steelhead are estimated to leave the CV annually, based on rough calculations from sporadic catches in trawl gear (Good *et al.* 2005). Nobriga and Cadrett (2001) used the ratio of adipose fin-clipped (hatchery) to unclipped (wild) steelhead smolt catch ratios in the USFWS Chipps Island trawl from 1998 through 2000 to estimate that about 400,000 to 700,000 steelhead smolts are produced naturally each year in the CV. Trawl data indicate that the level of natural production of steelhead has remained very low

since the 2011 status review, suggesting a decline in natural production assuming consistent hatchery releases. Catches of steelhead at the fish collection facilities in the southern Sacramento-San Joaquin River Delta (Delta) are another source of information on the production of wild steelhead relative to hatchery steelhead (CDFW 2019). The overall catch of steelhead has declined dramatically since the early 2000s, with an overall average of 2,705 in the last 10 years. The percentage of wild (unclipped) fish in salvage has fluctuated, but has leveled off to an average of 36 percent since a high of 93 percent in 1999.

Large portions of many historic populations of CCV steelhead are entirely above impassable barriers and may persist as resident or adfluvial rainbow trout, although they are presently not considered part of the DPS since they are unable to reach the ocean. Steelhead below major rim dams are well-distributed throughout the CV (Good *et al.* 2005, NMFS 2016c), however about 80 percent of the historical spawning and rearing habitat once used by CCV steelhead is now upstream of impassible dams (Lindley *et al.* 2006), which has greatly contribtued to the population's decline in abundance. Also, most populations of CCV steelhead DPS have a high hatchery component, including Battle Creek (adults intercepted at the Coleman National Fish Hatchery weir), the American River, Feather River, and Mokelumne River populations.

The observed reductions in population size are further reinforced by genetic analysis (Nielsen *et al.* 2003). Garza and Pearse (2008) also analyzed the genetic relationships among CCV steelhead populations and found that unlike the situation in coastal California watersheds, fish below barriers in the CV were often more closely related to below barrier fish from other watersheds than to *O. mykiss* above barriers in the same watershed. This pattern suggests the ancestral genetic structure is still relatively intact above barriers, but may have been altered below barriers by stock transfers. The genetic diversity of CCV steelhead is also compromised by hatchery origin fish, placing the natural population at a high risk of extinction (Lindley *et al.* 2007).

In summary, the 2016 status of the CCV steelhead DPS appears to have remained unchanged since the 2011 status review, and the DPS is likely to become endangered in the near future throughout all or a significant portion of its range (NMFS 2014, 2016a). Indications suggest CCV steelhead have continued to decrease in overall abundance and in the proportion of natural fish over the past 25 years (Busby *et al.* 1996, Good *et al.* 2005, McClure 2011, NMFS 2014, 2016a), with a projected negative long-term trend unless recovery actions are taken. Most wild CCV populations are very small and may lack the resiliency to persist for protracted periods if subjected to additional stressors, particularly widespread stressors such as climate change. Additionally, the genetic diversity of CCV steelhead has likely been impacted by low population sizes and high numbers of hatchery fish relative to wild fish, but in some cases the historical genetic diversity persists in resident or adfluvial *O. mykiss* populations above major dams (Pearse and Campbell 2018). Further details regarding this DPS can be found in the 2015 5-year status review (NMFS 2016a).

2.2.2 NEP CV spring-run Chinook salmon status

Since 2014, the SJRRP has incrementally released groups of spring-run Chinook salmon back into the SJR in reintroduction efforts (SJRRP 2017a). These actions are to meet a settlement goal that also fulfills a NMFS's recovery requirement regarding the CV spring-run Chinook salmon ESU. According to a final rule under ESA Section 10(j), the CV spring-run Chinook salmon

released as part of SJRRP's reintroduction efforts are designated as a NEP population inside of the experimental population area, which is defined as the SJR from its confluence with the Merced River upstream to the base of Friant Dam. All released NEP spring-run Chinook salmon juveniles are marked externally but released broodstock adults have successfully spawned in-river, producing unmarked NEP juveniles that are able to leave the NEP/SJRRP area (marked juveniles released into SJR Reach 1A were recovered downstream of the SJR/Merced River confluence, indicating juveniles are able to leave the area unassisted (NMFS 2019)).

Since the action area for this proposed action occurs inside the experimental population area of the NEP/SJRRP's Restoration area, and the project interacts with several of the migration corridors the NEP spring-run Chinook salmon must take to reach the ocean or return to the holding, spawning, and rearing areas in Reach 1A, the Authority has agreed to consider NEP CV spring-run Chinook salmon in this opinion as a threatened species. Adult NEP spring run have returned to the SJR (Cahill 2019, Sheehan 2019), though in low initial numbers and adults must be captured downstream and transported around passage barriers to reach holding and spawning grounds in Reach 1A. The number of spring-run Chinook salmon returning to the SJR in the Restoration area is expected to increase over time, as experimental hatchery production of juveniles for release is scheduled to increase, and the number of juveniles produced naturally due to increased adult escapement and spawning in-river.

Information concerning the CV spring-run Chinook ESU from which the NEP population was sourced is pertinent to the conservation considerations made for this conferencing opinion, therefore the status of the wild population is included below. The independent, wild populations of CV spring-run Chinook salmon in Butte, Deer and Mill creeks are the best trend indicators for the viability of this ESU. NMFS evaluates their risk of extinction based on VSP parameters in these watersheds. Lindley *et al.* (2007) indicated that the spring-run Chinook salmon populations in the CV had a low risk of extinction in Butte and Deer creeks, according to their population viability analysis model and other population viability criteria (*i.e.*, population size, population decline, catastrophic events, and hatchery influence, which correlate with VSP parameters abundance, productivity, spatial structure, and diversity). The Mill Creek population of CV spring-run Chinook salmon was at moderate extinction risk according to the population viability analysis model, but appeared to satisfy the other viability criteria for low-risk status. However, the CV spring-run Chinook salmon ESU failed to meet the "representation and redundancy rule" for the spatial structure parameter since these three populations are the only demonstrably viable populations from one diversity group (northern Sierra Nevada) out of the three diversity groups that historically supported the ESU, or out of the four diversity groups as described in the NMFS CV Salmon and Steelhead Recovery Plan (NMFS 2014), which stated a recovery criteria of nine viable populations. Over the long term, these three remaining populations are considered to be vulnerable to catastrophic events, such as volcanic eruptions from Mount Lassen or large forest fires due to the close proximity of their headwaters to each other. Drought is also considered to pose a significant threat to the viability of the spring-run Chinook salmon populations in these three watersheds due to their close proximity to each other. One large event could eliminate all three populations.

The most recent status review (NMFS 2016b) reported that CV spring-run Chinook salmon escapements had increased, through 2014, since the previous status review (2010/2011), which moved the Mill and Deer creek populations from the high extinction risk category to the

moderate extinction risk category, and Butte Creek remained in the low risk of extinction category. However, since the 2016 status review was issued, CV spring-run Chinook escapement estimates declined sharply, in 2016, 2017, and 2018 (California Department of Fish and Wildlife (CDFW) 2018). In 2017, Butte Creek held the majority of the spawning adults, at over 500 individuals, keeping it above the trigger of high extinction risk, while all other creeks had less than 300 adults (some creeks held 30 or less), for an estimated total of 1,105 wild fish returns. In 2018, Mill and Deer Creeks were believed to be heading towards the local extirpation of the species, with less than 500 adults consistently returning to watersheds that were once strongholds. NMFS and CDFW began drafting a CV spring-run Chinook salmon emergency action plan with the purpose of preventing this ESU from becoming classified as endangered in the next status review (Duryea 2018). In November of 2018, the Camp Fire in the City of Paradise, California, was the most destructive fire in California's history (ABC 7 News 2018). The debris and ash resultant from this wildfire is expected to devastate any spring-run Chinook salmon eggs that were incubating in the Butte Creek stream complex since the fire occurred around and upstream of many important spawning gravel beds. The poor water conditions and debris flows expected to have been mobilized by the rain that followed the wildfire are expected to suffocate and smother the developing eggs and fry, and therefore a total run failure of the 2018 cohort from Butte Creek is likely.

In summary, the CV spring-run Chinook salmon ESU is still facing significant extinction risk from many persistent threats, and may face mounting threats in the future. Detailed information regarding the ESU's life history, and VSP parameters pertaining to the natural populations that occur in tributaries of the Sacramento River basin can be found in the 2015 5-year status review (NMFS 2016b).

2.2.3 Climate change

One major factor affecting the rangewide status of all the listed anadromous fishes and their aquatic habitats in the CV at large is climate change. Temperatures are projected to increase steadily during the century, with a general increase from about 1.6°F in the early 21st century up to almost 4.8°F in the Sierra Nevada Mountains by the late 21st century (Reclamation 2015). Increased temperatures influence the timing and magnitude patterns of the hydrograph. Central California has shown trends toward warmer winters since the 1940s (Dettinger and Cayan 1995). Warmer temperatures associated with climate change reduce snowpack and alter the seasonality and volume of seasonal hydrograph patterns (Cohen *et al.* 2000). These changes are partly due to more precipitation falling as rain rather than snow (Dettinger *et al.* 2004, Stewart *et al.* 2004). Runoff is expected to increase during the fall and winter months, and peak runoff may shift by more than a month earlier in some watersheds (Reclamation 2015).

The magnitude of snowpack reductions is also subject to annual variability in total precipitation and air temperature. The large spring snow water equivalent (SWE) percentage changes, late in the snow season, are due to a variety of factors including reduction in winter precipitation and temperature increases that rapidly melt spring snowpack (VanRheenen *et al.* 2004). Factors modeled by VanRheenen *et al.* (2004) show that the melt season shifts to earlier in the year, leading to a large percent reduction of spring SWE (up to 100% in shallow snowpack areas). Additionally, an air temperature increase of 2.1°C (3.8°F) is expected to result in a loss of about half of the average April snowpack storage (VanRheenen *et al.*, 2004). The decrease in spring

SWE (as a percentage) would be greatest in the region of the Sacramento River watershed, at the north end of the CV, where snowpack is shallower than in the SJR watersheds to the south.

An analysis on CCV steelhead's response to climate change is not available, however one has been conducted considering Chinook salmon environmental requirements. Projected warming is expected to affect all runs of CV Chinook salmon. Because the runs are restricted to low elevations as a result of impassable rim dams, it is questionable whether any CV Chinook salmon populations can persist (Williams 2006) if Northern California atmospheric temperatures warm by 5°C (9°F), as predicted by Dettinger (2005). Based on an analysis of an ensemble of climate models and emission scenarios and a reference temperature from 1951 to 1980, the most plausible projection for warming over Northern California is 2.5°C (4.5°F) by 2050 and 5°C by 2100, with a modest decrease in precipitation (Dettinger 2005).

Steelhead in the CV historically consisted of both summer-run and winter-run migratory forms. Only winter-run (ocean maturing) steelhead currently are found in CCV rivers and streams as summer-runs have been extirpated (McEwan and Jackson 1996, Moyle 2002). In recent history, the summer and fall in-stream temperatures of many waterways below rim dams regularly exceed the recommended temperatures for optimal growth of juvenile steelhead, which range from 57 to 66°F (14 to 19 degrees Celsius (°C)). Several studies have found that steelhead require colder water temperatures for spawning and embryo incubation than salmon (McCullough *et al.* 2001). In fact, McCullough *et al.* (2001) recommended an optimal incubation temperature at or below 52 to 55°F (11 to 13°C). Successful smoltification in steelhead however, may be impaired by temperatures above 54°F (12°C), as reported by Richter and Kolmes (2005). As stream temperatures warm due to climate change, the growth rates of juvenile steelhead could increase in some systems that are currently relatively cold, but these individual may also experience decreased survival due to the higher metabolic demands and greater presence of predators. Additionally, stream temperatures that are currently marginal for spawning and rearing may become too warm to support wild steelhead populations according to current climate change projections.

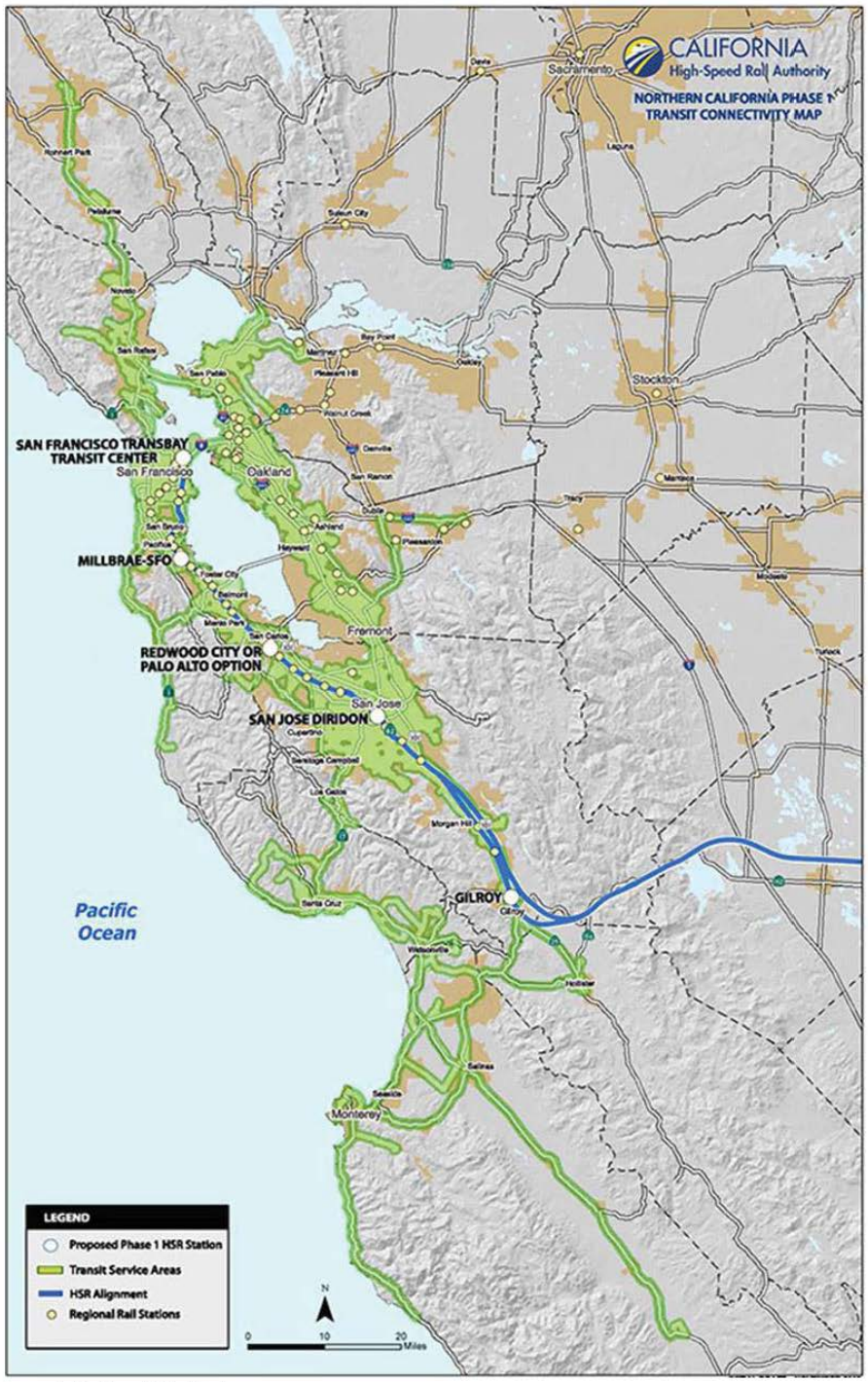
Besides simply facing temperature increases, and likely decreases in the overall availability of water at suitable temperatures during sensitive life stage periods on a region wide scale, there are additional effects expected to cascade through their freshwater ecosystems with severe consequences. Increases in the frequency, duration, and/or severity of droughts and heat stress caused by climate change are linked to wide-spread increases in tree mortality beyond what would be expected even in areas that are not normally-water limited (Allen *et al.* 2010). Widespread increases in dead trees in forested areas, as well as increases in other factors associated with climate change, greatly increase the risk for wildfires (Abatzoglou and Williams 2016). Wildfire activity in the Western U.S. has increased, with wildfires having longer durations and wildfire seasons lasting longer than they did before the mid-1980s (Westerling *et al.* 2006). Several watersheds critical to listed salmonids in the CCV have experienced large, intense forest fires recently, the Camp Fire being the most recent and most devastating example (ABC 7 News 2018). The increased risk of extinction elevated by wildfires has already been predicted in the NMFS Recovery Plan (NMFS 2014), especially for ESUs like that of the CV spring-run Chinook salmon, which is largely limited to a single geographic area and therefore extremely vulnerable to regional catastrophes.

In summary, observed and predicted climate change effects are generally detrimental to all anadromous species in the CCV as they rely on abundant cold water to successfully spawn and rear in freshwater habitats (McClure 2011, Wade *et al.* 2013). Unless offset by improvements in other factors, the statuses of these species are likely to decline over time due to the decreases in the functionality of their critical habitats to support cold-water breeding and rearing. The climate change projections referenced above cover the time period between the present and approximately 2100. While the uncertainty associated with climate change projections increases with time, the direction/trend of change is relatively certain (McClure *et al.* 2013) and is expected to exacerbate the extinction risk of the species covered here.

2.3 Action Area

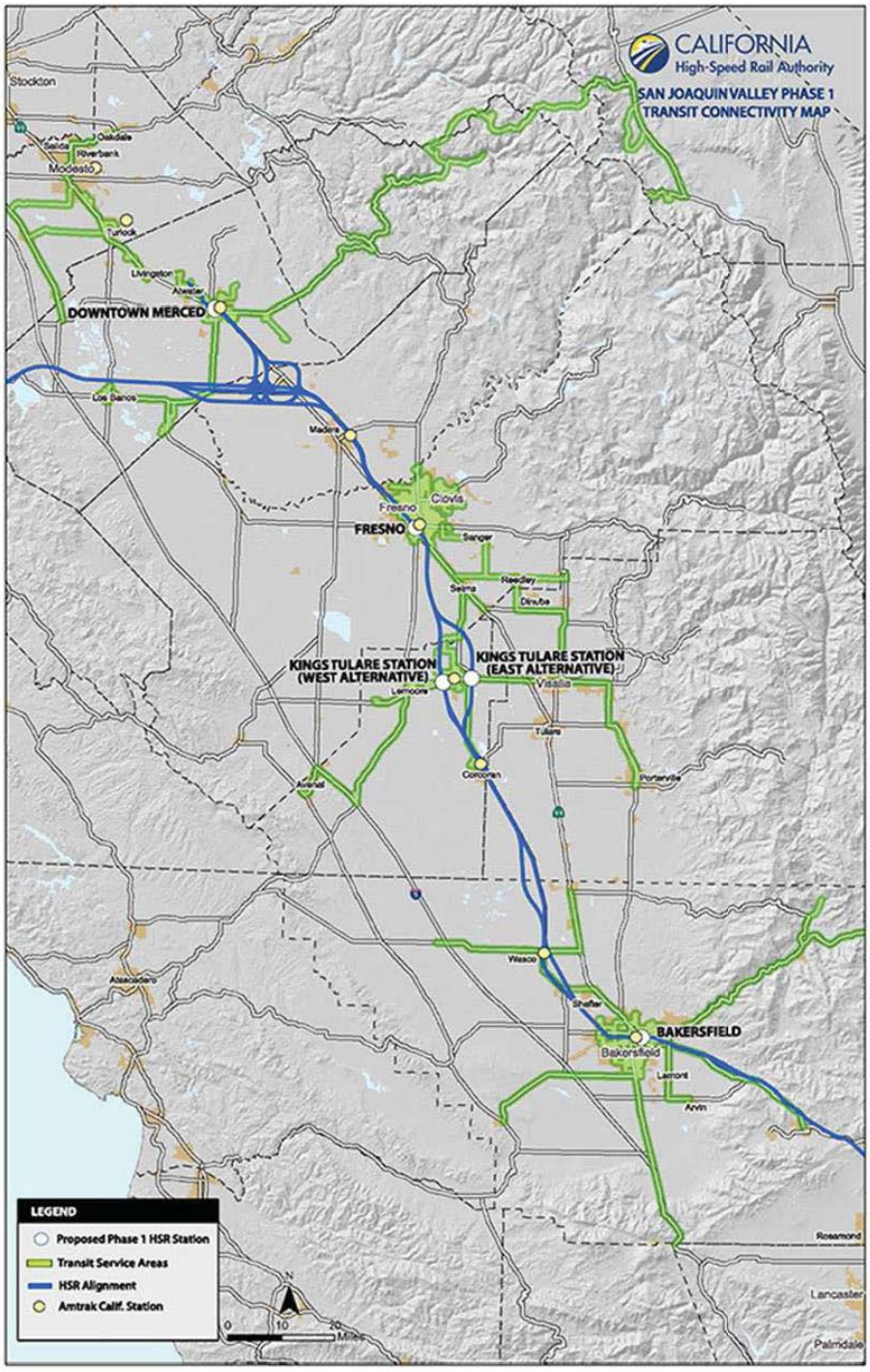
"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). The immediate construction areas and where permanent structures remain that have interactions with species and habitats under NMFS jurisdiction that will be examined in this opinion include: 1) the HSR viaduct crossing over Reach 1A of the SJR north of Fresno, California (Latitude 36.844121, Longitude -119.932625); 2) the HSR viaduct crossing over the Eastside Bypass west of Chowchilla, California (Latitude 37.083793, Longitude -120.530783) ; and 3) the HSR viaduct crossing over Reach 4A of the SJR west of Chowchilla, California (Latitude 37.087718, Longitude -120.568113). Sections outside of the Merced to Fresno plus CV Wye section will be analyzed in their own biological opinions as those sections are submitted to NMFS for environmental review and will not be contained here (Figure 1, Figure 2, and Figure 3), though all sections must be completed for the HSR system to achieve its purpose in connecting the major metropolitan and urban areas of the state of California.

The action area also includes any conservation banks or restoration areas funded as part of the action. Since there are no NMFS-approved mitigation banks that offer shaded riparian or floodplain credits that include the action area of the project in their service areas, the Authority plans to participate in the NFWF's ILF program to offset long-term impacts to CCV steelhead and NEP CV spring-run Chinook within the action area. Therefore, the action area also includes the restoration site that will be funded by the fees paid by the Authority to the ILF program to offset impacts from the Fresno to Merced plus CV Wye section. Preliminary information exchanges indicate that these particular fee payments will fund the proposed Mendota Wetlands Restoration Project (Latitude 36.768224, Longitude -120.286208). The Mendota Wetlands Restoration Project is part of the Kings River Service Area approximately five miles east from the town of Mendota, California. It is a parcel along the SJR that can be converted back to floodplain habitat after a small levee is breached/set-back (NFWF and WRA Environmental Consultants 2019) that would produce 26.10 acres of aquatic habitat/credits at full realization (Figure 4).



Source: Authority and FRA, 2014b

Figure 1. HSR Northern California Phase 1 Transit Connectivity Map from the CCV to the San Francisco/San Jose Bay Area ((Authority and FRA 2018) Appendix A).



Source: Authority and FRA, 2014b

Figure 2. HSR San Joaquin Valley Phase 1 Transit Connectivity Map from Merced to Bakersfield, California, including the Merced to Fresno plus CV Wye section ((Authority and FRA 2018) Appendix A).

Source: Authority and FRA, 2014b

Figure 3. HSR Southern California Phase 1 Transit Connectivity Map from the CCV/Bakersfield to the Los Angeles/Anaheim Area ((Authority and FRA 2018) Appendix A).

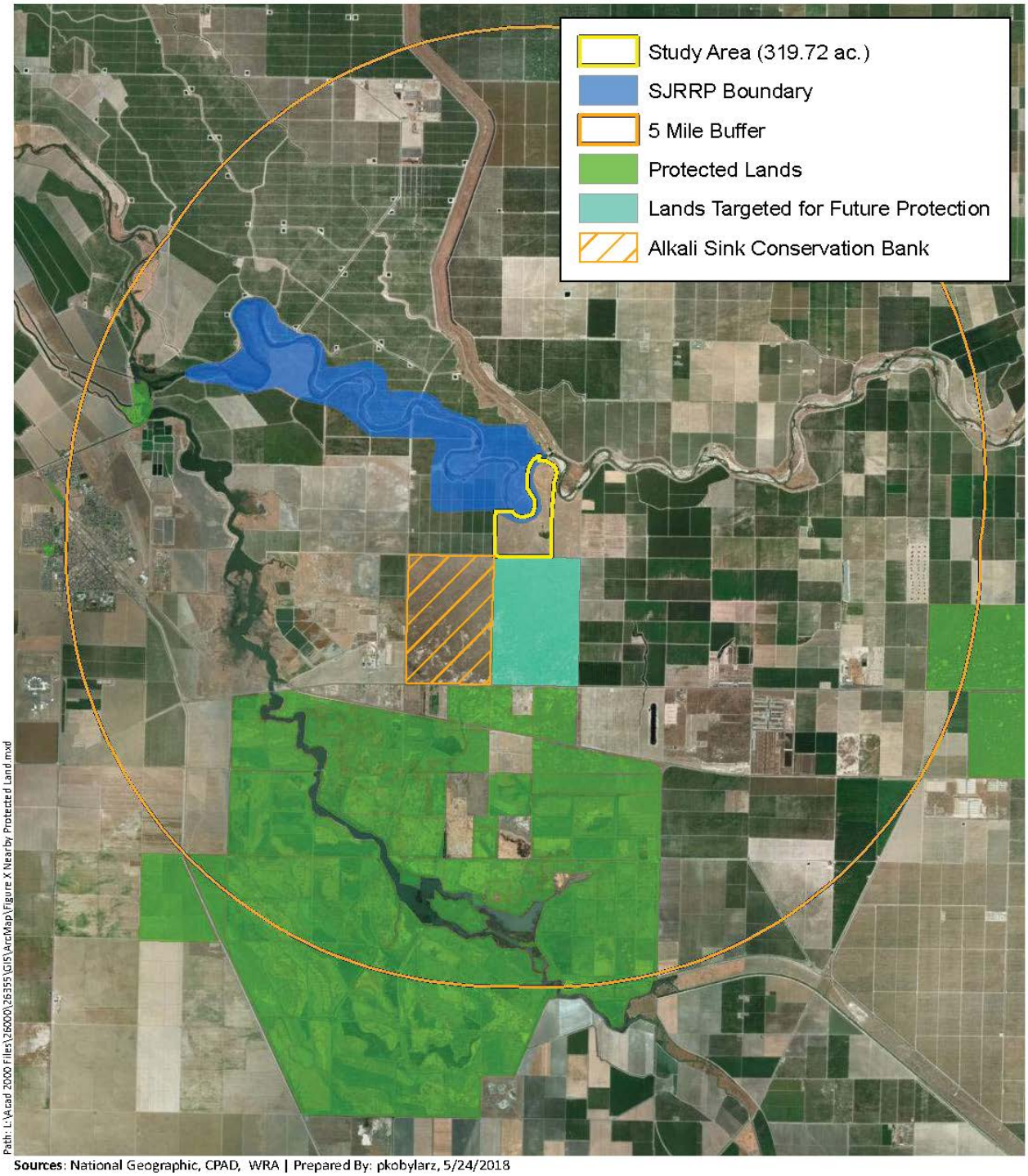


Figure 4. Mendota Wetland Restoration Project site (yellow outline) in Fresno County, California, compared to other protected lands (green) and a portion of the SJRRP Restoration Area (blue) (NFWF and WRA Environmental Consultants 2019).

2.4 Environmental Baseline

The "environmental baseline" includes the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early Section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR 402.02).

2.4.1 Occurrence of listed species

The federally listed anadromous species that use and occupy the action area are adult and juvenile CCV steelhead and CV spring-run Chinook salmon. The SJR mainstem in the action area is the primary migration corridor for both adult and juvenile life stages spawned below Friant Dam to reach the Delta, which contains important rearing habitat for the juveniles. The Eastside Bypass has potential to act as an auxiliary pathway when water management decisions dictate its use, as juveniles may be pushed out through this pathway from Reach 1 and 2 during flood flow releases.

2.4.1.1 CCV steelhead

It is believed that all current stocks of CCV steelhead have a winter-run timing, meaning they may migrate up rivers in the winter starting with the first pulse of notable rain runoff (Moyle *et al.* 1995). The life history strategies of steelhead are extremely variable between individuals, and it is important to take into account that steelhead are iteroparous (i.e., can spawn more than once in their lifetime (Busby *et al.* 1996)) and therefore may be expected to emigrate back down the system after spawning. As such, the determination of the presence or absence of steelhead in the Delta accounted for both upstream and downstream migrating adult steelhead (kelts).

Adult steelhead historically entered freshwater in August (Moyle 2002) and peak migration of adults moving upriver occurred August through September (Figure 5; Hallock, et al., 1957). Adult steelhead usually hold in large river mainstems until flows are high enough in the tributaries to complete their upstream, where they would spawn from December to April (Hallock *et al.* 1970). In the case of the SJR, many impassable barriers exist between the Delta, the SJR mainstem, and spawning areas in Reach 1A, until flows are over at least 5,000 cubic-feet-per-second (cfs), at which point the entire system would be in flood and fish barriers would be over-topped. This type of flooding is expected in 20% or less of all water year types (SJRRP 2017a), and could be expected to occur October (or later) through summer, depending on the year's precipitation pattern, snowpack availability, and melting rates and amounts compared to available storage capacity in Friant Dam. Additionally, the SJRRP monitors the confluence of the SJR and the Merced River for adult CCV steelhead (SJRRP 2015a), however none have been observed to date (though a large adult resident *O. mykiss* was captured in 2019 (Stuphin 2019a). Therefore an adult CCV steelhead migrating upstream could be expected to be present in the action area October through June, if the SJR were in major flood conditions at any point during that time period or if volitional passage was established through SJRRP efforts.

After spawning, any surviving steelhead kelts try to migrate back to the ocean starting in March (based on Sacramento River patterns), and have a relatively high presence in the Delta in May

(Figure 5). Therefore, kelt steelhead migrating downstream may be present in the action area from March through June, again depending on flow amounts and water temperatures.

Out-migrating juveniles in the Stanislaus River, the closest monitoring location to the construction areas, are observed January through June, with the core of their migration occurring February through the end of May (Figure 5). Larger juveniles in the process of smoltification (parr to smolt stage) have been captured until July on the Mokelumne River (Figure 5). Therefore, juveniles would be expected to be out-migrating from the upper SJR through the action area sometime between January through July, limited by suitable water temperature persistence.

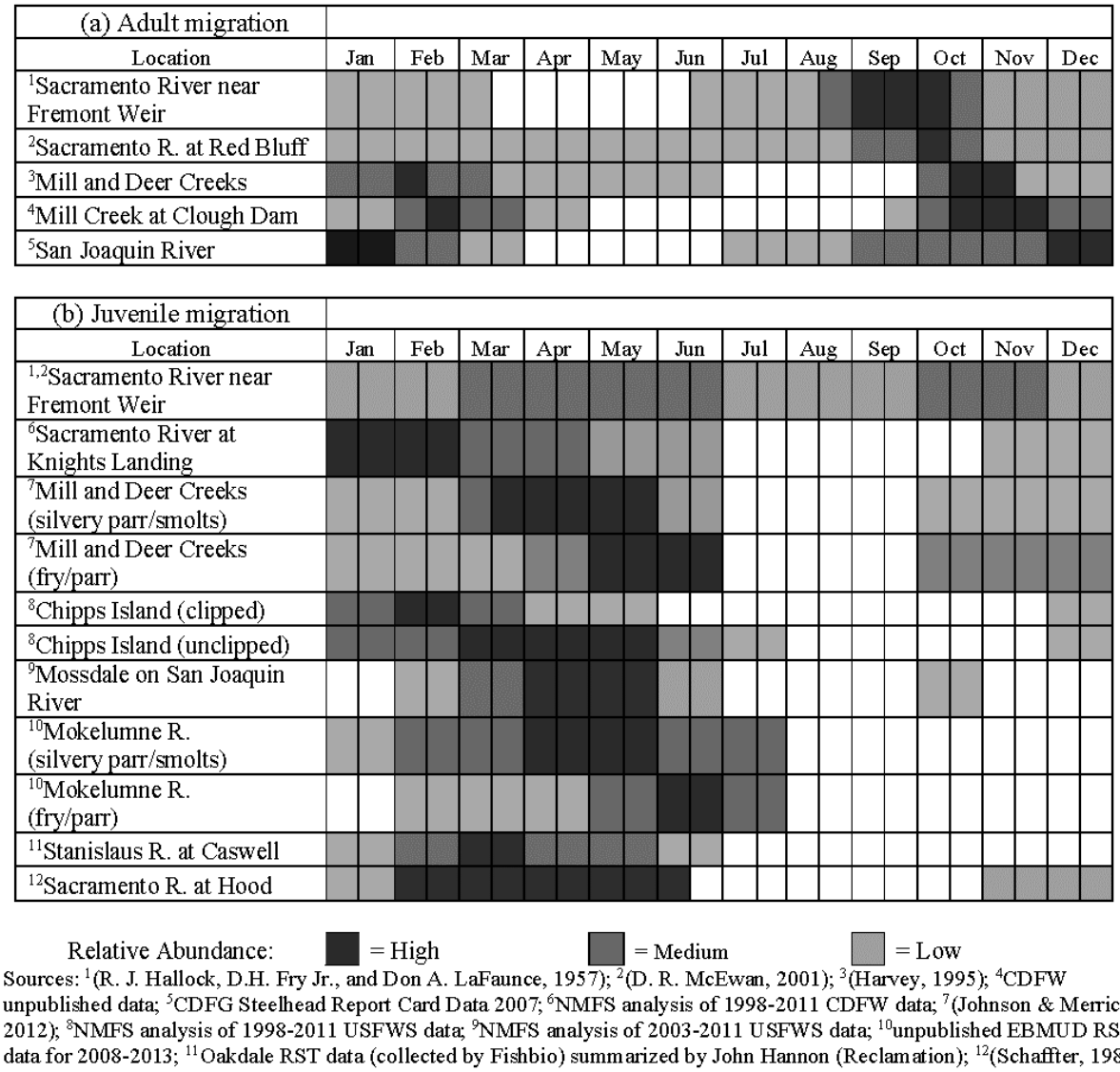


Figure 5. The temporal occurrence of (a) adult and (b) juvenile CCV steelhead at locations throughout the CV. Darker shades indicate months of greatest relative abundance.

2.4.1.2 NEP CV spring-run Chinook salmon

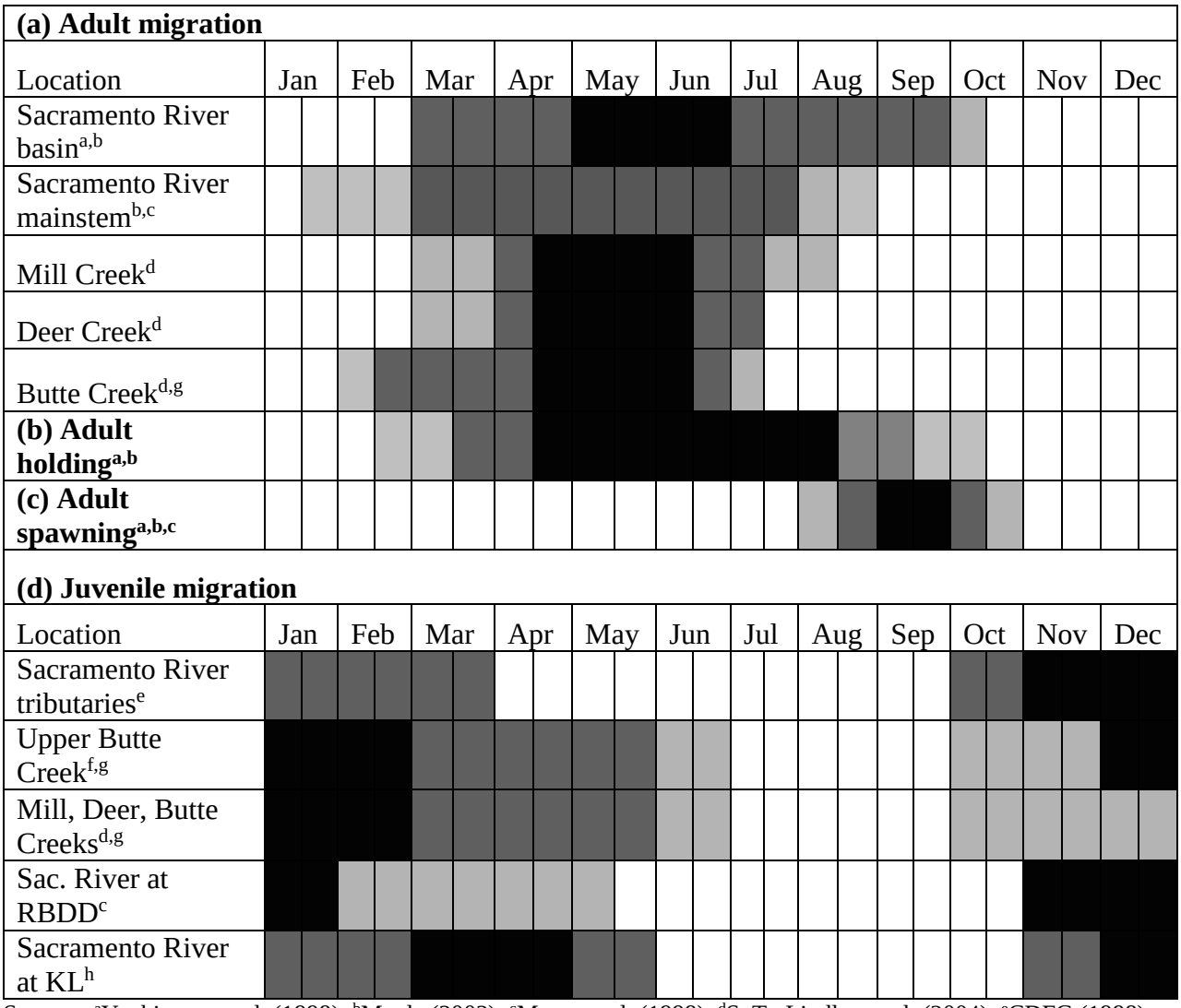
CV spring-run Chinook salmon are considered functionally extirpated from the Southern Sierra Nevada diversity group despite their historical abundance in the basin (NMFS 2016b). There have been observations of low numbers of spring time running fish returning to major SJR tributaries (the Stanislaus and Tuolumne Rivers) that exhibit some typical spring-run life history characteristics (Franks 2014). However, genetic evidence that these fish should be considered spring-run Chinook salmon is lacking (Garza 2019).

While the genetic disposition of fish from other rivers is still under scrutiny, the implementation of the reintroduction of the spring-run Chinook salmon into the upper SJR has begun and has resulted in over 800 wild-spawned NEP juvenile spring-run Chinook salmon (NMFS 2019), in addition to tens of thousands of juveniles released by SJRRP downstream of the Merced/SJR confluence for reintroduction purposes since 2014, and the return of 23 NEP adults to the SJR basin released by the SJRRP as juveniles in April 2019, likely from a 2017 release group (Glenn 2019b). Adult returns are expected to increase over time, especially as SJRRP proposed projects are completed (SJRRP 2017a, b) and river conditions become more suitable for Chinook use (NMFS 2016b).

The general CV spring-run Chinook salmon life history pattern is to return to freshwater as adults under spring floods/snowmelt flows to areas with deep holding pools high in the watersheds so that they can hold over summer and survive summer atmospheric temperatures while developing their gonads using energy reserves. Therefore adults typically return to freshwater basins starting in March (referencing the Sacramento River basin, Figure 6a), though the 23 returning NEP adults were captured April through May in the SJR basin, however high flows that persisted over March prevented adequate monitoring or fish capture that could detect earlier returns (Smith 2019). Therefore, as NEP adults begin returning in greater numbers, they may be expected to travel through the action area beginning sometime in March (Figure 6a). Several of the adults captured by SJRRP staff for transport to Reach 1A died in transit, likely due to water temperatures exceeding 75°F and in some cases 80°F, in the lower SJR near the capture location. While in-river temperatures have already receded, it is uncertain how many more adults may arrive, and at what point in the season water temperatures will completely dictate their survival by exceeding all lethality thresholds. However, if snow melt amounts and melt rates are able to drive in-river water temperatures down, adult returns could continue into July. Therefore, adult NEP returns may be expected to be present in the northern part of the action area from March through July, and in Reach 1A from the HSR viaduct crossing north of Fresno to the base of Friant Dam from March through September, however all use patterns are dictated by river flows and water temperatures.

The HSR construction areas are not adjacent to any holding habitat, though fish occasionally stray downstream during the summer. As summertime temperatures increase, adults are less and less likely to use the habitat by the HSR viaduct crossing north of the Fresno construction site. Interactions with spawning areas and activities are not expected as all known redds created by released adult NEP broodstock are located several miles upstream from the HSR viaduct crossing north of the Fresno construction site. Therefore, eggs and alevins are not anticipated to interact with the project.

NEP spring-run juveniles are expected in to be in the action area November through June (Figure 6b) as they emigrate through the action area, based on the known spring-run life history timing in the Sacramento River Basin and the limited information provided by SJRRP juvenile releases and monitoring. Rotary screw traps placed in the Restoration Area have captured fry and juveniles as early as December (Zachary Sutphin, preliminary 2018/2019 data, April 29, 2019, Fisheries Biologist, Reclamation), to mid-June in Reach 1A. Yearlings, which may stay in the system for an entire year, could be expected at the HSR viaduct crossing north of Fresno construction site at any time, depending on water temperatures. Again, exact timing of CV spring-run use of the action area is highly variable and these estimates of date ranges were made based on: 1) known volitional fish passage issues throughout the system; 2) observations of in-river water flows and temperatures; and 3) variations between life history stage timing differences between the better-known natural population in the Sacramento River basin and the information provided by the burgeoning success of the reintroduction of the NEP population in the SJR basin, as data becomes available.



Sources: [a]Yoshiyama et al. (1998); [b]Moyle (2002); [c]Myers et al. (1998); [d]S. T. Lindley et al. (2004); [e]CDFG (1998); [f]McReynolds, Garman, Ward, and Plemons (2007); [g]P. D. Ward, McReynolds, and Garman (2003); [h]Snider and Titus (2000)

Note: Yearling spring-run Chinook salmon rear in their natal streams through the first summer following their birth. Downstream emigration generally occurs the following fall and winter. Most young-of-the-year spring-run Chinook salmon emigrate during the first spring after they hatch.

Relative Abundance: = High = Medium = Low

Figure 6. The temporal occurrence of adult (a) and juvenile (b) Central Valley spring-run Chinook salmon in the Sacramento River (used for reference for the SJR until local information becomes available). Darker shades indicate months of greater relative abundance.

2.4.2 Factors affecting listed species

2.4.2.1 San Joaquin River Basin water resources

The SJR is the longest river in California, covering 366 miles, but is considered California's second largest river according to average total annual flow estimates. The SJR has an average flow of 6 million acre feet per year compared to the Sacramento River's 18 million acre feet (Reclamation 2015). It drains the central and southern portions of the CCV and joins the Sacramento River near the center of California to form the Delta, the largest estuary on the west coast of the United States. The SJR is primarily fed by the melting snowpack of the Sierra Nevada Mountains, receiving two thirds of its water in this way.

The primary water storage reservoir on the SJR is Millerton Lake, impounded by Friant Dam, which was completed in 1944. Millerton Lake/Reservoir can hold more than 500 thousand acre feet of water in storage. Friant Dam is then able to divert water into two canals, the Friant-Kern Canal and the Madera Canal, both of which primarily support the irrigation needs of agriculture as part of the Central Valley Project (CVP). See the existing Coordinated Long-term Operation of the CVP and State Water Project, and their effects on ESA-listed species and their critical habitats that have been analyzed in the 2009 NMFS CVP Operations opinion (NMFS 2009) for more information on the effects of federal and state water management on listed species under NMFS jurisdiction.

Since the completion of the Friant Dam/Millerton Reservoir, the entirety of SJR's flow was impounded and directed into the canals for southerly distribution by Friant Dam (except for releases into the SJR mainstem in an effort to manage flood flows and to fulfill a limited amount of riparian water rights holders downstream). These water management practices resulted in the river typically running dry for a 40 mile stretch annually and only achieving connection to the Delta during flood releases, until recently.

2.4.2.2 Flow patterns, flooding to summer lows, of the crossings

Since 2009, some forms of mandated river restoration flows have reconnected the SJR to the Delta on a semi-regular basis (see Section 2.4.3, Conservation and restoration efforts). A Settlement was reached between Natural Resources Defense Council (NRDC) et al. v. Rodgers et al (the Settling Parties) in 2006, including resolution to the finding that SJR flows were so regularly diverted out of the mainstem channel or stored in Millerton Lake to such a degree that historic water operations resulted in "significant portions of the main stem of the SJR between Friant Dam and Millerton Lake and the confluence of the Merced River being dry during significant portions of the year in most years,…" (2006) so that river flows must be released to restore the natural state of the SJR. The Settlement negotiations included, in part, a regular flow release schedule depending on water year type (Restoration Flows). Partial Restoration Flows, known as Interim Flows, began on October 1, 2009. Restoration Flows began January 1, 2014 but were curtailed in 2014 and 2015 due to extreme drought conditions. The SJR reconnected fully from Friant Dam to the Merced River confluence in August of 2016 and has been reconnected since (SJRRP 2018, 2019).

Restoration Flow and other water releases into the SJR main stem are currently implemented in a way that supports the re-introduction of spring-run Chinook salmon and their use of all reaches below Friant Dam for all life stages ((SJRRP 2017b) Appendix C, page 7). Though the total amount released each year as Restoration Flows from Millerton is dependent on the forecasted water year type, flow amounts and release periods were shaped to support the spring-run Chinook salmon spawning period, the spring-run Chinook salmon egg incubation period, fall-run Chinook salmon attraction period (fall-run Chinook salmon are also a focus species of SJRRP), the fall-run Chinook salmon spawning and egg incubation period, general winter base flows, spring rise and pulse flows (when regular increased snowmelt periods would occur naturally, as well as the spring-run Chinook salmon juvenile outmigration period and the spring-run adult attraction period), and summer base flows (including adult spring-run Chinook salmon holding period), until the cycle begins again. Critical water years still require some allocations to sustain the population, but the lower reaches are expected to receive little to no flows and may result in some lower reaches drying up again during the summers of very dry years.

In addition to Restoration Flows, the SJR basin is susceptible to flood flows since the capacity of Millerton Lake is limited to 520,500 acre feet of water (Reclamation 2016, 2019) but the annual mean flow is approximately 6 million acre feet, or more than 11 times Millerton's capacity. Flood conditions are usually in effect when SJR main stem flows are over 1,000 cfs, and have recently been recorded at over 5,000 cfs in 2016 at the Dos Palos gage in the SJR mainstem ((California Department of Water Resources 2018c, b) Figure 7). When extreme flood flows are expected, the Chowchilla and Eastside Bypasses are utilized to route excessive flows around areas vulnerable to flooding and avoid overtopping the levees and affecting adjacent properties.

The bypass system begins at the SJR 5 miles east of Mendota, California at the Chowchilla Canal Bypass Control Structure (a.k.a. the Chowchilla Bifurcation). The bypass system is designed for a capacity of 5,500 cfs however flows up to 12,000 cfs have been diverted through the bypasses when necessary (SWRCB 2010). Recent data from the California Data Exchange (CDEC) indicates that the bypass system has been utilized twice in recent years, in 2011 and 2017 (*Figure 8*). The Fresno River enters the bypass system at the downstream end of the Chowchilla Bypass, which is also where the Eastside Bypass begins, meaning the Eastside Bypass carries flows from both the Fresno River watershed and whatever flows were directed into the Chowchilla Bypass from SJR Reach 2. The Eastside Bypass's design capacity is 10,000 cfs at its entrance, but its channel capacity increases to 16,500 cfs by the time it joins the Mariposa Bypass. Flow in these bypasses are regulated by control structures downstream from the flow branching point and eventually enter the Delta.

a)

b)

Figure 7. Significant flow events (cfs) in the SJR from a) November 20, 2008 until October 20, 2018 date measured at the Donny Bridge Gage in Reach 1B, and b) since December 3, 2009 until October 20, 2018 at the Dos Palos Gage in Reach 3 (data from CDEC, (California Department of Water Resources 2018c, b)).

a)

b)

Figure 8. Recent use of the Chowchilla and Eastside Bypasses, flood event flows (cfs) from a) 2011 and b) 2017, as measured by the Chowchilla Bifurcation gage (California Department of Water Resources 2018a).

2.4.2.3 San Joaquin River water quality impairments

The Clean Water Act (CWA) gives the states the primary responsibility of protecting and restoring the quality of surface waters within state boundaries. Pursuant to CWA section 303(d), California is required to review and identify waterbodies within the state that do not meet water quality standards by identifying which parameter/standard not being met, the severity of the nonattainment, and the use of the waterbody curtailed because of its pollutants. CWA section 305(b) then requires California to report biennially the water quality conditions to the United States Environmental Protection Agency (EPA). These duties are carried out by the State Water Resources Control Board (SWRCB). The CWA section 305(b) Report and the CWA section 303(d) List was integrated into a single report for the state of California starting in 2012, (which satisfies the requirements of both CWA sections (SWRCB 2012, 2019b). Beyond the requirements, the 2012 California Integrated Report also includes SWRCB staff recommendations for additions or removals of waterbodies from the list, and input from stakeholder meetings and public comments from regional divisions. On October 3, 2017, the SWCRB issued the most recent report, the 2014 and 2016 California Integrated Report CWA Sections 303(d) and 305(b) (SWRCB 2019b) and it was approved by the EPA on April 6, 2018 (EPA 2018a).

The 2014/2016 California Integrated CWA Report assigns waterbodies to tiered categories according to the number of core beneficial uses supported by the waterway, whether a total maximum daily load (TMDL) or some other regulatory attainment framework has been implemented for the waterbody, and if enough data is available to evaluate the status of the water quality of a water body. Waterbodies may be assigned to categories 5A – 5C, 4A, or 4B, as either requiring the development of a TMDL, being addressed by a TMDL, or are being addressed by a regulatory action other than a TMDL. A TMDL is the calculation of the maximum amount of a pollutant allowed to enter a water body from known sources so that the waterbody will eventually attain and continue to meet required water quality standards to enable various water. On the 2014/2016 California CWA 303(d) list, the 70 miles stretch of the SJR from Friant Dam to the Mendota Pool is categorized as a 5A waterway, meaning that water quality standards are not met and a TMDL is still required (Table 3, (SWRCB 2016b)). The 88 mile stretch of the SJR from Mendota Pool to Bear Creek has impairments categorized as 5A and 5B, meaning that some water quality issues are being addressed with a TMDL, while others still require a TMDL (Table 3, SWRCB 2016b).

Regarding pesticides introduced from agricultural applications, in 2006 an amendment to the Basin Plan was approved by the EPA to address diazinon and chlorpyrifos discharges in the lower SJR only (EPA 2006). Currently, diazinon, chlorpyrifos, and pyrethroid pesticides are being addressed by TMDLs adopted as amendments that apply to the entire CV, including the SJR in the action area, to reduce the levels of these pesticides down to levels that are protective of both warm- and cold-water aquatic life (SWRCB 2014, 2017). A proposed TMDL amendment is in development to address organochlorine (SWRCB 2019a).

Regarding solutes that are found naturally in native soils but agriculturally concentrated through irrigation, TMDLs have been completed to address selenium inputs from Grasslands Marshes and Salt Slough, which are locations upstream and affect the action area (SWRCB 2000b, a), and

salt and boron is being addressed by a phased agricultural discharge control program with a target to achieve compliance point at Vernalis, effective by 2020 (SWRCB 2019c).

Table 3. The impairments of the SJR in the action area, from Friant Dam to confluence with Bear Creek, as listed on the 2014/2016 California CWA section 303(d) list, the designated waterbody negatively affected uses, and the status of the TMDL status (SWRCB 2016b, c).

SJR	Cause of Impairment	Listing Category	State TMDL Development Status	Impaired Beneficial Use(s)
Friant Dam - Mendota Pool	Invasive Species	5A	TMDL still required	Warm freshwater habitat
Friant Dam - Mendota Pool	pH	5A	TMDL still required	Water contact recreation; municipal and domestic supply; cold freshwater habitat
Mendota Pool - Bear Creek	Boron	5A	TMDL still required	Agricultural Supply
Mendota Pool - Bear Creek	Chlorpyrifos	5B	TMDL completed	Warm freshwater habitat
Mendota Pool - Bear Creek	DDT	5A	TMDL still required	Commercial/recreation fish, shellfish, aquatic organisms
Mendota Pool - Bear Creek	Diazinon	5B	TMDL completed	Warm freshwater habitat
Mendota Pool - Bear Creek	Group A Pesticides	5A	TMDL still required	Commercial/recreation fish, shellfish, aquatic organisms
Mendota Pool - Bear Creek	Toxicity	5A	TMDL still required	Warm freshwater habitat

The SJRRP also monitors the water quality of the Restoration Area, including the action area, as water quality has a direct impact on the success of its reintroduction efforts (SJRRP 2010b). Regarding in-river temperatures, the SJRRP identifies 68°F as the upper water temperature threshold (i.e., lethal) during adult migration and holding, 62.6°F for spawning, 60°F for egg incubation, 75°F for in-river fry and juvenile growth, rearing, and out-migration for Chinook salmon, though the estimated optimal water temperatures are several degrees cooler (SJRRP 2010a). Warmer water temperatures promote bacterial activity that can compromise fish survival, and in other ways may limit the production of juvenile salmonids from the SJR and also decrease the availability of holding habitat for adult CV spring-run Chinook salmon if left uncontrolled.

Within the action area, water temperatures of the SJR normally exceed suitable temperatures for both juveniles and adults during the summer (Figure 9). Water temperatures begin exceeding 75°F at Donny Bridge (just downstream of the north of Fresno/Reach 1B) sometime between late April through early July and typical recede below 75°F early August through October (Figure

9a), depending on the water year type and atmospheric forcing of any particular year. This means this area often has temperatures that are suitable for fry and juvenile use, but not necessarily supportive of adult holding and spawning activities. In some years, however, like 2018, water temperatures remained below 75°F for the entire year, meaning adults had a much longer period in which they might use the habitat around HWY 99 and upstream, increasing the amount and availability of holding areas.

Water temperatures at the Dos Palos gage track similarly to the Donny Bridge temperatures during the same annual periods, despite being measured lower in the SJR (west of Chowchilla/Reach 4A, Figure 9b). One difference seems to be that water temperatures exceed 75°F more regularly and remain above 75°F over the summer consistently at this gage compared to the upstream gage. As returning adults would have to pass through this section of the SJR sometime from March through June, they would have to complete their migration before this area exceeded 68°F, which is also variable but occurs most often May through June.

a)

b)

Figure 9. Water temperature readings of the San Joaquin River at the a) Donny Bridge gage and the b) Dos Palos gage stations, from 2009 or 2008 until October 2018. The black line indicates a lethality threshold for all life stages of CV spring-run Chinook salmon at 75°F (California Department of Water Resources 2018c, b).

2.4.3 Conservation and restoration efforts

There are many efforts by federal and state agencies to restore aspects of the SJR basin back to its natural physical state and biological functionality. For example, the SWRCB is pursuing new narratives and revisions for the previously existing 2006 Bay-Delta plan (SWRCB 2006) that outline lower SJR flow requirements that would be necessary to support natural populations of native fishes in this system and maintain southern Delta salinities that would protect surface water quality for agricultural beneficial uses (SWRCB 2016a). These recent proposed changes to the existing Bay-Delta plan are an attempt to address the "ecological crisis" occurring in the Delta and CV while also protecting the beneficial uses the limited surface water provides to the communities of California. While ESA-listed salmonids needs are addressed in the Bay-Delta plan, these efforts focus more on restoring the functionality of the available existing habitat. Other agencies are implementing efforts that are directed more to restoring specific salmonid populations in the SJR basin.

2.4.3.1 NMFS recovery plans

Recovery is the process by which listed species and their ecosystems are restored to the point that the protections provided by the ESA are no longer necessary to ensure their continued existence. Recovering anadromous species in the CV is challenging due to California's large and expanding human population, the associated amount and extent of water use and manipulation, and the continuous development of natural areas for agricultural production and housing (NMFS 2014).

In the 2014 Recovery Plan, NMFS established delisting/recovery criteria for the ESU of spring-run Chinook salmon and the DPS of CCV steelhead, including that both have at least two robust populations in the Southern Sierra Diversity Group (i.e., the upper SJR tributaries) (NMFS 2014). Though there are many recovery actions that are directed to restoring the marine, estuarine, and freshwater systems that these species depend on, there are a series of actions/efforts that must be completed specific to the SJR basin for these populations to successfully establish and persist. These are identified in full in the 2014 Recovery Plan (NMFS 2014), and include: implementation of restoration flows in the SJR, re-introduction of spring-run Chinook salmon, channel modifications and reconstructions for improved passage, minimization of fish entrainment and fish loss to diversions, improved management of predation risks, improved wastewater and stormwater treatment and management, spawning gravel augmentation, reestablishment of populations above dams, and development and execution of long-term population monitoring plans, to highlight an important subset. Many of the major actions required for recovery in the SJR are scheduled to be completed by the SJRRP (SJRRP 2010a, 2012, 2017a, b, 2019), and habitat-improvement actions that are designed to benefit spring-run Chinook salmon are likely to also benefit CCV steelhead when access is restored. SJRRP-moderated restoration flows that benefit fish passage through, and use of, the SJR basin have already begun, and spring-run Chinook salmon re-introduction efforts are ongoing. Fish passage and levee improvement components are scheduled to begin in 2018 through 2020 (NMFS 2018), and the Department of Commerce is required to report to Congress on the progress made on reintroduction and plans for the future of the reintroduction by the end of 2024.

2.4.3.2 The San Joaquin River Restoration Program

As previously discussed, the SJRRP is the result of a settlement that was reached in 2006 on an 18-year lawsuit between federal agencies, the Natural Resources Defense Council, and the Friant Water Users Authority (SJRRP 2018). The settlement stipulates that sufficient fish habitat must be provided in the SJR below Friant Dam so that two primary goals are met: 1) Fish populations must be maintained and restored to "good conditions" in the mainstem of the SJR from Friant Dam to the confluence of the Merced River, including self-sustained populations of salmon; and 2) Water management must reduce or avoid adverse water supply impacts to all Friant Division long-term contractors that may result from interim and restoration flows provided for fish and wildlife restorations. Some critical recovery actions identified in the NMFS recovery plan are achieved through the implementation of the settlement goals. Though this settlement and the SJRRP actions are restricted to the recovery area, the SJR mainstem from Friant Dam to the Merced River, the achievement of volitional fish passage from the Delta to the base of Friant Dam would increase the use of the SJR mainstem within the action area of this project by both adult and juvenile salmonid migration. SJRRP restoration projects slated for near-term implementation include: 1) the Reach 2B and Mendota Pool Bypass (creates bypass around Mendota Dam and increases capacity of Reach 2B to 4,500 cfs); 2) the Reach 4A and Eastside Bypass Improvement Project (restores the flow capacity of the low-flow channel in the Eastside Bypass and removes fish barriers); the Arroyo Canal and Sack Dam fish screen and fish passage project (adds a fish screen to the Arroyo Canal and modifies Sack Dam for fish passage); and 4) the Gravel Pit Isolation Project (inventories gravel pits of the SJR and ranks priority to which pits most adversely affect reintroduction efforts so they can be addressed in order of impacts). Several of these project directly address recovery actions outlined in the NMFS recovery plan for the SJR (NMFS 2014). There are also several additional projects that target the second goal of the SJRRP, i.e., minimizing effects of water management to water users, but that will not be covered in this section as these actions are unlikely to benefit the conservation or restoration of these species directly (more information may be found here: http://www.restoresjr.net/projects/).

2.4.3.3 In-lieu fee program

Currently there are no mitigation banks that serve the action area *and* offer NMFS-approved salmonid credits, shaded riparian, or floodplain credits. Therefore, as previously identified, the Authority will pay into USACE/NFWF's in-lieu fee program, enabling the restoration of the Mendota Wetland Restoration Project since the fee payments will be earmarked to offset impacts to CCV steelhead and NEP CV spring-run Chinook salmon.

Considered part of the environmental baseline, there are four biological communities present onsite currently at the Mendota Wetland Restoration Project: ruderal alkali grassland, seasonal wetlands, open water, and mixed riparian woodland scrub (NFWF and WRA Environmental Consultants 2019). Historical SJR floodplain habitat has remained largely unaltered though kept from seasonal inundation due to levees. While no special status species have been observed on-site thus far, once the floodplain acres are reconnected via levee breaches, this area will be highly beneficial to rearing anadromous fishes, most likely to rearing NEP spring-run Chinook salmon reintroduced by the SJRRP. This restoration project augments a recovery action identified in the NMFS recovery plan to permanently protect and restore riparian and floodplain habitats along the SJR (NMFS 2014).

2.5 Effects of the Action

Under the ESA, "effects of the action" means the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 CFR 402.02). Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur. The analyses of effects on CCV steelhead and CV spring-run Chinook salmon will occur together for the consideration of the effects of operation of the California HSR system, due to the similarities in their life history patterns, timing and use of the action area, the limitations of their physiology, and their generally similar reactions to environmental perturbations.

Three viaducts proposed for the Merced to Fresno, including the CV Wye, HSR section crossing over with waterways containing listed salmonids considered in this opinion are: 1) the crossing over the SJR Reach 1A SR-99/North of Fresno (currently in construction), 2) the crossing over the SJR Reach 4A/West of Chowchilla, and 3) the crossing over the Eastside Bypass/West of Chowchilla. After construction of the Merced to Fresno plus CV Wye section is complete, construction site clean-up and habitat restoration will commence. As construction of the other HSR track sections, stations, and maintenance yards move towards completion, the Authority and its contractors will begin safety tests of rolling stock/high speed trains. The Phase I of the HSR system will be considered complete when all sections, stations, and associated utilities and infrastructure of the Northern California Section (San Francisco/San Jose/Gilroy), the San Joaquin Valley Section (Merced/Fresno/Bakersfield), and the Southern California Section (Palmdale/Los Angeles/Anaheim) are connected and passenger operations can begin.

This opinion will consider the direct and indirect effects of the construction of the three bridges in the Merced to Fresno section plus the CV Wye section, and the long-term effects of HSR structure permanence and operations in the action area, as described in the 2018 HSR BA (Authority and FRA 2018).

2.5.1 Direct and indirect effects to species

2.5.1.1 General construction activities

Construction activities have the potential to introduce noise, vibration, artificial light, and other physical disturbances into the immediate environment in and around the construction zone that can result in the harassment of fish by disrupting or delaying their normal behaviors and use of areas, and in extreme cases causing injury or mortality, directly or indirectly. The potential magnitude of effects depends on a number of factors, including type and intensity of disturbance, the proximity of disturbance-generating activities to the water body, the timing of the activities relative to the use and occurrence of the sensitive species in question, the life stages of the species affected, and the frequency and duration of disturbance periods.

Fish may exhibit avoidance behavior near construction activities that displace them from locations they would normally occupy due to the noise generated by the operation of construction machinery or movement of soils and rocks during earthwork periods. Depending on the innate behavior that is being disrupted, the direct and indirect adverse effects could vary. An

example of a direct adverse effect would be cessation or alteration of migratory behavior. For juvenile fish, this effect may also include alteration of behaviors that are essential to their maturation and survival, such as feeding or sheltering, which co-occur with their outmigration from freshwater systems. In the context of construction at the viaduct crossings, the migratory and rearing behaviors of juvenile salmonids are expected to be affected by various construction-related effects.

To minimize the impacts of construction on listed salmonids, the Authority has proposed to adhere to specific work windows for in-water and near-water construction activities of the HSR system in the Merced to Fresno plus CV Wye section (pile-driving activities and adverse effects will be discussed in Section 2.5.1.4 Vibratory and impact pile driving, below).

Table 4. Proposed work windows by viaduct crossing and construction activities.

Site	Specified Activity	Work Window
Reach 1A/SR-99 North of Fresno	• In-water work • In-water impact and vibratory pile driving • Impact pile driving in floodplain outside of wetted channel	June 15th – October 31st
SJR Reach 4A Eastside Bypass West of Chowchilla	• In-water work • In-water impact and vibratory pile driving • Impact pile driving in floodplain outside of wetted channel	June 1st – December 1st
SJR Reach 4A Eastside Bypass West of Chowchilla	• All other near-water work in floodplain	April 30th – December 1st

These proposed in-water and near-water work windows align with work windows recommended by NMFS during early technical assistance meetings, and avoid the majority of the time periods CV spring-run Chinook salmon and CCV steelhead will use these areas. The BA also states that all construction in the Eastside Bypass channel will only occur when the channel is dry (i.e., not in use conveying water), therefore salmonid use of that immediate construction area would be extremely unlikely and listed fishes would not be adversely affected by work activities in that situation.

However, because each of these species may utilize a yearling life history strategy (i.e., juveniles rearing in freshwater habitats for longer than a year since hatching), a yearling could be present in any work area near a connected waterway at any point of the year, given suitable water temperatures. Also, steelhead adults occupy or migrate through freshwater habitats from July to December, but suitable water temperatures and adequate passage conditions would restrict their use of the action area. Due to the complexity of considering two species, and multiple life stages, locations, and work activities, Table 5,Table *6*, and Table *7* below summarize the assessed exposure of each subgroup to the proposed construction work windows.

Table 5. Evaluation of listed fish exposure by life stage and likelihood of habitat occupation to in-water construction (not including impact pile driving in the floodplain, see above work window) occurring at the SJR Reach1A/north of Fresno from June 15th – October 31st.

Species, life stage	Risk associated with the **June 15th – October 31st** work window at the SJR Reach 1A/north of Fresno site
NEP CV spring-run Chinook juveniles	Spring-run Chinook salmon juveniles may be finishing their out-migration from rearing areas in Reach 1A beyond June 15th, exemplified by rotary screw trap (RST) captures of spring-run juveniles until June 23, 2018 (NMFS 2019, Stuphin 2019b). Therefore, NEP CV spring-run juvenile may be present while in-water construction begins, though the extent downstream and duration of their occupation is dependent on seasonal water temperatures. If they are present during in-water impact pile driving, they are likely to be injured. Impact risk: Moderate
NEP CV spring-run Chinook yearlings	Spring-run Chinook salmon juveniles that persist in Reach 1A past the downstream migration period will become yearlings. Their use of the habitat near the construction area through the in-water work window is dependent on local water temperature, which may remain suitable until mid-to-late July in the summer. Water temperatures may again lower to below 68°F as soon as mid-September, and yearlings would be expected to migrate downstream in December through January. Therefore, in-water work may also overlap with yearling presence during the in-water window, depending on water temperatures and annual variation. If they are present during in-water impact pile driving, they are likely to be injured. Impact risk: Moderate
NEP CV spring-run Chinook adults	Adult NEP CV spring-run Chinook salmon, whether an adult return trapped, hauled past passage barriers, and released into Reach 1A, or a brood stock adult released for in-river spawning purposes, may be in Reach 1A at the beginning of the in-water work window (June 15th). Trapped and hauled returning adults are released at Camp Pashayan (the same river access locale as the SJR Reach1A/north of Fresno construction site) for water temperature acclimation purposes (Glenn 2019a). However, most fish quickly

	swim upstream to holding pool much further up Reach 1A and past acoustic tracking data of released adult brood stock has shown that while released adults display movement, none have strayed as far downstream as the SR-99/north of Fresno crossing construction area. Preliminary data of their movements and a seeming preference to stay higher up in Reach 1A does not preclude their use of the action area, if water temperatures were suitable, as redd surveys have marked fall-run Chinook redds directly below the crossing footprint (SJRRP 2016). Therefore, there is a small probability that an adult may be present in the habitat in the construction area, but it would be highly atypical, based upon available data, especially during the work window. Impact risk: Low
CCV steelhead juveniles	CCV steelhead juvenile outmigration should be on a similar time frame as CV spring-run juveniles, and they would be similarly limited by water temperature thresholds, though steelhead juveniles have higher water temperature tolerances compared to Chinook salmon juveniles (McEwan 2001). An adult rainbow trout has been captured upstream of the Merced River/SJR confluence (Stuphin 2019a) and rainbow trout parents are capable of producing anadromous offspring (NMFS 2014), though not included under ESA protections themselves. This adult was captured and moved back downstream according to the SJRRP's steelhead monitoring program guidelines. However, CCV steelhead have not been identified in the SJR upstream of its confluence with the Merced since the river's reconnection in 2012 (SJRRP 2015a). Without adults spawning upstream to produce a CCV steelhead juvenile, the overall probability of a juvenile occurring in the construction zone is low, even when suitable water temperatures persist throughout the area. Impact risk: Low
CCV steelhead adults	As above, adult CCV steelhead have not been observed in the SJR since their extirpation, however improvements in river health associated with flow amounts and aquatic/riparian/floodplain habitat conditions increase the probability of their recolonization of the Restoration Area each year as restoration efforts continue. Steelhead adults are more capable swimmers and jumpers than Chinook salmon, and are able to pass barriers that block Chinook salmon adults, given sufficient flow. If steelhead adults were to

	occur the action area, they would be arriving with the initial portion of substantial fall/winter rain runoff (September through December) to spawn sometime in winter (December through January). Additionally, adults may survive spawning and go back downstream as kelts, meaning adult CCV steelhead may be traveling through the construction area any time between January through May, if present and water temps/conditions are suitable, and therefore may overlap with in-water construction at this location. Due to their life history strategies, an adult CCV steelhead has a very low probability of occurring within the construction zone from approximately September through October 31st, when they are migrating upstream and may be injured during in-water impact pile-driving. However they would be very few in number, only those that were not captured and relocated by the SJRRP steelhead monitoring program. Impact risk: Very Low

Table 6. Evaluation of listed fish exposure by life stage and likelihood of habitat occupation to in-water construction (including in-water impact and vibratory pile driving and impact pile driving in floodplain but outside of wetted channel) occurring at the SJR Reach 4A/west of Chowchilla from June 1st – December 1st.

Species, life stage	Risk associated with using the **June 1st – December 1st** work window at the SJR Reach 4A/west of Chowchilla site
NEP CV spring-run Chinook juveniles	NEP CV spring-run Chinook juveniles are unlikely to be present in the SJR Reach 4A or the Eastside bypass during the work window according to the outmigration timing data currently available (NMFS 2019), coupled with the average water temperatures during the work window being suitable to host the juveniles. Juveniles are usually past this area and in the Delta by the end of April. Therefore, it is unlikely that juveniles would be present in the waterways near the construction area during the work window and would not overlap with in-water activities or pile-driving. Impact risk: Low
NEP CV spring-run Chinook yearlings	Chinook yearlings are unlikely to be present in Reach 4A or the Eastside Bypass during the majority of the work window. They may be present when water temperatures and flow are suitable in the fall and winter (SJRRP tagged yearling releases show fish traveling to the Delta within 3 months of release (NMFS 2019)), and it is possible yearlings could be forced out of superior rearing habitat in Reach 1A if heavy early rains occur October through December or spring/early summer snowmelts cause flood flows that require the use of the Eastside Bypass, as seen in May of 2019. However a majority of their natural movement is expected to occur December through March. There is a very low probability that a yearling spring-run Chinook would occur in the Reach 4A during the latter part of the work window. Impact risk: Low
NEP CV spring-run Chinook adults	Adult NEP spring-run Chinook are expected to migrate through the middle reaches of the SJR/Eastside Bypass before May to begin holding in Reach 1A before water temperatures exceed 68°F, which is reflected in water temperature readings from the Dos Palos gage (California Department of Water Resources 2018c).

	Also, multiple migration barriers still exist downstream and would likely prevent adult upstream passage to this construction site in normal water years, until all SJRRP passage projects are complete. Therefore, neither naturally returning CV spring-run Chinook salmon nor released reintroduction adult brood stock would be expected to be using this river reach during the work window, so no interaction is expected. Impact risk: Very Low to None
CCV steelhead juveniles	Juvenile steelhead outmigration should be on a similar time frame as CV spring-run juveniles, since they are also adversely affected by high water temperatures though their upper lethal limit is slightly above that of Chinook salmon. Therefore, juvenile steelhead should have left the area for the Delta by April or May, but certainly by June. Combined with the previous discussion that CCV steelhead have not been positively identified or captured in the SJR upstream of its confluence with the Merced River since their extirpation, the overall probability of juvenile presence in SJR Reach 4A during the work window is low. Impact risk: Low
CCV steelhead adults	Improvements in flow amounts and habitat conditions annually increase probability of adult CCV steelhead occurrence as the SJRRP continues with their restoration efforts. Steelhead are more capable swimmers and jumpers than Chinook salmon, and are able to pass barriers that block Chinook salmon adults, given sufficient water flow. If an adult were to occur in the area, it could be traveling through the construction area any time between October through May, if storm runoff and other water conditions were suitable, and if it avoided capture by the steelhead monitoring program. Even so, the total number of adults would be expected to be very low overall, until most river restoration and connectivity issues are addressed by SJRRP actions. Impact risk: Very Low

Table 7. Evaluation of exposure of listed fish by life stage and likelihood of habitat occupation to near-water construction (but not impact pile driving in the floodplain, see above in Table 6) occurring at the SJR Reach 4A and Eastside Bypass/west of Chowchilla from April 30th –December 1st.

Species, life stage	Risk associated with using the **April 30th –December 1st** work window at the SJR Reach 4A/west of Chowchilla site
NEP CV spring-run Chinook juveniles	NEP CV spring-run Chinook juveniles may be at the tail end of their out-migration period through the middle reaches of the SJR, depending on water temperatures. They may also be in the Eastside Bypass if used for flood control purposes, which may persist until July. Therefore, juveniles may be present in the waterway during near-water construction, and their movement patterns could be disturbed. Impact risk: Low to Moderate
NEP CV spring-run Chinook yearlings	Juveniles may stay in Reach 1A for more than a year and migrate out of the region December through early spring and use this location when water temperatures and flows are suitable. However, available data indicates that yearly fish generally leave the Restoration Area and arrive in the Delta within 3 months of release (NMFS 2019). Potential overlap of yearling Chinook use and near-water work activities is expected to occur only at either end of the work window, and yearlings would not be expected to be greatly harmed by the near-water work. Impact risk: Low
NEP CV spring-run Chinook adults	NEP adults are expected to migrate through the middle reaches of the SJR and the Eastside Bypass April through June, and therefore their occurrence in the action area is expected to overlap with construction for a short period with the beginning of the near-water work window at these locations. SJRRP counted over 20 adult returns as of May 21, 2019 (Glenn 2019b), and more are expected but they require capture and transport around passage barriers to reach the upper SJR. The number of returning adults

	is expected to stay relatively low until passage barriers downstream are addressed through SJRRP restoration actions. Impact risk: Low
CCV steelhead juveniles	Juvenile CCV steelhead outmigration should be on a similar time frame as CV spring-run juveniles, since they are also adversely affected by high water temperatures, although their upper lethal limit is slightly above that of Chinook salmon. While juvenile steelhead should have left Reach 4A area for the Delta by April or May, there may be some overlap of work activities and CCV steelhead use of the water way during the work window. Combined with the previous discussions that CCV steelhead have not been positively identified or captured in the SJR upstream of its confluence with the Merced River since their extirpation, the overall probability of juvenile presence is small. Impact risk: Low
CCV steelhead adults	Improvements in flow amounts and habitat conditions annually increase the probability of adult CCV steelhead occurrence as the SJRRP continues with their restoration efforts. Steelhead are more capable swimmers and jumpers than Chinook salmon, and are able to pass barriers that block Chinook salmon adults, given sufficient water flow. If an adult did manage to spawn upstream in the SJR and survive, it would be migrating through Reach 4A as a kelt sometime between January through March, before the start of this work window. If an adult migrated upstream through Reach 4A, it could be traveling through the construction area any time between October through December, if storm runoff and other water conditions were suitable and if it avoided capture by SJRRP's steelhead monitoring program. Even so, the total number of adults would be expected to be very low overall, until most river restoration and connectivity issues were address by SJRRP actions. Impact risk: Very Low

In addition to the seasonal work windows, active work hours conducted near waterways would be limited to daylight hours from one hour after sunrise to one hour before sunset. These daily work hour restrictions are likely to minimize project effects on fish migration and passage behaviors during crepuscular periods and at night. Recent studies suggests that adult steelhead show the greatest amount of upstream movement in river mainstems from early dawn until approximately 0800 hours and show somewhat more movement nocturnally compared to mid-morning and evening hours (Keefer *et al.* 2012). Steelhead juveniles are known to change diel movement tactics as they leave their natal streams; however, in this section of the SJR/Delta, they are expected to move mostly at night or have no preference between night or day movement (Chapman *et al.* 2012).

In the absence of migration pattern alterations, general construction disturbance may increase fish physiological stress and increase risk of mortality. Fish vacating protective habitat due to disturbance may experience increased predation rates and decreased survival rates compared to those left undisturbed. In extreme cases, general construction-related effects may also include debris and/or equipment falling into the channel. Such instances could cause physical injury or death if a fish was struck or crushed, or at least, acute avoidance tactics would be taken, altering any normal behaviors and inducing a great amount of acute physiological stress.

Because salmonid use of the middle SJR/Reach 4A is limited by warm temperatures and adequate water flows, the Authority has requested an exception to the work windows for in-water and near-water construction if local water temperatures are on average 75°F or more for seven consecutive days. If water temperatures exceed Chinook temperature tolerances (SJRRP 2010a) for a week or more, salmonids are likely to have vacated the area to seek thermal refugia elsewhere and would no longer be present in the Reach 4A construction site effects boundaries. Seven consecutive days is ample time for individuals to move to other areas upstream closer proximity to the Friant Dam spillway where water temperatures are kept suitable, or complete their outmigration to the Delta. In such cases, there is no cause for construction to adhere to the work windows designed to avoid salmonid use if construction impacts to individual salmonids would not be likely. If such an environmental situation occurs prior to the in-water/near-water work window start, the Authority or its contractors propose to contact NMFS to confirm with staff that local water temperatures measured 75°F or more for at least seven consecutive days, that salmonid presence is not expected in the area, and that construction may commence outside of the stated work windows. Conversely, if water temperatures drop below 75°F again, the Authority and its contractors propose to revert back to the original work windows intended to minimize adverse construction effects to salmonids in the action area.

Viaduct construction activity in or near waterways also includes the placement of structures, movement of materials, and disturbance of soils in the water channels and riparian corridor. Such disturbance is likely to mobilize sediment and increase the likelihood of erosion, possibly sending it into associated waterways at elevated rates, particularly after the first rain event. Localized increases in erosion and in-water turbidity are expected to have adverse effects on juvenile CCV steelhead present in the action area during the proposed in-water construction window. For salmonids specifically, high sedimentation and turbidity levels has been shown to decrease juvenile growth and survival as a result of reduced prey detection and availability, and individual physical injury rates increase in high turbidity due to increased activity in association with gill fouling and even peer aggression (Bash *et al.* 2001). Sigler *et al.* (1984), in a lab study

using juvenile steelhead and coho salmon, found individuals to preferentially occupy parcels of water between 57 and 77 nephelometric turbidity units (NTU) when given a choice. This result suggests that juvenile salmonids may avoid waters of very low turbidities (i.e., clear waters). Coupled with information presented by Gregory (1993) which found that juvenile Chinook salmon decrease predator avoidance behaviors at increased turbidities, juvenile salmonids may avoid clear waters where they are easily visible to predators but since they experience negative physiological effects in muddy waters, they may be most successfully overall in slightly cloudy waters. Given the proposed development of a stormwater pollution prevention plan (SWPPP) and the other erosion control BMPs included in the project description and general Authority construction guidelines, it is unlikely that construction activities will alter the natural range of in-river turbidities to a degree that would adversely affect the salmonids using the action area, therefore adverse effects are expected to be minimal.

In summary, harm and harassment of listed salmonids due to general construction activities is expected to occur through disruption of normal fish behaviors and their use of the aquatic habitats near construction zones. Equipment operation, construction noise, soil disturbance, and general human presence in and near waterways is expected to elicit these responses. Though the adoption of seasonal (Table 4) and daily work windows (one hour after sunrise to one hour before sunset) substantially diminishes the impacts to NEP spring-run Chinook salmon and CCV steelhead caused by general construction, the possibility remains that these fishes may occupy the SJR mainstem and the Eastside Bypass channel while HSR construction is occurring due to natural seasonal variability of fish use of these waterways. Specifically, adult CCV steelhead and NEP spring-run Chinook salmon may be deterred from using the area and may delay their migration during active construction. Juveniles CCV steelhead and NEP spring-run Chinook salmon may also be deterred from using the area for migration or rearing purposes. Direct injury or mortality from general construction activity is not anticipated to be an adverse effect because it would require an extreme event to occur (e.g., overwater support failure resulting in debris and construction materials violently crashing down into a waterway containing listed species). Artificial lighting from construction is not expected to occur, as nighttime work is not proposed. Overall, adhering to the work windows will substantially decrease the probability that listed fish will be present in the waterways affected by construction, and will decrease the overlap between fish use and construction activities, therefore decreasing the extent of harm to these populations.

2.5.1.2 Site preparation, relocation of utilities, and vegetation removal

Site preparation is required and will likely occur early in the work window periods (before July) and will include pre-construction surveys, sensitive habitat identification, the installation of exclusionary fencing, and other similar BMPs intended to minimize impacts to natural habitats. Site preparation will also include earth moving, leveling, slope grading, excavation, road installation, and relocation of utilities. In the process of preparing the site for major construction, riparian vegetation and trees may be trimmed or removed for construction access and permanent structure placement.

As examined above in Section 2.5.1.1, general human presence and general construction activities near waterways have the potential to disturb fishes and disrupt their normal behavior patterns when the timing of the activities and fish occurrence overlap. Concerning preparatory work during the beginning of the work windows, juvenile and yearling CCV steelhead and NEP

CV spring-run Chinook salmon would be expected to be out-migrating past the construction locations from January through June, again depending on the availability of suitable water temperatures and flows. Adult CV spring-run Chinook salmon may be migrating past these locations to reach holding areas far upstream in Reach 1A (Figure 6) between February through May, while CCV steelhead kelts may migrate downstream past the construction locations sometime between January through March. Overlap between site preparation, vegetation removal, and utility relocation during spring is expected to overlap with juvenile salmonid rearing and migration use, including behaviors highly susceptible to disturbance such as foraging, resting, and sheltering. Adult CCV steelhead and CV spring-run Chinook are not expected to forage during their migrations and therefore would only be adversely affected via temporary disruption of resting and migration patterns. Given the daily work hours, sunset, sunrise, and nighttime periods will be available to listed fishes to move undisturbed daily.

For all activities, preparing the construction footprints and staging areas is expected to create fugitive dust that may settle into nearby waterways. Turbidity increases caused by dust input may have a minimal impact to any fish occupying affected waters. These effects are expected to persist only as long as clearing, grubbing, and grading activities are occurring and are therefore temporary. Due to BMPs and AMMs to control erosion incorporated into the project description, increased turbidity from soil entering the SJR are not expected.

Beyond disruption of normal rearing behavior in waterways adjacent to vegetation removal and site preparation activities, the decreases in riparian vegetation will create physical changes in the environment, which cumulatively decrease the survivorship of juvenile salmonids (Bjornn and Reiser 1991). Changes in vegetative cover can influence the macroinvertebrate prey assemblage, through alterations in shading, water temperatures, and nutrient inputs, to one less supportive of juvenile salmonid growth (Meehan *et al.* 1977). Removal of riverine vegetation prior to construction will reduce the natural cover that was previously available on site and reduce the general habitat complexity that would otherwise be beneficial to CCV steelhead and spring-run Chinook salmon freshwater rearing and juvenile freshwater migration. Particularly at the Reach 4A crossing, these removals decrease habitat complexity in a stretch of the SJR main stem that is relatively sparse in riparian vegetation due to long-term anthropogenic management and removal.

In addition, overhanging or in-channel vegetation that provides shade is an important habitat component capable of mitigating solar radiation and offsetting the associated increases in water temperatures to some degree. While water temperature increases caused by vegetation removal is a concern, at a certain point soon after the work window opens, summer atmospheric temperatures will cause water in the channel to readily exceed lethal thresholds, regardless of the cooling capabilities of the local vegetation. Therefore, while existing vegetation in or near the channel may somewhat delay the time at which local water temperatures exceed lethality, the amount of delay attributable to currently available vegetation is likely insignificant relative to typical timing, which is determined by largescale atmospheric forcing.

The Authority proposes to replace any removed vegetation in-kind on-site locally of at least a 3:1 ratio. Though the Authority has committed to replant the disturbed areas with native riparian species at a higher ratio than what was removed, there will be temporary reductions of vegetative cover at all viaduct construction locations until the plantings establish and flourish. The period of

reduced riverine vegetation will begin when construction commences and persist for several years while construction is ongoing (the Reach 1A/SR-99 north of Fresno SJR viaduct crossing construction began in 2016, still under construction in 2019), until replanting occurs. The replanting will likely take at least one year to execute, and then take several additional years until the vegetation matures. During this lengthy interim, juvenile CCV steelhead and NEP CV spring-run Chinook salmon are expected to experience reductions to their individual fitness to a small degree.

2.5.1.3 Potential contamination of waterways from equipment operations, staging, and maintenance

Construction staging areas will be established in the areas that will ultimately serve as permanent HSR facilities when possible, to further reduce impacts to natural habitats (CM-GEN-13). Additional staging and material storage areas may occur seasonally in the floodplain of waterways, restricted to the period of April 15th through October 31st (CM-GEN-14), and only when areas are dry. At all other times, equipment may enter the river channel area for daily use but will be removed and stored outside areas subject to possible flooding at the end of each work day.

Operation of construction equipment/heavy machinery is likely to deposit trace amounts of heavy metals throughout the construction area (Paul and Meyer 2001). Heavy metals, even in trace amounts, have been shown to alter juvenile salmonid behavior through disruptions of various physiological mechanisms including sensory dampening, endocrine disruption, neurological dysfunction, and metabolic disruption (Scott and Sloman 2004). Oil-based products used in combustion engines contain polyaromatic hydrocarbons (PAHs), which have been known to bio-accumulate in other fish taxa, and cause carcinogenic, mutagenic, and cytotoxic effects to fish (Johnson *et al.* 2002). Studies have shown that increased exposure of salmonids to PAHs results in reduced immunosuppression and therefore increases their susceptibility to pathogens Arkoosh (Arkoosh *et al.* 1998, Arkoosh and Collier 2010). Though these substances can kill fish or illicit sub-lethal effects when introduced into waterways in sufficient concentrations, adverse effects from hazardous materials is not expected due to the numerous AMMs and BMPs integrated into the proposed action to control such pollutants and the implementation of an appropriate spill prevention control and countermeasures plan (SPCCP) and SWPPP.

Fuels, maintenance fluids, and other necessary chemicals will be stored at least 200 feet from the OHWM, preferably on paved roads or area, within double containment, and all fueling, cleaning, and equipment maintenance will be performed on vehicles and equipment in designated refueling/staging areas on existing paved surfaces with secondary containment at least 200 feet from the OHWM. Any equipment or vehicles to be driven/operated in the floodplain or over water will be checked and maintained daily to ensure proper working conditions and prevention of leaks, and collection pans or absorbent pads will be placed underneath stationary equipment. Hazardous materials stored in floodplain areas will be properly stored in catch basins and any spills will be immediately cleaned up (including any contaminated soil). Due to adherence to these pollution prevention BMPs, adverse effects resulting from these activities are not expected.

2.5.1.4 Vibratory and impact pile driving

Construction of the three viaduct crossings will require the use of both vibratory and impact pile driving to install cofferdams, the temporary construction support decks and platforms, and to place the permanent CIDH columns that will support the aerial HSR tracks. Temporary support piles and sheet piles for cofferdams will be placed via pile driving into the wetted channel, and the permanent CIDH piles will be placed near wetted channels. When construction is complete, vibratory pile driving will be used to remove the temporary support piles and cofferdam sheet piles.

Pile driving near or in water has the potential to kill, injure, and cause death through infection via internal injuries, or cause sensory impairments leading to increased susceptibility to predation. The pressure waves generated from driving piles into river bed substrate propagate through the water and can damage a fish's swim bladder and other internal organs by causing sudden rapid oscillations in water pressure, which translates to rupturing or hemorrhaging tissue in the bladder when the air in the swim bladder expands and contracts in response to the pressure oscillations (Gisiner 1998, Popper *et al.* 2006). Sensory cells and other internal organ tissue may also be damaged by pressure waves generated during pile driving activities as sound reverberates through a fish's viscera (Caltrans 2015). In addition, morphological changes to the form and structure of auditory organs (saccular and lagenar maculae) have been observed after intense noise exposure (Hastings and Popper 2005). Smaller fish with lower mass are more susceptible to the impacts of elevated sound fields than larger fish, so acute injury resulting from acoustic impacts are expected to scale based on the mass of a given fish. Since juveniles and fry have less inertial resistance to a passing sound wave, they are more at risk for non-auditory tissue damage (Popper and Hastings 2009) than larger fish (yearlings and adults) of the same species. Beyond immediate injury, multiple studies have also shown responses in the form of behavioral changes in fish due to human-produced noises (Wardle *et al.* 2001, Slotte *et al.* 2004, Popper and Hastings 2009).

Based on recommendations from the Fisheries Hydroacoustic Working Group (FHWG), NMFS uses an interim dual metric criteria to assess onset of injury for fish exposed to pile driving sounds (NMFS 2008a, Caltrans 2015, 2019). The interim thresholds of underwater sound levels denote the expected instantaneous injury/mortality, cumulative injury, and behavioral changes in fishes. Impact pile driving is normally expected to produce underwater pressure waves at all three threshold levels. Vibratory pile driving generally stays below injurious thresholds but often introduces pressure waves that will incite behavioral changes. Even at great distances from the pile driving location underwater pressure changes/noises from pile driving is likely to cause flight/startle responses, hiding, feeding interruption, area avoidance, and movement blockage. For a single strike, the peak exposure level (peak) above which injury is expected to occur is 206 dB (reference to 1 micro-pascal [1µpa] squared per second). However, cumulative acoustic effects are expected for any situation in which multiple strikes are being made to an object with a single strike peak dB level above the effective quiet threshold of 150 dB. Therefore, the accumulated SEL level above which injury of fish is expected to occur is 187 dB for fish greater than 2 grams in weight, and 183 dB for fish less than 2 grams. If either the peak SEL or the accumulated SEL threshold is exceeded, then physical injury is expected to occur. Behavioral effects may still occur below these thresholds for injury. NMFS uses a 150 dB root-mean-square

(RMS) threshold for behavioral responses in salmonids. Though the dB value is the same, the 150 dB RMS threshold for behavioral effects is unrelated to the 150 dB effective quiet threshold.

At the viaduct crossing of the SJR in Reach 4A, the proposed action includes up to 120 temporary support piles will be placed in the wetted channel and in the nearby riparian corridor. These piles will be a mix of 24-inch and 30-inch diameter steel pipe piles, similar to those used in the construction of the north of Fresno viaduct construction. The Authority estimates that pile installation would take between 20 to 25 days of one in-water work season. For the Eastside Bypass viaduct, temporary trestles and support piles would not be needed because work would only be complete if the Eastside Bypass channel was dry, removing the need of a temporary work platform during permanent column installation. The north of Fresno viaduct crossing location has already installed their temporary piles, 119 in total, though installation took approximately 35 days to complete over two work seasons (though all in-water piles were placed during one work season in 2016). In addition, some piles placed were 36-inches in diameter or I-Beams.

On-site data were recorded during in-water installation of piles at the north of Fresno/Reach 1A construction location. Though some of the underwater sound monitoring was executed incorrectly, some of the maximum estimates were somewhat informative to this analysis. Often the cumulative SEL exceeded the 187 dB threshold, as multiple piles required a high number of strikes per day to be set, and underwater sound attenuation tactics were not effectively or consistently used. The peak dB threshold was not exceeded as often as the cumulative SEL dB threshold, but at its highest was estimated at 211 dB (back calculated to estimate sound exposure at adjusted back to 10 meters from the driven pile). Vibratory pile driving was generally less harmful, but the 150 dB RMS threshold was also exceeded regularly, according to the self-reported monitoring data (Environmental Science Associates 2017).

According to the Caltrans 2012 pile driving compendium of field data (Caltrans 2012), in-water impact pile driving of the 36-inch diameter steel pipe piles for this project could generate unattenuated underwater sound waves of up to 210 dB peak, 190 dB SEL, and 190 dB RMS, as measured at 10 meters from the strikes, in approximately 5 meters of water depth or less (Table 8). These estimates are calculated from field data gathered from pile driving activities at other locations and are considered informative only, not the definite levels that will be generated by impact pile driving in the SJR in Reach 4A during the course of this project. This is because each pile driving situation is unique and variations in the substrate, channel shape, depth, and even water temperature are expected to alter how the pressure waves will propagate and the amount of transmission loss that will dampen the underwater sounds as they travel. These numbers are similar to some of the underwater sound data collected by the Authority during installation of piles at the north of Fresno viaduct crossing.

Table 8. Empirical data from various pile driving activities offered by the 2012 FHWG pile driving compendium Caltrans for various types and sizes of piles, driving types, distance at which underwater sound was recorded, in reference to the proposed pile driving activities of the project (Caltrans 2012).

Pile Type	Driver Type	Pile Location	Reference Distance	Peak (dB)	SEL (dB)	RMS (dB)
20-inch diameter steel pipe piles	Impact	In water, >5 meters depth	10 meters	208	176	187
20-inch diameter steel pipe piles	Impact	In water, >5 meters depth	20 meters	201	173	184
20-inch diameter steel pipe piles	Impact	On land	10 meters	198	171	183
20-inch diameter steel pipe piles	Impact	On land	20 meters	188	NA	172
24-inch diameter steel pipe piles	Impact	In water, ~ 5 meters depth	10 meters	203	177	190
30-inch diameter steel pipe piles	Impact	In water, +/- 3 meters depth	10 meters	210	190	177
36-inch diameter steel pipe piles	Impact	In water, <5 meters depth	10 meters	208	180	190
36-inch diameter steel pipe piles	Impact	On land	10 meters	201	174	186
36-inch diameter steel pipe piles	Impact	On land	20 meters	198	171	183
36-inch diameter steel pipe pile	Vibratory	In water, ~ 5 meters	10 meters	180-185	170-175	170
24-inch AZ steel sheet pile	Vibratory	In water, ~15 meters	10 meters	175-182	160-165	160-165

For 1,000 impact strikes a day, the NMFS Pile Driving Calculator (NMFS 2008a) indicates (using the above underwater pressure estimates for maximum sound levels) that the distance that instantaneous mortality due to underwater pressures above the 206 dB peak threshold would be expected to occur is within 18 meters from the driven pile. For fish above 2 grams (as would be expected at the SJR Reach 4A location), the distance at which injury is expected to occur due to cumulative SEL exposure above 187 dB is within 1585 meters from the driven pile (*Table 9*). The distance within which behavior changes are expected is 4,642 meters from the driven pile, where the RMS sound will be above 150 dB RMS. SELs below 150 dB are assumed to not accumulate and cause fish injury, or be significantly different from ambient conditions, (i.e., effective quiet). If the number of strikes per day is increased to 5,000, the distances affected by injurious cumulative SELs is increased to almost the entirety of the affected area, out to 4,634 meters from the driven pile.

Pressure levels in excess of 150 dB_{RMS} are expected to cause temporary behavioral changes (startle and stress) that could decrease a fish's ability to avoid predators. The background RMS sound pressure levels, or effective quiet, is assumed to be 150 dB_{RMS} and the acoustic impact

area is the area where the predicted RMS sound pressure level generated by pile driving exceeds this threshold. Once the pressure waves attenuate below this level, fish are assumed to no longer be adversely affected by pile driving sounds. Under the concept of effective quiet being equal to 150 dB_{RMS}, the distance fish are expected to be adversely affected during pile driving is out to 4,642 meters (*Table 9*) from the location of the pile being driven, assuming a transmission loss constant of 15 (NMFS 2008a).

Table 9. Estimated threshold distances to in-water adverse effects using maximum dBs (210 dB peak, 190 dB SEL, 190 dB RMS), modulated by strikes per day, for fish weighing >2 grams, calculated by the NMFS pile driving calculator (NMFS 2008a).

Strikes per Day	**Peak (dB) ≥ 206**	**Cumulative SEL (dB) ≥187**	**RMS (dB) ≥150**
1,000	18 meters	1585 meters	4642 meters
5,000	18 meters	4634 meters	4642 meters

Based on past performance (data from the 2016 construction season at the SR-99/SJR Reach 1A/north of Fresno viaduct crossing (Environmental Science Associates 2017)), the Authority and its contractors are likely to be unable to effectively control the underwater pressure waves created by pile driving, mostly due to inconsistent use and improper application of standard attenuation devices. Additionally, field observations of the underwater sound monitoring protocols and hydrophone apparatus installation in-river call into question the integrity of the underwater sound monitoring data gathered. And based on the number of strikes per day actually taken on site in past performance, the construction crew is likely to exceed the typical expected 1,000 strikes per day, so a great amount of underwater habitat will experience cumulative SEL pressures that exceed the injury threshold, up to approximately 2.87 miles away from the pile driving site in both directions (Table 9). In the SJR Reach 4A, this would mean an approximately 5.74 miles of river would be hazardous to CCV steelhead and NEP spring-run Chinook salmon during active impact pile driving, from south of HWY 152 to north of the Eastside Bypass connection with the SJR (Table 9). The elevated underwater sounds would be expected to cause behavioral disturbances and harass fish out to this same distance.

Though the underwater pressure waves are expected to affect a large area of the water channels, the number of individual fish affected by pile driving is expected to be small due to the life history patterns of the fishes (Tables Table *5*,Table *6*, &Table *7*), the in-water/pile driving work windows, and environmental factors that limit fish use of a waterway, such as high seasonal water temperatures and low flow patterns.

- Reach 1A/SR-99/SJR crossing north of Fresno: No additional impact pile driving is expected at the Reach 1A/SR-99 crossing north of Fresno, as all pile installation was completed in the 2016 construction season. Temporary piles and cofferdams may be removed in a subsequent construction season using vibratory pile driving, but the underwater sound levels created should not reach peak or cumulative SEL thresholds for injury or death, though fish may be disturbed. The most at risk group is juvenile and

yearling CV spring-run Chinook salmon, and they are expected to have mostly completed their outmigration by the start of the in-water work window (Table 5).

- Eastside Bypass/west of Chowchilla: The BA states all channel work within the Eastside Bypass will be completed in one season while the bypass is completely dry. Without a wetted, connected channel, salmonid presence in the work area is impossible.

- Reach 4A/west of Chowchilla SJR viaduct crossing: All in-water work including impact and vibratory pile driving, and impact pile driving in the nearby floodplain outside of the wetted channel is scheduled to occur between June 1st through December 1st.

    - Adult NEP spring-run Chinook salmon are expected to complete the majority of their upstream migration by June 1st (TableTable *6* &Table *7*)

    - The downstream migration of juvenile NEP spring-run Chinook salmon should be completed by the start of the work window at this location (TableTable *6* &Table *7*).

    - If sufficient, early winter storms occur, there is a chance yearling NEP spring-run Chinook salmon may pass through the area in early December, however, in such a situation, the Authority's contractors would cease working during significant rain events due to erosion concerns and on-site personnel safety requirements.

    - CCV steelhead adults could be passing by this area on their upstream migration in early summer if flows are available, however barriers to migration downstream of the project site usually prevent volitional passage. Also, SJRRP steelhead monitoring efforts would likely capture any adults downstream, preventing them from entering the action area in SJR Reach 4A or upstream (TableTable *6* &Table *7*).

The possibility of a CCV steelhead juvenile being present in the work area during impact pile driving is also very low, because although *O. mykiss* adults may have spawned upstream, a juvenile steelhead has not been confirmed in SJRRP steelhead monitoring efforts (Table 6, *Table 7*). In summary, any NEP CV spring-run Chinook salmon adults and juveniles, and CCV steelhead juveniles present, are expected to be adversely affected by pile driving during some portions of the in-water work windows during which pile driving occurs. Listed salmonids are expected to experience temporary disturbance of normal behaviors and migratory patterns from both impact and vibratory pile driving in-water and on land near waterways, and in a few instances, underwater pressure waves created by impact pile driving may cause injury and direct or indirect mortalities. Because of the timing of the work windows and fish use of the waterway, and what is known about the current abundance of these species in the action area, the overall number of individuals to be adversely affected is expected to be very low.

2.5.1.5 Cofferdam installation and dewatering

During the in-water work windows, cofferdams will be installed on the river bank or near the water line to isolate and de-water areas before the construction of permanent HSR aerial supports. Cofferdams may also be used as an underwater sound mitigation measure. Cofferdams will be made of sheet piles, gravel-filled sandbags, or comparable materials. Sheet piling will be

installed around the work area to form a cofferdam via vibratory hammer pile driving (effects of vibratory pile driving examined above, Section 2.5.1.4). Any contained or ponded water will need to be pumped out so that the soils below the OHWM may be accessed. Pumped out water will be directed or trucked to nearby infiltration pits/basins that will allow the water to return to the SJR water table without affecting in-river water quality. After construction is complete, the sheet piles will be removed via a vibratory hammer and the areas will be restored to pre-construction condition.

If water temperatures remain suitable during the in-water work windows, there is a small possibility that juvenile salmonids may become entrapped or stranded during cofferdam installation and be adversely affected by dewatering activities. Entrapped fish will require capture and release, AKA "fish rescue," before the area is pumped dry to ensure their survival and minimize take of listed fishes. A fish rescue plan will be drafted and approved by NMFS before dewatering activities that may involve fish commence, and will include methods for minimizing stress and the risk of mortality from capture and handling of fish (see CM-FISH-5,(Authority and FRA 2018)).

Prior to any fish rescue, fish handling, or dewatering, the Authority or its contractors will contact NMFS so that such activities can be coordinated and ensure minimal adverse effects to fish through capture and handling procedures. It is expected that the number of juvenile salmonids to require fish rescue and handling will be very low, due to the seasonal in-water work windows, expected species abundances, and dewatering and pumping should only be required during cofferdam establishment.

Stranded juvenile CCV steelhead and NEP CV spring-run Chinook salmon would likely experience increased stress levels, shock, and suffer mild injuries during capture and handling, even if seasoned fisheries biologists perform the fish rescue. Some juveniles may be killed during capture, handling, or transport, while others may be disoriented at release, leaving them more susceptible to predation. Furthermore, handled fish are more likely to develop serious infections from small wounds inflicted during handling compared to unhandled fish. The expected rate of immediate juvenile salmonid mortality due to capture and handling is expected to be low (i.e., no more than 3% of the total number of juveniles relocated). These adverse effects would be expected to occur at the Reach 1A and Reach 4A construction sites. In the Eastside Bypass, construction will not commence until the channel is dry, however some juveniles may become entrapped in any ponded water within the construction zone as the floodway is ramped down following a flood flow release. Though individual juveniles will experience increased stress and harm, it is preferable to capture and relocate them into connected aquatic habitat compared to the eventual mortality these individual would otherwise experience. Adults are not expected to become entrapped and therefore would not be adversely affected by dewatering activities.

2.5.1.6 Curing of new concrete

The pouring of new concrete may negatively affect water quality by increasing the pH of water in contact with uncured surfaces. The amount the curing cement will increase pH in water decreases over time as the concrete cures, but during the curing period these pH changes can harm fish to varying degrees through direct damage to gills, eyes, and skin, and interfere with

fishes' ability to dispose of metabolic wastes (ammonia) through their gills (Washington Department of Fish and Wildlife 2009). In addition, alkali may leak from freshly cast concrete for some time after curing if in contact with water, up to several days to months depending on the water in the water-cement ratio of the mix (CTC & Associates 2015).

Because the casting and curing of concrete will be done "in-the-dry," the potential that the curing concrete will adversely affect water quality and fish health is reduced. New concrete is expected to mature and be practically inert within six months after casting, but it is possible that raised river heights caused by rain and snow melt in the months following project completion may cause SJR water to be in contact with the concrete before curing is complete. The large amount of river volume expected when the maturing concrete is in contact with raised river water is expected to dampen any potential changes in pH of river water from contact down to immeasurable differences due to volumetric dilution, even if listed fishes are present while the cement is still precipitating alkali. Therefore, adverse effects to listed fishes from chemical changes from new concrete are not expected to occur.

2.5.1.7 Placement of riprap and bank stabilization measures

Riprap/revetment will be placed on some SJR banks to protect and stabilize the permanent HSR column footings placed on in-river channel or floodplain areas. Otherwise, "soft" approaches such as vegetative plants and placement of large woody debris, to control bank erosion will be used to the extent possible. A combination of both tactics may be used at a single site to maintain a natural riparian corridor (CM-GEN-6, CM-FISH-1) and ensure bank stability.

While "soft" erosion control approaches would generally benefit listed fish over the long term by promoting a more natural riparian corridor (FEMA 2009), the construction of these areas will harass fish in the same way general construction effects might, as described in Section 2.5.1.1. When hard revetment or riprap is placed on stream banks, it removes the marginal shallow water habitat at the water/bank interface that provides refugia for rearing salmonids, reduces the total amount of riparian vegetation that can be established in the future, changes the prey base through alteration of the benthic substrate type and localized water dynamics, and often provides ambush habitat for non-native piscivorous fishes (Tiffan *et al.* 2016). In addition, the act of bank stabilization is expected to prevent normal stream processes from occurring, like natural braiding and erosion, which would otherwise create the habitat complexity that supports rearing salmonids. Instead, the placement of any riprap or revetment will perpetuate the channelization of the SJR into the future. Therefore, the habitat changes that follow placement of the riprap is expected to have a negative impact on juvenile CCV steelhead and NEP spring-run Chinook salmon survivorship and growth in the area (Knudsen and Dilley 1987, Fischenich 2003), though there is potential to offset these adverse effects, if the "soft" approaches are utilized to their fullest extent. These adverse effects will persist as long as hard riprap/revetment remains and serves as bank stabilization.

Adult CCV steelhead and CV spring-run Chinook salmon are not expected to be directly affected by the placement of riprap as they are not reliant on margin habitat for foraging or refuge like juveniles.

2.5.1.8 Placement of permanent HSR structures and associated shading

The three HSR viaducts to be constructed as part of the proposed action are new structures that will span the SJR and Eastside Bypass river channels in perpetuity. The viaduct crossings are approximately 360 feet in length and 100 feet in width, indicating the structure would cover 36,000 square feet, or 0.826 acres of riparian corridor including the river channel itself, at each crossing location. This will decrease the amount of light the aquatic vegetation and river ecosystem below the viaducts receives compared to current conditions, which is expected to adversely affect juvenile salmonids using these areas.

Overwater structures affect the amount of light that reaches the water column and the bottom of a riverbed, which limits or prevents riparian and aquatic plant growth underneath and around the structure due to shading. Introduced shade has cascading effects on the benthic ecosystem immediately underneath the structure. This changes the type and amount of prey available to rearing juvenile CCV steelhead and NEP spring-run Chinook salmon. Also, the shade created by artificial structures is drastic or sharp compared to that cast by overhanging vegetation (i.e., low and wide structures create stark high light and low light areas in the water column/substrate, verse the gradual and diffuse shading created by tree leaves). Predators are likely to hide in the shadowed areas to ambush prey, such as juvenile salmonids, coming in from brightly light areas with greater success compared to those not hiding in stark shadows (Helfman 1981). Therefore, the localized shading increases are expected to reduce the fitness and increase the risk of mortality of juvenile salmonids. In some cases, overwater structures can serve as novel roosting or nesting for piscivorous birds (PFMC 2014), however at this time avian predators are not a notable source of mortality for juvenile salmonids in the recovery plans for the SJR basin (NMFS 2014).

The footings of the support columns of the HSR viaduct crossings will permanently and physically occupy riparian and floodplain habitat due to their placement in these natural areas, though the Authority has designed the viaduct crossings to avoid the active water channels to the extent practicable.

- At the SJR Reach 1A/SR-99 north of Fresno crossing, the footings of the two support columns are located just outside of the summer-time water level of this portion of Reach 1A.

- At the SJR Reach 4A/west of Chowchilla crossing, the footings of three support columns will be located in the floodplain habitat while one will be completely outside the wetted channel.

- At the Eastside Bypass/west of Chowchilla crossing, the footings of the nine supporting columns will be located within the bypass channel itself.

While most of the support columns and footings will not be in water during normal flow conditions, as the SJRRP moves forward with channel capacity and seepage easement actions, and the restoration flow release amounts increase over time, and during periods of flood flows, the column footings are increasingly likely to interact with the river flow as river levels rise. These structures will create a new source of water turbulence as they interact with the flows, and

affect the water velocities listed salmonids will experience while using the areas under the viaduct crossings. In addition, the change in hydrodynamics has the potential to create abnormal erosion and sediment deposition rates around and downstream from the supports and footings (Oregon Water Resources Research Institute 1995). At the SJR Reach 4A and Eastside Bypass crossing, there is no potential to affect spawning habitat, however appropriate amounts of gravel are important to provide prey for rearing salmonids (Merz 2001, Merz and Ochikubo Chan 2005). Scour around these footings may remove local gravel deposits, decreasing the available food for rearing salmonids.

The Authority has committed to offsetting the occupational footprint of the viaducts over riparian habitat used by salmonids through participation in NFWF's ILF program, as discussed below in Section 2.5.1.7. To address potential scour and sedimentation impacts, proposed CM-FISH-1 also identifies that:

- The designs of the SJR Reach 4A and Eastside Bypass crossings will incorporate the flow increases planned by the SJRRP and minimize any appreciable changes in scour, sediment transport, deposition, or changes in geomorphic processes that could alter habitat conditions in ways that may impede the re-establishment of NEP CV spring-run Chinook salmon;

- The design-build team will work with NMFS to design hydrology and demonstrate minimal hydraulic effects from crossing designs, and;

- The Authority with the design-build team will provide final SJR Reach 4A/Eastside Bypass crossing plans to NMFS prior to any site preparation or mobilization of work. If design is determined to affect listed salmonids in a manner or to an extent not considered in this opinion, ESA Section 7 consultation with NMFS would be reinitiated.

There is also a possibility that over-river HSR crossing structures may require nighttime lighting for operational safety reasons. CM-FISH-1 also states that if night lighting is required for these structures, then the design will ensure that direct illumination of the surrounding waters is avoided. It is likely that both juvenile salmonids and piscivorous predators will be attracted to night lighting, increasing the risk of mortality to individual juveniles.

Due to the incorporation of CM-FISH-1 to the Authority's proposed plan for the Merced to Fresno plus CV Wye HSR section, a majority of the possible adverse effects to fish from the permanent structures are addressed to the extent practicable at this time. While adverse effects to CCV steelhead and NEP CV spring-run Chinook salmon, especially to juveniles, are still expected to occur, the Authority has committed to minimize these long-term effects through a commitment of continued coordination with NMFS.

2.5.1.9 Mitigation credit purchase or in-lieu fee program participation

To offset the expected reductions in juvenile salmonid fitness and survival anticipated over the extended construction period and to acknowledge that the occupation of riverine habitat by permanent HSR structures that, even after on-site restoration, will degrade habitat used by salmonids, the Authority is purchasing 14.41 acres of aquatic habitat credits that will benefit CV

salmonids from NFWF's Sacramento District California ILF program. From the Authority's ILF payment, a restoration project will be implemented that will result in increases to the juvenile salmonid rearing and floodplain habitat close to the location of impact in the long-term, and will sufficiently offset the loss and indirect adverse effects to habitat important to rearing salmonids, resultant from the HSR project Merced to Fresno plus CV Wye section.

The Mendota Wetland Restoration Project has been identified as the site that will be restored and preserved with these funds. While the site is still under design and has a draft prospectus, early contact between the site leads, NMFS staff, and SJRRP representatives indicate that restoring this area and reconnecting the potential floodplain habitat it contains via strategic levee breaches has great potential to benefit the CCV steelhead and NEP spring-run Chinook salmon populations impacted by the project. It is expected to increase the functionality of the rearing habitat in the upper SJR reaches, and may eventually help to increase the outmigration survival and success of reintroduced/recolonizing salmonid juveniles in the future. NMFS expects to be continuously involved in the project so that salmonid benefits will result from restoration of the selected site. The Authority has elected not to provide compensatory mitigation for its temporary impacts to riparian habitat offered by the Eastside Bypass but will offset for permanent impacts there at a 1:1 ratio.

NMFS expects that both reintroduced NEP of spring-run Chinook salmon and individuals from the CCV steelhead DPS will eventually directly benefit from the restoration and reconnection of the Mendota Wetlands as juvenile salmonids of both species should be able to use the floodplain habitat created by the restoration, once complete. The benefits this restoration site will offer are expected to be provided in perpetuity. As part of the area served by NFWF's Sacramento District California ILF Program, the Mendota Wetland Restoration Project is governed by an enabling instrument (NFWF 2018, 2019, NFWF and WRA Environmental Consultants 2019). The enabling instrument, originally approved by NMFS leadership on October 3, 2014, and most recently with amendments on February 12, 2018, ensures that the funds generated by each credit sale will be tracked comprehensively and allocated to the appropriate credit type. Additionally, there is a program account separate from any long-term management and maintenance funds of ILF project sites, established by the program sponsor, according to stipulations in the enabling instrument.

2.5.2 Interrelated and interdependent action effects to species

After the construction of the viaduct crossings and the associated construction clean-up is complete, the Authority will be responsible for the HSR's management, operations, and maintenance as a whole running transit system. Effects associated with the operation of the HSR are considered effects of an interrelated/interdependent action, as described in section 1.3, *Proposed Federal Action*.

2.5.2.1 Effects of vibration and noise from HSR train operations

Once the CA HSR system is completely constructed and regular ridership commences complete with regular schedules, it is assumed that the trains running over SJR/Eastside Bypass on the viaducts may harass fish due to the noise and vibration that comes from high speed operation of the rolling stock and passenger cars. Japan's Shinkansen HSR is reported as running up to 13

trains in each direction at peak hours with (Central Japan Railway Company 2019), sixteen cars in tow each (likely out of the major metropolitan hub of Tokyo, Japan). While it is currently unknown if the CA HSR system will eventually run as many trains as the Shinkansen system over the SJR/Eastside Bypass waterways per hour, it is expected that daily disturbance due to the train's schedule could occur often throughout the day and night once the system is in operation.

Quantification of the effects of HSR systems on aquatic organisms or fish is lacking, however it is generally accepted that transportation noise pollutes aquatic and marine environments (i.e. ship traffic in waterways and automotive traffic over bridges permeating into the aquatic environment (Hawkins and Popper 2016, Pavlock McAuliffe 2016)), and that HSR systems currently cause disturbance to human residents that live in close proximity to tracks in operation (Yokoshima *et al.* 2017) and disturbance to fish utilizing habitat under viaducts crossing is similarly expected. Studying fish responses to varying levels and types of transportation/disturbance sounds have produced unclear results (Federal Highway Administration 2017), however, it can be assumed that due to the speed, wind shear, and vibrations that will be associated with the HSR operations (Hunt and Hussein 2007), fish will be startled as engines and passenger cars pass overhead throughout a 24 hour period.

There are some mechanisms the Authority can incorporate to dampen operational vibration and sounds that transmit down the columns into the river channel and water column, but it is currently undecided which if any dampening tactics will be used and to what degree they will be incorporated into the track design. Adult salmonids that are temporarily startled are expected to leave the immediate area, moving either upstream or downstream. This would alter their migration and use patterns, and at the SJR Reach 1A crossing, train operations could interrupt resting periods. Juvenile salmonids are also expected to be startled and alter their migration patterns, and their foraging and resting behaviors. An unwarranted startle response would make juveniles susceptible to attack from piscivorous predators and increase their risk of mortality. Adverse effects associated with noise and vibration from train operation are expected to persist in perpetuity, as long as the HSR system is in operation.

2.5.2.2 Effects of pollution from HSR system over time

General HSR Operations

Currently, the state of California's electricity grid would power the HSR system, and is expected to require less than 1% of the state's future projected energy demands (Authority and FRA 2018). Because the power supplied by California's electricity grid is not necessarily from 100% renewable clean energy sources at this time, the Authority will instead obtain the quantity of power required for the HSR system by paying a clean-energy premium for the electricity consumed, with a goal of a net-zero rail system (Authority 2019a). Renewable energy sources such as sun, wind, geothermal, and bioenergy are cited as options. Over time, use of such renewable sources would be expected to decrease the amount of carbon released into the atmosphere; however, if hydropower was utilized, the perpetuation of greenhouse gas release from reservoirs could be considered an adverse effect of the HSR system (Deemer *et al.* 2016). Additionally, reliance on hydropower for electricity would be further linked to the decline of salmonids in California's CV as high rim dams continue to block salmonids from a majority of their spawning habitats in the Sierra Nevada (NMFS 2014), as well as adversely controlling and

altering water flow and river temperatures downstream. Since hydropower is not cited as a possible renewable energy source, it is not expected that the creation of the electricity used to power the HSR system will cause indirect adverse effects to listed salmonids.

While the HSR system is a passenger train designed to run on electricity and will not carry any cargo composed of hazardous material (Authority and FRA 2018), other sources of pollution are still expected to occur. While the exact vehicle type has not been selected, the HSR will use electronic propulsion power supplied by an overhead system on a steel-wheel-on-steel-rail track. Such systems are widely regarded as one of the least polluting transportation systems available, with the Japanese Shinkansen touting 1/8 to 1/12 the carbon emissions per passenger as an airplane for the same distance (Central Japan Railway Company 2019). However, all trains and machinery require lubricants that release PAHs, and the braking system will also release heavy metals and other compounds during breaking as the breaking pad materials are worn down and degraded by use (Brooks 2004, Burkhardt *et al.* 2008, Bobryk 2015, Levengood *et al.* 2015). In general, train operations are expected to contribute low-levels of heavy metals such as zinc, copper, lead, nickel, manganese, chromium, and iron to the environment immediately near tracks, and most studies indicate that the concentration of these metals and PAHs increases drastically at station platforms and at maintenance yards (Bukowiecki *et al.* 2007, Wilkomirski *et al.* 2011, Wilkomirski *et al.* 2012).

At this time the Authority is committed to capturing all stormwater runoff (Authority and FRA 2018). All stormwater runoff created by the HSR system, including the tracks, support structures, maintenance facilities, stations, passenger parking lots, and ROW access roads will be redirected as sheet flow into adjacent drainage systems or swales to infiltration basins designed as water quality control measures. No runoff from the proposed action will be directly discharged to any surface water body, including runoff from bridges, overpasses, underpasses, and aerial structures. The Authority and the FRA are implementing low-impact development (LID) designs and other stormwater BMPs to manage and treat stormwater and protect water quality as it leaves HSR station and passenger parking lot areas. Measures may include vegetated stream setbacks, vegetated buffer zones, tree planting and preservation, vegetated swales (bioswales), in accordance with the Phase II Small Municipal Separate Stormwater Permit (State Water Board Order 2013-0001-DWQ). There are even some studies that suggest that the green spaces created by railway ROW can be beneficial habitat for wildlife when not disturbed by regular railway operations (Lucas *et al.* 2017).

The exact stormwater control and treatment designs are still forthcoming, but due to the high degree of stormwater management attention, in addition to (Authority 2019b) public stormwater outreach efforts and LID stormwater control design plans in past documents (Authority 2012), it is anticipated the Authority will adequately control and treat all transportation pollution created by operation of the HSR system. Therefore it is not expected that listed salmonids will be adversely affected through the introduction of heavy metals, PAHs, and other general transportation pollution created by the project. In addition, it is expected that the HSR system will decrease the amount of passenger vehicles driving between the cities in the CCV serviced by the system, therefore overall transportation pollution that stormwater carries into adjacent waterways may decrease over time and as HSR ridership increases, potentially improving water quality.

HSR System Maintenance

As with any major transportation or infrastructure system that provides a service to the public, the Authority will perform regular structural, erosion, and disaster (flood, fire, and earthquake) safety checks to ensure the integrity of the tracks and support columns of the HSR system. Such protocol formations are in their infancy, and draft plans are not available to review, however it is assumed that some safety checks will be performed on these viaduct crossings and require personnel to be in close proximity to the river channels, and possibly require putting personnel or equipment in water. NMFS expects that the Authority will be in contact with staff when draft safety check protocols are available so that a determination can be made regarding listed salmonid interactions with Authority staff and actions at that time.

Similarly, it is expected that vegetation control near HSR tracks and column footings will be required in the future. Vegetation control plans and protocols have not been drafted, but these activities would likely include manual removals, such as trimming and "weed whacking", and also some forms of herbicide application. If vegetation control is required in the riparian corridor, in floodplain habitat, or near waterways containing listed fish, NMFS again assumes that the Authority will approach NMFS for additional ESA Section 7 consultation to ensure adverse effects to salmonids are minimized and incidental take coverage is obtained prior to the commencement of such activities.

Catastrophic Accidents

Finally, a catastrophic derailment of the system while running is possible and a crash from a viaduct would certainly affect the riparian environment and adversely affect salmonids if a derailment were to occur while crossing a waterway. However rigorous safety testing, which will occur before passenger trips commence, and many safety protocols will be followed during regular operations, so a derailment occurring at all is extremely unlikely. The comparative Japanese Shinkansen system has been in operation since 1964 and has no record of fatalities, injuries, or derailments (Sim 2017), despite some lapses in inspection protocols and material vetting before an oil leak was discovered and resolved on December 11, 2017. However other HSR systems have experienced crashes or derailments, such as the Santiago de Compostela rail disaster in 2013, the Wenzhou train collision in 2011, and the Eschede train disaster in Germany in 1998 (Wikipedia 2019). Compared to the number of lines, trips, and total number of HSR systems in operation for comparison and their overall safety record, the occurrence of a derailment would be so rare that it is unlikely to reasonably adversely affect listed salmonids.

2.5.3 Interrelated and interdependent action effects to designated critical habitat

As previously stated, there is no designated critical habitat for CCV steelhead or CV spring-run Chinook salmon within the action area (CCV steelhead critical habitat ends at the confluence of the Merced and San Joaquin Rivers, substantially north of both viaduct crossing locations discussed in this opinion). While the proposed action under examination is not expected to cause direct or indirect effects to their designated critical habitats, local suitable habitat for each species' life history stage is important to maintain so fish may successfully migrate through and rear throughout the action areas. These potential impacts were identified previously as direct impacts to individuals of each species. Impacts to the quality and functionality of aquatic habitats

important to the growth, maturation, and production of Chinook salmon are also discussed in *Section 3: The Magnusson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation*.

2.6 Cumulative Effects

"Cumulative effects" are those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to Section 7 of the ESA.

The CCV cities in general, but especially Merced, Chowchilla, Madera, and Fresno, anticipate increases in human population growth and urban development (Fresno Council of Governments 2012), especially near HSR stations and in association with increased connection to larger employment centers like the Bay Area/Silicon Valley or the Los Angeles metropolitan area. The Authority acknowledges the link between the service the HSR system will provide and increased urban development, and has committed to coordinating with sprawl-reducing and best environmental practices land use development tactics ((Authority and FRA 2018) page A-21). Even with the best intentions, it is expected that private development associated with the HSR system will increase the percent of impervious surfaces, the freshwater demand, and the overall degree of environmental degradation and pollution from non-Federal sources over the long term once the HSR system is operational.

A primary concern is that the stormwater volume and contaminant load is likely to increase in the CV as the amount of impervious cover increases with HSR build-out and associated urban development, despite the Authority planning on treating all of its stormwater prior to discharge. Pollutants become more concentrated on impervious surfaces until either they degrade in place, or are transported via wind, precipitation, or active site management to another location. Stormwater runoff delivers a wide variety of pollutants to aquatic ecosystems, many of which are not listed by the EPA or SWRCB, so discharge of such pollutants often goes unregulated and uncontrolled. Increased urbanization of streams generally leads to decreases in the health and abundance of aquatic species (Hecht *et al.* 2007, Scholz 2011, McIntyre *et al.* 2012, McIntyre *et al.* 2015, Closs *et al.* 2016, Feist *et al.* 2017), including the abundance and health of salmonids of various species.

Post-construction stormwater runoff often picks up a variety of pollutants from both diffuse (nonpoint) and point sources before depositing them into receiving water bodies (EPA 1993). Constituents may include, but are not limited to: fertilizers, herbicides, insecticides, and sediments (landscaping/agriculture); oil, grease, PAHs, and other toxic compounds from motor vehicle operations (roads and parking lots); pathogens, bacteria, and nutrients (pet/dairy wastes, faulty septic systems); toxic metals and metalloid like aluminum, arsenic, copper, chromium, lead, mercury, nickel, and zinc (from building decay, manufacturing or industry byproducts); and the atmospheric deposition onto impervious surfaces from other surrounding land uses (manufacturing industry, freight and trucking exhaust, agriculture field treatments). Therefore, stormwater pollution created by local urban development associated with HSR station placement may be more likely to have a greater impact on aquatic life in receiving waterbodies than the

stormwater output of the HSR project itself, since stormwater impacts directly associated with the HSR project will be more carefully planned and monitored.

Fish exposure to these ubiquitous pollutants in the freshwater and estuarine habitats is likely to cause multiple adverse effects to steelhead and salmon, even at pre-project, ambient levels (Spromberg and Meador 2005, Hecht *et al.* 2007, Sandahl *et al.* 2007, Macneale *et al.* 2010, Feist *et al.* 2017). For instance, stormwater contaminants accumulate in the tissues of juvenile salmonids, acquired from contaminant accumulation in the tissues of their prey (bio-accumulation). Depending on the level of concentration, those contaminants can cause a variety of lethal and sub-lethal effects on salmon and steelhead, including disrupted behavior, reduced olfactory function, immune suppression, reduced growth, disrupted smoltification, hormone disruption, disrupted reproduction, cellular damage, and physical and developmental abnormalities (Hecht *et al.* 2007). Predators of salmonids, like killer whales (*Orcinus orca*), harbor seals (*Phoca vitulina*), and California sea lions (*Zalophus californicus*), are in turn at risk of ingesting toxins that have bio-accumulated in their salmonid prey or are adversely affected in other ways by stormwater toxins, even when far removed from the area of exposure (Grant and Ross 2002, Mos *et al.* 2006, NMFS 2008b).

Even at very low levels, chronic exposures to those contaminants have a wide range of adverse effects on the ESA-listed species considered in this opinion, including:

- Increases in early development issues in gastrulation, organogenesis (exposure of adults, sub-lethal effects passed to resulting offspring) which lowers hatching success.

- Decreases in juvenile survival through reduction in foraging efficiency, reduced growth rates and condition index.

- Increased delay in, or issues occurring during smoltification (only in salmonids) rooted in anion exchange, thyroxin blood hormone, and salinity tolerance.

- Increases in mortality due to increased susceptibility to diseases and pathogens, and depressed immunocompetence.

- Decreased survivorship due to increased predation, reduced predator detection, less shelter use, and less use of schooling behaviors.

- Changes or delays to migration patterns, use of rearing habitats, ability of adults to home to natal streams, and spawning site selection.

- Changes to reproductive behaviors that affect production, including altered courtship behavior, reduced number of eggs produced, and decreased fertilization success (NMFS, 2016b).

Data that quantify the exact sublethal effects of urban stormwater on steelhead and Chinook salmon are limited, which makes analyzing the effects of new or additional sources of non-point stormwater discharge on these populations difficult. It is reasonable, however, to conclude that stormwater that is not sufficiently treated coming from sources outside of the Authority's

jurisdiction will cause persistent adverse effects to listed salmonids that are realized at a watershed/basin level.

Finally, some continuing non-Federal activities are reasonably certain to contribute to climate effects within the action area. However, it is difficult, if not impossible, to distinguish between the action area's future environmental conditions caused by global climate change that are part of the environmental baseline versus cumulative effects. Therefore, all relevant future climate-related environmental conditions in the action area are described in the *Environmental Baseline* (section 2.4).

2.7 Integration and Synthesis

The Integration and Synthesis section is the final step in our assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the effects of the action (Section 2.5) to the environmental baseline (Section 2.4) and the cumulative effects (Section 2.6), taking into account the status of the species and critical habitat (Section 2.2), to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) Reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) appreciably diminish the value of designated or proposed critical habitat for the conservation of the species.

CCV steelhead is listed as threatened under the ESA and the most recent 5-year status review for the DPS concluded that its threatened status is still applicable (NMFS, 2015; 2016b). CCV steelhead remain threatened despite recovery efforts in large part because of widespread degradation, destruction, and blockage of their natural freshwater habitats. The CV spring-run Chinook salmon ESU is also listed as threatened under the ESA but is considered extirpated from the SJR basin as a wild population (NMFS, 2016a). Through recovery plan implementation and SJRRP experimental reintroduction efforts (SJRRP, 2018), NEP CV spring-run Chinook salmon are expected to use the action area, which is also a priority recovery action in the recovery plan for the CV spring-run Chinook ESU (NMFS 2014).

One of the primary reasons both of these species were listed under the ESA is the ubiquitous artificial modifications to, and destruction of, the freshwater habitats upon which these species depend. Also, these populations have been tremendously negatively affected by high rim dams, which have blocked them from a majority of their spawning and rearing habitat high in Sierra Nevada for decades, altering water flow patterns and river temperatures downstream. These primary threats are expected to persist and to grow as human populations, land development, and freshwater demands also increase throughout California. Such trends are likely to suppress the recovery potential of these populations, especially comparing the effective scale of past and continuing adverse habitat changes to restorative recovery actions.

The adverse effects to CCV steelhead and NEP CV spring-run Chinook salmon through HSR system construction are short-term disturbance, decreased survivorship probabilities, disruption of normal behaviors and habitat use, and may result in injury, or in the death of, a small number of fish of each population at each crossing over several years once construction commences. The placement of permanent artificial structure (the viaduct overcrossing structures and their footings) over the waterways and riprap in the floodplain is expected to remove small amounts of

habitat through spatial occupation, change the aquatic ecosystem structure below the structure due to shading, and slightly degrade freshwater habitat locally through the placement of riprap. These adverse effects will slightly reduce the functionality of the habitat available to listed salmonids in the action area. This project will also prevent these riparian areas from being returned to a completely natural state despite Authority restoration and replanting plans, in part due to the HSR system's reliance on existing river levees and other bank armoring tactics to maintain bank stability and reliance on the status quo of the flood protection systems of the SJR basin.

Because the placement of the HSR system will effectively remove a small amount of functional acreage from riparian habitats in perpetuity and to offset temporary adverse habitat changes, the Authority plans to offset these impacts by participating in the NFWF's ILF program and purchasing aquatic habitat credits. Through the Authority's participation and payment of fees, the Mendota Wetlands Restoration Project will commence, including the local restoration and re-connection of historical floodplain habitat. This restored habitat will be maintained in perpetuity, making this tactic an effective offset to long-term adverse salmonid habitat impacts associated with building and operating the Merced to Fresno section of the HSR system, because the same populations of salmonids negatively affected by Authority actions will also have access to the floodplain habitat this restoration project will provide upon completion. The Mendota Wetlands Restoration Project is expected to restore and preserve up to 26.1 acres of floodplain habitat that will be accessible to listed salmonids that use the SJR in the SJRRP's Restoration Area. The amount of floodplain acreage restored by the Mendota Wetlands Restoration Project is greater than the acreage total of the HSR aerial structure and riprap footprints over riparian habitat (3:1 offset ratio over the SJR, 1:1 in the Eastside Bypass) to ensure that the intended benefits will compensate for the adverse effects of habitat destruction and degradation caused by constructing the HSR.

Once the HSR system is operational, low-level railway pollution is expected to be generated and may be transported into waterways through stormwater runoff from the tracks. At stations, passenger parking lots, and rolling stock maintenance facilities, the Authority plans to incorporate a high degree of LID designs and effective stormwater treatment and control devices, which are expected to minimize the introduction of transportation contamination into waters containing listed fishes to the extent practicable. However, increased development around HSR stations is expected in the CV as commuters begin having reliable, fast access to the San Francisco/San Jose Bay Areas and the Los Angeles Area for employment but enjoy the lower costs-of-living in the CV. As the human population in the CV increases, freshwater water quality impacts are also expected to increase, through increased urbanization effects, increases in stormwater runoff and contaminate loads, increases discharges from wastewater treatment plants, and increases in the demand for drinking water.

The expectations of climate change in California is that precipitation and snowpack patterns will begin to fluctuate rapidly between extreme highs and lows, and that dry year types may become more frequent, in addition to becoming more severe. Since the SJR is historically a snowmelt-fed system, if snowpack becomes unavailable, surface water in the SJR basin will also become more limited. Thus, because the ability of the SJR and Sierra Nevada supply of freshwater may be diminished at a time when human demands on the freshwater supply is increasing, it is likely that the water quality in the SJR basin will become severely degraded. Better water quality control

and adequate treatment of new sources of urban stormwater discharges throughout the CV are needed to ensure that the water quality of aquatic habitats will be maintained at sufficient levels into the future to sustain listed salmonids through all water year types.

Overall, the total numbers of fish taken directly and indirectly as a result of the proposed action is anticipated to be small compared to the total population, especially over the long-term. Combining the adverse and beneficial effects associated with this proposed action, effects of the interrelated/interdependent actions, the environmental baseline and the cumulative effects, and taking into account the status of the species affected by the project, the construction and operation of the Merced to Fresno plus CV Wye section of the HSR system is not expected to appreciably reduce the likelihood of survival or recovery of the listed species examined in the opinion.

2.8 Conclusion

After reviewing and analyzing the current status of the listed species, the environmental baseline within the action area, the effects of the proposed action, any effects of interrelated and interdependent activities, and cumulative effects, it is NMFS' opinion that the proposed action is not likely to jeopardize the continued existence of CCV steelhead, or CV spring-run Chinook salmon, or jeopardize the reintroduction of the NEP spring-run Chinook salmon to the SJR below Friant Dam.

2.9 Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined by regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102). "Incidental take" is defined by regulation as takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant (50 CFR 402.02). Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this ITS.

2.9.1 Amount or extent of take

In the biological opinion, NMFS determined that incidental take is reasonably certain to occur. Adult and juvenile CCV steelhead are expected to be incidentally harassed, harmed, injured, or killed as a result of the proposed action. Incidental take will not be issued for NEP CV spring-run Chinook salmon though they will also be affected, because the 10(j) designations means otherwise lawful activities are excepted from take prohibitions of Section 9 within the boundaries of the experimental population area, though recommendations on how to minimize the harm to this 10(j) population will be included for conferencing purposes. Specifically:

1. General construction activities in and near waterways are expected to harass adult and juvenile fish by causing them to alter their normal behaviors and their migration patterns, and inducing stress, even during the proposed in-water work window, due to disturbance (noise, vibration, and equipment operation).

2. Site preparation, relocation of utilities, and vegetation removal in and near waterways are expected to harass adult and juvenile fish by causing them to alter their normal behaviors and their migration patterns, and inducing stress, due to disturbance. Reducing habitat quality (vegetation removal, temporary and permanent land disturbance and alteration, shading) is expected to reduce the growth and survival of salmonids in the action area, decreasing their overall fitness.

3. Vibratory and impact pile driving in and near waterways are expected to harass, injure, or kill adult and juvenile salmonids by introducing underwater pressure waves into the aquatic environment during the installation and removal of temporary steel pipe and cofferdams sheet piles, and the installation of permanent CIDH piles.

    a. The underwater pressure waves from vibratory pile driving is not expected to reach injurious or mortalities levels (<206 dB_{PEAK}, <150 dB_{RMS}) but will harass and disturb fish up to 4,642 meters in both directions from the pile driving location.

    b. The underwater pressure waves from impact pile driving are expected to exceed injurious and mortality levels (≥206 dB_{PEAK}, ≥ 187 dB_{SEL} cumulative, and ≥150 dB_{RMS}). Instantaneous mortality is expected within an 18 meter radius from the driven pile, and injury leading to death is expected out to a 4,634 meter radius from the driven pile without the use of underwater sound control measures.

    c. The density of CCV steelhead in the areas affected by pile driving underwater sound within the estimated distances during the seasonal work windows are expected to be very low, with adult returns expected to be rare before volitional passage is achieved and because the SJRRP steelhead monitoring program is likely to encounter, capture, and relocate steelhead adults before they enter the action area, *therefore* it is estimated that no more than 1 adult CCV steelhead will be injured or killed per year due to pile driving activities. Juvenile steelhead presence is expected to be somewhat more probable as resident *O. mykiss* parents may produce anadromous steelhead offspring (McEwan 2001, Courter *et al.* 2013, Pearse and Campbell 2018) and adult resident *O. mykiss* have been confirmed in SJR Reach 1A. One successful *O. mykiss* redd would be capable of producing multiple ocean-type/steelhead offspring that would use the action area, but due to the timing of the work windows, juvenile use and pile driving overlap would be limited. Therefore, it is expected that no more than 2 juvenile CCV steelhead will be injured or killed per year due to pile driving activities.

4. Cofferdam dewatering is expected to harass, injure, or kill juvenile salmonids by entrapping them, necessitating their capture, handling, and relocation, which is likely to stress, shock, and injure them, resulting in immediate or delayed death, or susceptibility

to predation. The number of juveniles salmonids entrapped by cofferdams, requiring capture and relocation is expected to be low, no more than 10 individual juveniles per year or 33 individuals over the course of construction of the Merced to Fresno plus CV Wye Section. It is also estimated that no more than 3% of the total number of juveniles should die due to capture, handling, and relocation by the Authority or its contractors.

5. In-water activities that contact the channel bottom, such as in-water pile driving for both pile installation and removal, are expected to cause turbidity plumes locally and downstream of the construction locations, and will harass adult and juvenile salmonids by causing them to alter their normal behaviors, their migration patterns, and induce respiratory stress, as long as the turbidity plumes persist.

6. Placement of riprap and bank stabilization measures is expected to harm juvenile salmonids because the use of "hard" stabilization methods (i.e., riprap/revetment) will reduce the amount of feeding and resting areas locally. A reduction in the amount of feeding and resting areas is expected to reduce the fitness of fishes that would have otherwise used this area, in perpetuity.

7. Placement of permanent artificial structures and associated shading is expected to harm juvenile salmonids because the permanent structure occupation of habitat effectively reduces the amount of feeding and resting areas locally, and the shading of the viaduct over the river channel will change the local aquatic ecosystem composition/available salmonid prey base, and create ambush habitat for predators of juvenile salmonids, in perpetuity. Additionally, juvenile salmonids are likely to be startled by vibrations and noise created when high speed trains pass over the viaducts, causing them to flee when they otherwise may be resting or foraging, potentially creating situations in which they are more likely to be predated upon in these areas over the long term.

For incidental take avenues 1, 2, 3a, 5, 6, and 7, NMFS cannot, using the best available information, quantify and track the amount or number of individuals that are expected to be incidentally taken because of the variability and uncertainty associated with the population sizes of the species, annual variation in the timing of migration, and variability regarding individual habitat use of the action area. However, it is possible to express the extent of incidental take in terms of ecological surrogates for those elements of the proposed action that are expected to result in incidental take.

These ecological surrogates are measureable, and the Authority or its contractors can monitor them to determine whether the level of anticipated incidental take described in this ITS is exceeded over the course of project implementation.

2.9.1.1 Incidental take associated with general disturbance, vibration, and noise

The most appropriate threshold for incidental take consisting of temporary fish displacement, behavior modification and slight increases in stress levels associated with general construction activities (#1), site preparation and relocation of utilities (#2), and vibratory pile driving and impact pile driving underwater sound greater than 150 dB_{RMS} but less than cumulatively

injurious SEL (187 dB) (#3a) is an ecological surrogate of the amount of habitat disturbance due to these activities within a certain distance from the construction site.

Vibratory pile driving is expected to produce underwater pressure levels over 150 dB_{RMS} out to 4,642 meters from the location of the pile driving sites. Though these elevated levels are not expected to injure or kill fish directly, they are expected to cause disruption of normal habitat utilization and elicit temporary behavioral effects in juvenile and adult salmonids, leading to harm as described in Section 2.5.1.4. Any behavioral alterations in juvenile fish are expected to decrease their fitness and ultimate survival by decreasing feeding opportunities that will decrease their growth, and by causing area avoidance, which will delay their downstream migration and increase their predation risk. Adult fitness is expected to decrease slightly when area avoidance delays their upstream migration.

Elevated noise disturbance is also expected to elevate fish stress levels. Beyond 4,642 meters, underwater sound is expected to attenuate down to effective quiet underwater sound levels, or 150 dB_{RMS} or less, and therefore this distance is considered the limit of this ecological surrogate. All other activities that cause noise and vibration disturbance, such as general construction activities, heavy equipment operation, site preparation, and relocation of utilities, would also be contained within the vibratory pile driving distance threshold of exceeding effective quiet. Therefore, for simplicity, this surrogate will apply to incidental take forms #1, 2, and 3a and require that all disturbance from these activities be limited from the boundary of the location of the disruptive activity out to 4,642 meters upstream and downstream of the location. All other types of temporary disturbance effects related to noise or vibrations created by equipment operation, construction noise, and human presence is expected to also be contained within this boundary of anticipated incidental take, during the proposed work windows in Table 4. Exceeding 150 dB_{RMS} beyond 4,642 meters from the construction site will be considered exceeding expected incidental take levels for this surrogate.

2.9.1.2 Incidental take associated with elevated in-river turbidity plumes

The most appropriate threshold for incidental take consisting of fish disturbance and sub-lethal effects associated with elevated in-river turbidity plumes is an ecological surrogate of the amount of increase in downstream in-river turbidity generated by in-water pile driving activities (incidental take form #5). In-river pile driving and in-river pile removal are expected to mobilize sediment and increase water turbidity above natural levels. Increased turbidity is expected to cause harm to adult and juvenile CCV steelhead through elevated stress levels and disruption of normal habitat use locally. These temporary responses are linked to decreased growth, survivorship, and overall reduced fitness as described for underwater noise avoidance.

The surrogate for turbidity increases will be based on juvenile salmonid sensitivity to raised turbidity levels. According to CDEC Dos Palos (SDP) station, while NTUs can range over a 1,000 NTU in winter flood condition, typical turbidity in the SJR during the in-water work season is usually less than 50 NTU (California Department of Water Resources 2018c). 50 NTU is already above the range at which steelhead experience reduced growth rates (25 NTU) but below the range steelhead would be expected to actively avoid the area. Therefore, within the already established disturbance surrogate for pile driving, SJR river water cannot be more than 50 NTU above the turbidity level in upstream measurements. Downstream of the construction

underwater noise/pile driving disturbance surrogate boundary, turbidity immediately downstream cannot measure more than 25 NTU above the ambient turbidity level in SJR water measured immediately upstream of project activities. Since in-river values change daily, the upstream comparison value must therefore be taken daily, in association with the downstream readings, during in-water pile driving. Exceeding these tiered turbidity thresholds will be considered as exceeding the expected incidental take levels.

2.9.1.3 Incidental take associated with placement of riprap, bank stabilization, permanent structure, habitat occupation by artificial material, and shading

The most appropriate measurement of harm to salmonids associated with placement of permanent riprap and bank stabilization (#6), and permanent structure, habitat occupation by artificial material, and shading (#7) is a surrogate of the amount of degradation of habitat function in the immediate area associated with artificial structure placement and material occupation. The artificial hard structure and materials would occupy benthic substrates that support benthic prey of juvenile salmonids, reducing feeding opportunities and negatively affecting their potential growth rates. The hard structures and the new water velocities created around them also reduce the possibility of natural processes from otherwise occurring in the area, like aquatic vegetation or large woody material establishment, preventing juveniles from resting or sheltering in the immediate project area. Any shading is related and proportional to the amount and degree of artificial structures overhanging the wetted channels and riparian corridor, and will change the local ecosystem structure and increase the amount of water column ambush predator habitat. While habitat functionality will not be lost completely, the artificial structures and associated habitat changes will be maintained in perpetuity; therefore, the adverse effects associated with these structures will also remain as long as the artificial structure and riprap remain. While the Authority is proposing restoration and compensatory mitigation to offset some of these impacts, these adverse effects will remain locally.

On the bank, the Authority estimates that the permanent structures will occupy a total of 2.02 acres of riparian habitat in Reach 1A and Reach 4A of the SJR and 1.36 acres on the leveed bank of the Eastside Bypass (Table 1). Oblique shading over a greater distance around the aerial structures caused by differing sunlight angles throughout the day are omitted from this total for simplicity and because the area directly under the structure will experience the greatest reduction in surface lighting. The temporary adverse effects associated with these sites are estimated to impact 5.05 acres of riparian habitat. Exceeding these total acreages stated above as surrogate amounts for incidental take forms #6 and #7 will be considered as exceeding the expected incidental take levels. Also, the amount of compensatory mitigation purchased is directly related to the estimated areas of temporary and permanent habitat disturbance, therefore any increases to the amount of area disturbed or permanently covered by HSR permanent structures will not be adequately offset by current in-lieu fee payments.

2.9.2 Effect of the take

In the biological opinion, NMFS determined that the amount or extent of anticipated take, coupled with other effects of the proposed action, is not likely to result in jeopardy to the species.

2.9.3 Reasonable and prudent measures

"Reasonable and prudent measures" (RPMs) are nondiscretionary measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take (50 CFR 402.02).

1. Measures shall be taken by the Authority and its contractors to minimize the extent of disturbance and harm to CCV steelhead caused by construction activities and equipment operation in the action area, related to both direct and indirect effects, as discussed in this opinion.

2. Measures shall be taken by the Authority and its contractors to reduce the extent of degradation and alteration to the habitats used by CCV steelhead in the action area, related to both direct and indirect effects of this project as discussed in this opinion, because further degradation of such habitats would decrease the survival and success of this species in the action area.

3. The Authority or its contractors shall prepare and provide NMFS with updates, reports, and monitoring plans pertinent to incidental take under NMFS jurisdiction.

The following terms and conditions will also minimize the amount of harm to the NEP CV spring-run Chinook salmon being reintroduced in the action area.

2.9.4 Terms and conditions

The terms and conditions described below are non-discretionary, and the Authority and its contractors must comply with them in order to implement the RPMs stated above (50 CFR 402.14). The Authority and its contractors have a continuing duty to monitor the impacts of incidental take and therefore must report the progress of the action and its impact on the species as specified in the ITS (50 CFR 402.14). If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

1. The following terms and conditions implement RPM 1:

    a. Measures shall be taken to maintain, monitor, and adaptively manage all conservation measures, AMMs, and BMPs throughout the life of the project to ensure their effectiveness.

    b. The Authority and its contractors shall work in coordination with NMFS and SJRRP fisheries representatives throughout HSR project active construction phases so that impacts on and interactions with listed fishes can be reduced or avoided to the greatest extent possible.

    c. The Authority and its contractors shall work in coordination with NMFS before and during active HSR operations and maintenance activities so that impacts on, and interactions with, listed fishes can be reduced or avoided to the greatest extent possible.

i. The Authority shall request NMFS review and incorporate comments on drafts of HSR safety check protocols when possibility of interaction with listed salmonids or their habitats is likely, prior to establishing said safety protocols.

ii. The Authority shall request NMFS review and incorporate comments on draft plans for vegetation removal activities and herbicide use as regular maintenance near waterways containing listed salmonids, prior to undertaking said activities.

d. In the course of monitoring the construction portion of the project, the Authority or its contractors shall contact and coordinate with NMFS within 24 hours after direct incidental take of a listed fish or of its ecological surrogate is observed, or is suspected of being exceeded, so that both agencies can work to reduce take back below applicable levels. Construction shall cease until coordination can take place and an adaptive management plan is put in place.

e. The Authority shall ensure its contractors comply with the terms and conditions in this opinion by including them in future contracts through specific requirements that address:

i. Adherence to the NMFS terms and conditions identified in this opinion as part of the award packages as necessary to reduce and limit the amount of take of listed anadromous fishes;

ii. Explicit assignment of the responsibilities of implementation of the environmental AMMs/BMPs related to NMFS resources required to meet the terms and conditions as part of the award package, and;

iii. Explicit assignment of responsibilities of the monitoring of NMFS resources and associated ecological surrogates to ensure the performance of the AMMs/BMPs associated with the terms and conditions stated below, as part of project award packages.

f. The schedule of the construction activities shall be modified to avoid or limit interacting with CCV steelhead. The schedule of the construction activities necessary to limit the impacts of construction on CCV steelhead at each overwater construction location, depending on whether SJRRP fish passage projects have been completed and volitional anadromy is achieved in the system relative to the start of construction, as follows:

i. At the SJR crossing Reach 1A/SR-99 Construction Package-1 north of Fresno site: the seasonal work window shall be limited to **June 15th – October 31st**, irrespective of volitional passage because this location is already high-value/high-use area. Activities inclusive to this work window at this location include: all in-water work, in-water impact and vibratory pile driving, and all near-water work, including impact and vibratory pile driving in the floodplain outside of the wetted channel.

ii. At the SJR crossing Reach 4A, CV Wye west of Chowchilla site:

1. If volitional passage is not yet achieved:

a. the seasonal work window for in-water work, including in-water impact and vibratory pile driving, and impact pile driving in the floodplain near water but outside of the wetted channel shall be limited to **June 1st – December 1st**.

b. the seasonal work window for all other types of near-water work outside of the wetted channel, in the floodplain/on channel banks, including vibratory pile driving, shall be limited to **April 30th – December 1st**.

2. If volitional passage has been achieved:

a. the seasonal work window for in-water work, including in-water impact and vibratory pile driving, and impact pile driving in the floodplain near water but outside of the wetted channel shall be limited to **July 1st – October 15th**.

b. the seasonal work window for all other types of near-water work outside of the wetted channel, in the floodplain/on channel banks, including vibratory pile driving, shall be limited to **June 15th – October 15th**.

iii. At the Eastside Bypass crossing, CV Wye west of Chowchilla site:

1. No work shall occur in the channel of the Eastside Bypass until flows cease (the BA states no work will occur at this location until the channel is dry or water is at least ponded in disconnected pools, therefore avoiding most fish interactions).

2. The seasonal work window for in-water/in-channel work, including in-water impact and vibratory pile driving and impact pile driving in the floodplain near water is **June 1st – December 1st**.

3. All other types of near-water work that may occur in the floodplain/on the banks when the wetted channel is connected, including vibratory pile driving, shall occur **April 30th – December 1st**.

iv. During all seasonal work windows stated above, the daily work hours for all SJR/Eastside Bypass crossing construction sites shall be limited to one hour after sunrise to one hour before sunset when wetted

channels are connected, to avoid nighttime, dawn, and dusk hours, when peak salmonid movement and feeding activities occur.

v. If water temperatures exceed 75°F or more, on average, for seven consecutive days in the wetted channel affected by the construction work, the Authority and its contractors shall contact NMFS staff to obtain approval to proceed with in-water work and impact pile driving (in water or in the floodplain) outside of the work windows stated above. NMFS staff must concur with the Authority's conclusion that no salmonids are likely to be present in the wetted channels near the work site due to high water temperatures before the Authority and its contractors may proceed with construction activities, until such time that water temperatures drop below 75°F once again or the original work window ends.

vi. High water years with suitable water temperatures may necessitate additional consideration of salmonid presence at different construction sites, and shall require additional coordination between all involved agencies to reduce interactions with salmonids.

g. During construction activities, but especially pertaining to impact and vibratory pile driving periods:

i. If any salmonid is injured or killed within the action area in relation to project activities, the Authority and its contractors shall cease construction actions and contact NMFS staff immediately.

ii. If dead, the fish shall be recovered and placed on ice or frozen until transfer to NMFS or SJRRP offices can occur. If injured, the fish shall be handled only to take a photograph to enable later species assignment. Then it shall be immediately released back into the waterbody it was taken in, preferably in a shaded area with overhanging or in-water vegetation.

iii. Construction activities shall not resume until NMFS can analyze the situation and determine if the take could have been avoided.

h. During in-water pile driving for installation and removal of cofferdams and permanent structures:

i. Piles shall be driven as far as possible with vibratory hammering before using an impact hammer.

ii. Piles shall be inspected daily for accumulated debris and debris shall be removed.

iii. A qualified biologist shall use a held-hand turbidity monitor to conduct water quality monitoring upstream and downstream of the location of

construction activities to ensure in-river turbidity plumes created by construction do not exceed 50 NTUs beyond the underwater noise surrogate boundary. If an in-river turbidity plume is created and conditions within the plume exceed this threshold beyond the underwater noise surrogate boundary, construction will cease and turbidity/sedimentation control AMMs/BMPS shall be adjusted until increases to turbidity readings downstream relative to upstream readings cease.

i. During the in-water work windows, if cofferdams require dewatering, the enclosed area shall be checked for listed salmonids, according to the best recommendations of the assigned, on-site fish biologist, but considering the following:

    i. NMFS staff shall be notified of any planned "fish rescue" or salvage activities at least two business days before fish capture and relocation activities begin, so that staff can advise these efforts or make a field visit to observe, if deemed necessary.

    ii. Juvenile salmonids entrapped shall be captured using nets (seines) or electrofishing of enclosed areas, water temperature permitting (less than 18°C). Fishing equipment used shall be in good condition and decontaminated if used outside of the SJR watershed prior to the fish salvage event.

    iii. Persons performing salmonid captures shall be experienced juvenile salmonid handlers and be familiar with the fishing equipment in use.

    iv. If electrofishing is selected to be used, the operator of the equipment shall have at least 100 hours of practical experience using such equipment in the field.

    v. Clean relocation equipment and containers shall be available and ready to receive fish on site during all fishing/fish salvage activities, preferably under shade.

    vi. Captured juvenile salmonids shall be identified to species (*O. mykiss* and *O. tshawytscha* shall be sufficient), counted, and assessed visually for immediate health condition. Total immediate mortality from fish salvage/rescue and relocation activities shall be less than 3% of the total captured and relocated. Therefore, fish salvage operations shall take measures to minimize the number of juveniles injured or killed.

    vii. If a listed fish dies, see retaining and reporting a mortality procedures above (Term and Condition 1f).

    viii. The water quality of the transport water shall be monitored to ensure sufficient oxygen and temperature levels are maintained. Transport

water shall be within 2°C of the river water to minimize shock and transport stress, and less than 18°C overall.

ix. Captured juvenile salmonids shall be held in transport containers for no more than 30 minutes before release. Release locations shall be nearby, be the same water body from which they were removed, and the selected release area shall have complex shaded habitat so juveniles may rest or hide after release.

x. Water pumps shall be screened and checked periodically to ensure they are working properly and that any fish missed in capture efforts are not being entrained and injured by the pumps.

xi. A report on fish rescue and relocation efforts and results shall be submitted to NMFS within 30 days of conclusion of the activities, indicating the number of salmonids that were handled, the number injured or killed, the transport water quality readings, total time in transport, and the location they were released into.

xii. If the Authority or its contractors observe salmonids entrapped in naturally ponded or disconnected waterways within the action area, they shall notify NMFS as soon as possible in case a separate fish salvage effort must ensue. The Authority and its contractors shall facilitate site and area access through the ROW/construction zone until the fish salvage efforts conclude.

j. In-stream woody material refugia shall be designed and placed near the viaduct footings in the SJR to minimize predation of juveniles expected from the regular disturbance of HSR trains running over the river channel on the viaducts and the artificial structures attracting more piscivorous predators to the area than would be expected without the overwater structures and ongoing HSR operations. The Authority shall contact NMFS and SJRRP staff to advise placement and amount to provide optimal refuge for juveniles to hide in and avoid predation.

k. The Authority and its contractors shall prepare and adhere to a SPCCP and SWPPP for each construction site discussed in this opinion, to minimize the probability of introducing pollution into waterways and to reduce the amount discharged should an accidental or uncontrolled discharge occur.

i. Stormwater and erosion AMMs and BMPs shall be established prior to the start of construction and earthwork, and be maintained regularly to ensure effectiveness.

ii. Accidental spill containment and clean-up materials shall be present at all work locations and be accessible to construction crews at all time, to ensure rapid response to events. Materials shall be adequate for the machinery and chemicals expected onsite.

iii. All equipment maintenance and fueling shall occur in paved areas whenever possible, and occur at least 200 feet away from the wetted channel, using full spill or leak containment systems.

iv. Equipment shall be checked for leaks and maintained regularly to ensure proper function before entering water channels or traveling over water channels. Equipment to be used stationary over water for long periods shall have drip pans or absorbent pads placed underneath to catch any and all leaks.

v. Should an accidental spill or discharge into the SJR or Eastside Bypass occur, NMFS staff shall be contacted within 24 hours with information regarding the event, including type of spill or breach, event duration, estimates on the amount and concentration of materials discharged, Authority/contractor immediate response, and the Authority's and their contractors proposed long-term resolution to avoid such events.

2. The following terms and conditions implement RPM 2:

a. The Authority and its design-build team shall work with NMFS staff to ensure viaduct footings will demonstrate minimal hydraulic effects and not alter the hydrology of the SJR in a way that may impede the migration of listed salmonids or cause changes in geomorphic processes that could alter habitat, taking into account increases in Restoration Flow planned by SJRRP.

b. The Authority and its design-build team shall provide final SJR Reach 4A and Eastside Bypass crossing plans of the CV Wye to NMFS at least one year prior to construction mobilization and site preparation start dates for consultation and coordination purposes, in case new information or project design changes warrant consultation re-initiation or opinion amendments.

i. If consultation reinitiation or opinion amendments are not required, the Authority and its construction contractors shall again contact NMFS at least two months ahead of construction mobilization to discuss adaptively managing or avoiding interactions with special status anadromous fishes and the habitats they use in the upcoming construction season.

c. Decreases to the riparian vegetation available locally shall be minimized.

i. Riparian vegetation removal shall be limited to the extent practicable for structure placement and construction access, and both trimming and removal shall be limited to the absolute minimum amount required for construction.

ii. Riparian vegetation not planned for removal shall be clearly marked and areas of special biological significance that contain native, over-hanging riverine trees, floodplain habitat, or other habitat features that

offer in-water heterogeneity such as large woody debris shall be fenced off or clearly marked before removal activities begin to ensure those resources are avoided and preserved.

iii. Remaining trees shall be protected from damage during construction activities and during riprap placement to ensure their continuing survival as part of the riverine habitat. Protective measures may include wrapping their trunks with burlap and/or creating a scaffold buffer of scrap timber around the trunks, in both cases to buffer against damage. A qualified biologist shall confirm proper application of these protective measures and tree survival through the construction and restoration process.

d. Trees to be removed for the project shall be surveyed for species and number. The Authority or its contractors shall replant onsite at least a 3:1 ratio in-kind for the number of individual trees removed once construction is complete. Plantings shall be monitored and cared for at least three years after planting to ensure survival.

e. Temporary construction materials and BMPs shall consist of natural biodegradable materials and the use of plastic (such as monofilament and Visqueen) shall be minimized to the extent practicable. All materials intended for temporary use onsite shall be removed within 60 days post construction/project completion to reduce pollution and trash entering the waterways.

f. Temporary construction areas shall be utilized for staging, storage, parking, and stockpiling outside of the water channels, floodplains, and riparian areas whenever practicable.

g. Disturbed areas that were graded will be re-contoured and stabilized at the end of the construction year to ensure erosion and sediment mobilization into the SJR will be avoided. Once construction is complete, all disturbed areas shall be naturalized to the extent practicable.

h. The placement of artificial structures in the riparian corridor and on the river banks shall be limited to the extent practicable, both above and below the OHWM.

i. The placement of riprap on the river bank shall be limited to the extent described in the project BA or less. “Soft” or green approaches to bank stabilization shall be utilized to the extent practicable, hard bank protection methods shall be avoided whenever feasible, and all tactics shall include the placement of large woody material.

ii. Wood treated with creosote or copper-based chemicals shall be avoided for use in bank stabilization efforts.

iii. Whenever revetment/riprap must be used, quarry stone, cobblestone, or their equivalents shall be used and complemented with native

riparian plantings and other natural stabilization alternatives with the goal of maintaining a natural riparian corridor.

iv. Temporarily disturbed areas shall be revegetated with native plants that resembles or improves the existing native vegetation diversity based on historical, locally appropriate assemblages.

v. When revetment/riprap is placed, voids created by the boulders shall be filled by smaller diameter rocks/gravel when below the OHWM to avoid supporting piscivorous predator ambush habitat.

i. The use of pesticides and herbicides shall be avoided within the SJR and Eastside Bypass wetted channels, floodplains, and uplands during weed control activities.

j. Temporary piles shall be completely removed rather than cutting or breaking them off below the water/ riverbed surface to avoid creating predator habitat.

k. Sediment suspension created by removing temporary piles shall be controlled by encircling the in-water work area with a silt curtain, pulling the piles out slowly, and filling any holes with clean, native sediment or appropriately sized spawning gravel following pile removal.

3. The following terms and conditions implement RPM 3:

a. The Authority and its contractors shall coordinate with SJRRP fisheries staff and NMFS, when necessary, to allow safe and reliable access through HSR ROW and construction sites when in-river SJRRP monitoring or fish salvage operations are required.

i. NMFS and SJRRP shall submit requests for access to particular locations at least 48 hours before the date of the required access.

ii. The Authority shall designate an on-site point of contact who can facilitate access and ensure safety through HSR construction sites and ROW, and update NMFS and SJRRP of their contact information regularly.

b. Annual updates and reports required by these terms and conditions shall be submitted by December 31st of each year of construction.

c. Monitoring reports related to RPM 3 shall include record of adherence to project schedules, project milestone completion dates, and details regarding AMM/BMP implementation and performance, as well as any take, incidents, or encounters relating to NMFS resources or their ecological surrogates.

d. Updates and reports required by these terms and conditions shall be sent to:

San Joaquin River Branch Chief – Erin Strange
California Central Valley Office
National Marine Fisheries Service
650 Capitol Mall, Suite 5-100
Sacramento, CA 95814
Erin.strange@noaa.gov

2.10 Conservation recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Specifically, conservation recommendations are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02).

- When local water temperatures of the SJR are less than 65°F during impact pile driving activities during the aforementioned seasonal in-water work windows (in Reach 1A or Reach 4A), listed salmonids may still be present in the wetted channel areas. NMFS recommends that the Authority or its contractors control their underwater sound from pile driving activities to the FHWG interim threshold levels (Caltrans 2015, 2019) and adjusting pile driving activities appropriately (NMFS 2008a) and/or implementing underwater sound control measures correctly.

- The Authority and its contractors should continue to work cooperatively with other State and Federal agencies, private landowners, governments, and local watershed groups to identify opportunities for cooperative analysis, monitoring, and funding to otherwise support salmonid restoration projects and reintroduction actions projects in the CV, particularly efforts associated with the SJRRP, regarding the Merced to Fresno plus CV Wye section. Doing so would aid restoration of the functionality of existing critical habitats in general, and improve the resiliency and probability of recovery of CCV steelhead and NEP spring-run Chinook salmon in the region.

- The Authority should use biodegradable oil in equipment and onsite vehicles. Doing so will reduce the amount of construction equipment contamination resultant from the project, and available critical habitat quality will be better maintained, in support of CCV steelhead and NEP spring-run Chinook salmon.

2.11 Reinitiation of consultation

This concludes formal consultation for the California HSR Merced to Fresno plus CV Wye Section.

As 50 CFR 402.16 states, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and if: (1) The amount or extent of incidental taking specified in the ITS is exceeded, (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion, (3) the agency action is subsequently

modified in a manner that causes an effect on the listed species or critical habitat that was not considered in this opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action.

3. MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT ESSENTIAL FISH HABITAT RESPONSE

Section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. The MSA (Section 3) defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Adverse effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects on EFH may result from actions occurring within EFH or outside of it and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH.

This analysis is based, in part, on the EFH assessment provided by the Authority and descriptions of EFH for Pacific Coast Salmon contained in the fishery management plans developed by the Pacific Fishery Management Council (PFMC) and approved by the Secretary of Commerce (PFMC 2014, 2016).

3.1 Essential Fish Habitat affected by the project

The geographic extent of salmon freshwater EFH is described as all water bodies currently or historically occupied by PFMC-managed salmon within the USGS 4th field hydrologic units identified by the fishery management plan (PFMC 2014). This designation includes the 18040001 – Middle San Joaquin-Lower Chowchilla hydrologic unit for all runs of Chinook salmon that historically and currently use these watersheds (spring-run and fall-run). The fishery management plan also identifies Habitat Areas of Particular Concern (HAPCs) for Pacific Coast Salmon as: complex channel and floodplain habitat, spawning habitat, thermal refugia, estuaries, and submerged aquatic vegetation.

The action area occurs within Pacific Coast Salmon EFH, specifically watersheds utilized by Chinook salmon (*O. tshawtyscha)*, including a fall-run and a NEP of re-introduced spring-run, though the spring-run historically dominated this watershed. The SJR is historical habitat for these two runs and contains the southernmost populations of Chinook salmon, though anthropogenic changes in the environment have severely adversely impacted their ability to use this basin over the last century. The combined Sacramento – San Joaquin Rivers system once supported Chinook salmon runs comparable to those of the Columbia and Fraser rivers. The freshwater Pacific Coast Salmon EFH components affected by this project include spawning and egg incubation habitat (for fall-run Chinook, discussed below), juvenile rearing habitat, and the juvenile and adult migration corridors, but does not include adult holding habitat. Any habitat used for spawning is considered a HAPC, however HAPCs have not been officially designated in this area.

In 2010, the SJRRP began trap and haul activities to move adult fall-run Chinook salmon around dry stretches of the river as an interim action to restore anadromy until full river connectivity was

achieved. In 2013 and 2014, translocated fall-run Chinook salmon were spawning in the SJR near the action area (SJRRP 2016), and in 2015, more than 20 redds were observed near the span of the HWY 99/North of Fresno site in Reach 1A, under to slightly downstream of the direct in-water footprint of the project (Portz 2016). Therefore the Merced to Fresno section of the HSR project affects the spawning HAPC of fall-run Chinook salmon.

Starting in 2016, the SJRRP began releasing excess adult NEP spring-run broodstock into Reach 1A to monitor and gather data about adult holding behaviors, use areas, and redd creation locations (NMFS 2019). Over the last three years (2016, 2017, and 2018) no spring-run redds have been observed as far downstream as the HWY 99 bridge/HSR viaduct construction site though spawning had occurred in Reach 1A upstream of these sites, despite the 319 fish having sufficient flows and free access to the area (majority of released NEP spring-run broodstock were acoustically tagged and tracked throughout the holding and spawning periods). Reach 1A is suspected as being spawning habitat/gravel limited and issues may eventually arise where fall-run pairs dig up or superimpose over spring-run redds (SJRRP 2017a). Observations of fall-run/spring-run redd superimposition have not yet occurred and may not be a pressing issue until both runs simultaneously occupy SJR Reach 1A in greater numbers.

3.2 Adverse effects on Essential Fish Habitat

Proposed projects that occur in or along waterways often cause significant long-term or permanent negative impacts to aquatic habitat, and the HSR system is no different as the route crosses the SJR and other waterways multiple times in this section. Additionally, improved transportation infrastructure is associated with increased human population growth and urbanization effects that combine to cumulatively decrease the functionality of aquatic ecosystems over large landscapes via individually smaller but pervasive public and private actions (i.e., land development from rural/agriculture to housing and commercial lots, increased water demands, increases in impervious surfaces, point and non-point source pollution increases, increases in aquatic recreation, increases in bank protections to protect new land development, etc.). Therefore, direct and immediate impacts to Pacific Coast Salmon EFH will be considered, as well as indirect and long-term effects of the existence and operation of the HSR system as its implementation affects the quality and quantity of Pacific Coast Salmon EFH into the future.

3.2.1 HSR Construction and Permanent Structure (Pacific Coast Salmon EFH, Complex Channel & Floodplain HAPC, Spawning Gravel HAPC)

The construction of the HSR system in and over the riparian corridor (e.g., building permanent structures, utility installation, temporary or permanent road building, earthwork, etc.) will significantly alter the land surface, soil, vegetation, and hydrology characteristics of the local areas and therefore adversely impacts salmon EFH directly through habitat loss or modification. The HSR viaducts will permanently occupy a small portion of the wetted channel through support columns and footings, and also permanently shade under the viaducts structures, changing the aquatic ecosystem below its structure. A larger area of floodplains, the riparian corridor, and upland areas will be occupied by the HSR route and track placement, associated utilities, and Authority ROW. Construction activities can also have detrimental effects on salmon habitat through adverse water quality impacts via runoff of large quantities of sediment where

topsoil is disturbed, as well as the potential for construction equipment lubricants, heavy metals, and pesticides to be introduced into the waterway.

The Authority is offsetting much of the permanent and temporary impacts to Pacific Coast Salmon EFH through on-site replanting of removed riparian vegetation at a 3:1 ratio by species removed (and agreeing to maintain and monitor for five years after construction is complete), stabilizing and reseeding disturbed topsoil as soon as possible after activities conclude, employing rigorous onsite SWPPP and SPCCP measures to avoid construction pollution impacts to water quality, and by payments into the NFWF/USACE's in-lieu fee program at a 3:1 ratio of the footprint of the viaducts of the SJR riparian corridor and at a 1:1 ratio of the footprint of the viaducts in the Eastside Bypass.

However, these restorative or offset measures do not address the hydrologic effects of the large number of temporary support piles placed into the SJR channel (>120 24 inch or greater diameter piles, arranged in rows of four-five piles each) over the course of the 2016 to 2018 water years, which saw some flood events. It is likely that the temporary piles changed the water flow dynamics of the area, increased the velocities between the pile rows and caused scour and artificial movement of the spawning gravel that was below the temporary support trestle at the HWY 99/Reach 1A North of Fresno viaduct crossing site. Because Friant Dam sequesters any new inputs of sediment and gravel behind the dam, any spawning gravel lost to scour will not be naturally replaced, further limiting and reducing the spawning habitat available to Chinook salmon.

Also, it is likely that during operations of the HSR system, rolling stock passing overhead will cause vibrations and noise to travel down the support columns into the water column, and periodically disturb fish. While it is difficult to determine to what extent Chinook salmon may be disturbed by HSR rolling stock operation, given that much underwater sound research is focused on high impact sounds that rise to the level of injuring or killing fish, such as impact pile driving or offshore drilling activities (Popper and Hastings 2009, Hawkins and Popper 2016), it is reasonable to expected that sudden vibration from trains running at 120 mph will elicit a startle response. While adults may be disturbed with little detriment beyond expending a few calories in movement, juveniles that are caused to flush or startle from resting or hiding spots become vulnerable to predators for a short time period. In combination with shading effects from the overhead bridge that obscure objects in the shaded portion when observed from sunlight water columns (Helfman 1981), it is likely that the HSR viaducts will become habitats that attract ambush predators (predation hotspots). Juvenile Chinook salmon must pass under the HSR viaducts to complete their migration to the Delta and the Pacific Ocean, so constructing and using HSR viaducts will degrade the quality of their migration corridor by occupying a relatively small portion of physical space, but also making it less likely that an individual juvenile will survive the journey.

To mitigate for some of these adverse effects to Pacific Coast Salmon EFH, the Authority is planning to purchase 14.41 acres of aquatic habitat credits from the NFWF's Sacramento District California in-lieu fee program (as discussed in Section 2.5.1.9 Mitigation credit purchase or in-lieu fee program participation).

3.2.2 Floodplain alteration through bank stabilization and protection (Pacific Coast Salmon EFH, Complex Channel & Floodplain HAPC)

Many river valleys in the west were once marshes and were well vegetated, filled with mazes of floodplain sloughs, beaver ponds, and wetlands. Salmon evolved within these systems. Juvenile salmon can spend large portions of their freshwater residence rearing and over-wintering in floodplain environments and riverine wetlands. Spring-run Chinook salmon also will spend up to a year rearing in freshwater and will rely on floodplains for refuge during flood conditions, and access to such floodplain refuge improves their overall growth and fitness (Sommer *et al.* 2001). Salmon survival and growth are often better in floodplain channels, oxbow lakes, and other river-adjacent waters than in mainstream systems (National Research Council 1996).

Now, much of the floodplain rearing habitat in the CCV is highly altered and its functionality has been greatly reduced. Within the action area, a large degree of the alterations to floodplain and wetlands are associated with levees and the flood protection system. The hard armoring and leveeing of mainstem shorelines simplifies habitats, reduces the amount of complex freshwater and intertidal habitats by design, and affects nearshore processes and the ecology of a myriad of species (Williams and Thom 2001). The physical, chemical and biological processes driving natural riverine ecosystem function are often not correctly considered in bank stabilization and shoreline protection project designs (Beechie *et al.* 2010) and frequently result in alterations of stream flows and temperatures and reduction of the heterogeneity of rearing habitat. As such, the preservation and enhancement of any remaining floodplain is important to maintain the ability of Pacific Coast Salmon to naturally rear in the CCV, however these physical changes can also decrease the effectiveness of salmon habitat restoration efforts that co-occur in the area (Beechie *et al.* 2005).

Therefore, the adverse effects from the HSR system infrastructure will be added on top of previous degradation to the floodplain and complex channel HAPC. Though the SJR mainstem and the Eastside Bypass Channel are already leveed, impacted, and artificially maintained to different degrees, the addition of hard stabilization measures and artificial structures make it unlikely that these areas will ever be set-back or restored to their natural states, and the quality and quantity of the Pacific Salmon EFH available locally to rearing juvenile Chinook salmon will remain low. However, the Authority has also committed to using ‘soft armoring’ techniques (FEMA 2009, Authority and FRA 2018) to the extent practicable and to participating in NFWF/USACE’s in-lieu fee program. The Authority has specifically identified fee payment commitment to the Mendota Wetland Restoration Project due to this location’s unique ability to increase the floodplain habitat available to salmonids in the upper SJR. This project proposes to purchase largely unaltered, SJR-adjacent land and strategically breach its levees to reconnect historical floodplain back to the SJR watershed (NFWF and WRA Environmental Consultants 2019). This will re-create and maintain floodplain habitat that can be used by rearing Chinook salmon juveniles affected by the proposed HSR action.

3.2.3 Urbanization and associated increases in stormwater pollution (Pacific Coast Salmon EFH, Complex Channel & Floodplain HAPC)

The degree of urbanization of the action area is expected to increase as the HSR system becomes operational, and therefore urbanization of Pacific Coast Salmon EFH is considered an indirect

but important effect of the proposed project. The negative effects of urbanization on stream ecology are second only to agriculture, even though urban areas occupy significantly less land surface than farmlands (Paul and Meyer 2001). This is because the amount and pervasiveness of impervious surfaces associated with urbanization and development. Buildings, rooftops, sidewalks, parking lots, roads, gutters, storm drains, and drainage ditches, in combination, quickly divert rainwater and snow melt into receiving streams, resulting in an increased volume of runoff from each storm, increased peak discharges, decreased discharge time for runoff to reach the stream, and increased frequency and severity of flooding. Flooding reduces refuge space for fish, especially where accompanied by loss of instream structure, off-channel areas, and habitat complexity. Flooding can also scour eggs and young from the gravel in spawning HAPCs. Increases in streamflow disturbance frequencies and peak flows also compromises the ability of aquatic insects and fish to recover (May *et al.* 1997).

In addition, urbanization greatly impacts Pacific Coast Salmon EFH through decreasing local and downstream water quality via various urban/municipal sources. Water quality is essential to salmon, and the quality of their habitat can be altered when pollutants are introduced through surface runoff or through direct discharges of pollutants into the water. Direct input of pollutants include the wastewater discharges of municipal sewage or stormwater treatment plants, power generating stations, and industrial facilities (e.g., pulp mills, desalination plants, fish processing facilities). Indirect sources of water pollution in salmon habitat results from runoff from streets, yards, construction sites, gravel or rock crushing operations, or agricultural and forestry lands. Stormwater runoff from streets is the main indirect concern in this instance, and it may carry oil and other hydrocarbons, lead and other heavy metals, pesticides, herbicides, sediment, nutrients, bacteria, and pathogens into salmon habitat (Feist *et al.* 2017) without adequate treatment. The introduction of pollutants into EFH can create both lethal and sublethal habitat conditions to salmon and their prey (Scholz 2011, McIntyre *et al.* 2015).

Due to the intermittent nature of rainfall and runoff, the large variety of pollutant source types, and the variable nature of source loadings, urban runoff is difficult to control. The National Water Quality Inventory (EPA 2009) reports that runoff from urban areas is the leading source of impairment to surveyed estuaries and the third largest source of impairment to surveyed lakes. The amount of impervious surfaces also can influence stream temperatures. Summertime air and ground temperatures in impervious areas can be 5°C warmer than in agricultural and forested areas (Bounoua *et al.* 2015, Edmondson *et al.* 2016). In addition, the trees that could be providing shade to offset the effects of solar radiation are often missing in urban areas, and these temperatures can translate to increases in stream temperatures during storm events (Zeiger and Hubbart 2015). The lack of infiltration also results in lower stream flows during the summer by reducing the interception, storage, and release of groundwater into streams. This affects habitat availability and salmonid production, particularly for those species that have extended freshwater rearing requirements (e.g., spring-run Chinook salmon/Coho salmon). Generally, it has been found that instream functions and value seriously deteriorate if the levels of impervious surfaces reach 10% of the total land surface cover in a sub-basin.

Numerous Federal and State programs have been established to improve and protect water quality. One of the most important programs relating to salmon EFH is the CWA's Section 319 program administered by the EPA. Under this section, states are required to submit to EPA for approval of an assessment of waters within the state that, without additional action to control

nonpoint sources of pollution, cannot be expected to attain or maintain applicable water quality standards. In addition, states are to submit to EPA their management programs that identify measures to reduce pollutant loadings, including BMPs and monitoring programs. It is, therefore, critical that actions aimed at improving EFH water quality, especially in streams and rivers, are taken in concert with state agencies (e.g., California's SWRCB) responsible for water quality management.

The Authority has pursued and obtained the necessary SWRCB permits to enable HSR construction and operations, and plans to incorporate a high degree of stormwater control and treatment/LID designs into the project, including both along the systems routes and at stations, passenger parking lots, and service areas. Considering these steps, it is unlikely that the HSR system itself will directly negatively impact the water quality of the Pacific Coast Salmon EFH within the action area. However, the Authority has significantly less control over the stormwater and runoff management of the community areas outside of its properties and jurisdiction, though increased development is expected in association with the HSR route. This will further urbanize the action area, and reductions in SJR basin water quality are expected because the status quo stormwater control and treatment practices of the area are not sufficient to meet the water quality requirements of Pacific Coast Salmon in the SJR mainstem and tributaries (EPA 2018a, b, SWRCB 2019b).

Other adverse effects concerning habitat functionality and individual salmon impacts are discussed further in Section 2.5 of the biological opinion.

3.3 Essential Fish Habitat Conservation Recommendations

The species managed under the Pacific Coast salmon fishery management plan that may be affected by this project are: Chinook salmon (*O. tshawytscha)*, both the fall-run and spring-run. Fall-run Chinook are known to migrate and spawn in SJR tributaries, spring-run Chinook salmon are being to be re-introduced and re-establish in the project area, and juveniles from both runs are known to grow and rear in the action area. The EFH of Chinook salmon is adversely affected by the proposed project through the pathways identified above: HSR system construction and artificial structure placement in/over the riparian corridor, floodplain alteration and bank stabilization, and increased urbanization and associated stormwater inputs once the HSR system becomes operational.

Some Pacific Salmon EFH concerns are addressed through the ESA consultation RPM's 1-3 (Section 2.9.3) and the Authority's plan to purchase 14.41 acres of aquatic habitat credits that will benefit CV salmonids from NFWF's Sacramento District California ILF program, specifically opening up floodplain habitat previously disconnected from the SJR system. In addition, the following EFH Conservation Recommendations (CRs) are intended to address the adverse effects of temporary and permanent structures associated with the HSR system construction near the HWY 99 Reach 1A north of Fresno crossing, placed in and over the spawning HAPC used by Chinook salmon:

1. To address the alteration of sediment composition under and downstream of the temporary support piles/false work structures and permanent viaduct HSR structures through alterations of in-river flows through temporary and permanent

flow obstruction, NMFS recommends that the FRA, or the Authority on behalf of the FRA, restore the riverbed sediment to its original condition, including the placement of clean, native river gravel and/or cobble appropriately sized for the spawning and rearing habitat for Chinook salmon after the construction of the viaduct is complete and temporary support piles are removed. Sediment size-classes, origin, volumes, timing, and placement will be coordinated with NMFS and other agencies affiliated with SJRRP regarding specifics to fulfill the restorative intent of this CR (SJRRP 2015b). Augmenting the available local gravel is also expected to help address the alteration of benthic prey (benthic macro-invertebrate) abundance/composition and the quality of local foraging habitat for juvenile salmon due to sediment composition change and overwater structure shading under the viaduct crossings (Merz and Ochikubo Chan 2005), therefore execution of this CR may serve a dual purpose.

The following CRs are intended to address the adverse effects of temporary and permanent structures associated with the HSR system construction placed in and over juvenile Chinook rearing and migration EFH, and the floodplain and complex channel HAPC:

2. To address the creation of predator habitat through installation of permanent in-water structures (ambush locations, overwater shading), NMFS recommends also installing in-river large woody material (LWM) around or adjacent to the HSR viaduct crossing and footings so that juvenile Chinook may also have access to predator refuges nearby the impacted locations. Enhance in-stream fish habitat by providing root wads and deflector logs below the stabilized bank, and by planting shaded riverine aquatic cover vegetation, as part of bank revitalization in conjunction with support footings so that the likelihood of scour caused by structure placement is reduced. The Authority should work with NMFS and SJRRP staff to ensure LWM installations are placed in arrangements and in sufficient numbers so that maximal benefits and use of Chinook salmon juveniles are likely and expected (Dolloff and Warren 2003).

The following CRs are intended to address the adverse effects of floodplain alteration and bank stabilization associated with the HSR system installation in the riparian corridor and juvenile Chinook rearing and migration EFH, and the floodplain and complex channel HAPC:

3. To address the need to continue to stabilize the river banks upon which the HSR structures are placed, NMFS recommends utilizing alternatives to traditional riprap and hard armoring, such as designing compacted fill lifts and vegetation plantings to stabilize banks while also enhancing the limited rearing and foraging EFH locally available to juvenile Chinook. This could involve placing granular soil under compost socks above the OHWM. The compacted fill lifts would consist of compost socks, would have a minimum durability of one year and would be composed of biodegradable jute, sisal, burlap, or coir fiber fabric. A 12-inch diameter compost sock would be installed on the face of each lift and then the compost sock and soil at each lift would be wrapped with biodegradable material. The process would be repeated until the top of the site is reached. Once the compost socks and soil wraps have been placed, two 6-foot live willow branch

cuttings would be placed per linear foot in each of the lifts and a 2-inch layer of topsoil would be placed over the cuttings. Hard bank protection should be a last resort and the following options should be explored beforehand for efficacy (tree revetments, stream flow deflectors, and vegetative riprap (FEMA 2009)). Exchanging riprap placement for these recommendations helps restore the disturbed ground, decreases the chance of future erosion events, and moves the riverbank back to a more natural state while still providing the stabilization needed for the continuous operations of the HSR system.

4. In areas where levees are under the jurisdiction of the USACE, apply for and obtain a vegetation variance which will allow for the Authority or its contractors to re-plant the area with native species as described above in CR #3, at least in the lower one-third of the waterside of the levee.

The following CRs are intended to address the increased urbanization and associated stormwater inputs once the HSR system becomes operational, and its impact on the floodplain and complex channel HAPC and general Pacific Salmon EFH for all life stages and uses:

5. To address general urbanization of natural areas, NMFS recommends the Authority re-examine its ROW and access road designs of the immediate project areas to designate more acreage near the riparian corridor as public green areas/open spaces that will allow access and enjoyment wherever feasible while also ensuring HSR operational safety and environmental continuity. Interpretative signage should be included in the public space to explain how the Authority places a high value on river health and preservation of aquatic/riverine ecosystems, including Pacific Salmon EFH, even with an increasing urban landscape. Such designs could also include incorporation of stormwater treatment/LID tactics that can help treat stormwater before discharge, further decreasing HSR indirect negative impacts on the SJR watershed.

6. To address expected decreases in EFH water quality due to increased urbanization and stormwater discharge associated with HSR system implementation, NMFS recommends that the Authority take efforts beyond its own properties to help the local communities (perhaps through permitting guidance or knowledge exchanges with the communities stations are located within):

    i. Install and monitor vegetated buffers along stormwater drains to streams or bioswales in a large percentage of upland areas with the goals of trapping sediment, removing nutrients and metals, and moderating water temperatures, as feasible.

    ii. Increase their stormwater quality monitoring following National Pollutant Discharge Elimination System and SWRCB requirements from all stormwater discharge points, and before and after pollution control BMPs to establish their performance over time, and adapt/replace/maintain stormwater quality BMPs, as necessary.

iii. Increase their access to knowledge about water quality issues and encourage local efforts to improve SJR watershed water quality in general, especially meeting the existing TMDLs that affect salmon EFH.

In total, fully implementing these six EFH CRs would protect, by avoiding or minimizing the adverse effects described in Section 3.2, at least 38.5 acres (approximately) of designated EFH for Pacific Coast Salmon in the Merced to Fresno plus CV Wye action area.

3.4 Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, the Authority must provide a detailed response in writing to NMFS within 30 days after receiving an EFH CR. Such a response must be provided at least 10 days prior to final approval of the action if the response is inconsistent with any of NMFS' EFH CRs unless NMFS and the Federal agency have agreed to use alternative time frames for the Federal agency response. The response must include a description of measures proposed by the agency for avoiding, minimizing, mitigating, or otherwise offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the CRs, the Federal agency must explain its reasons for not following the recommendations, including the scientific justification for any disagreements with NMFS over the anticipated effects of the action and the measures needed to avoid, minimize, mitigate, or offset such effects (50 CFR 600.920(k)(1)).

In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many CRs are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, we ask that in your statutory reply to the EFH portion of this consultation, you clearly identify the number of CRs accepted.

3.5 Supplemental Consultation

The Authority must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH CRs (50 CFR 600.920(l)).

4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

The DQA specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the opinion addresses these DQA components, documents compliance with the DQA, and certifies that this opinion has undergone pre-dissemination review.

4.1 Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this opinion are the Authority and the FRA. The format and naming adheres to conventional standards for style.

4.2 Integrity

This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, 'Security of Automated Information Resources,' Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

4.3 Objectivity

Information Product Category: Natural Resource Plan

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the NMFS ESA Consultation Handbook, ESA regulations, 50 CFR 402.01 et seq., and the MSA implementing regulations regarding EFH, 50 CFR 600.

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the References section. The analyses in this opinion and EFH consultation contain more background on information sources and quality.

Referencing: All supporting materials, information, data and analyses are properly referenced, consistent with standard scientific referencing style.

Review Process: This consultation was drafted by NMFS staff with training in ESA and MSA implementation, and reviewed in accordance with West Coast Region ESA quality control and assurance processes.

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APPENDIX D: MITIGATION MONITORING AND ENFORCEMENT PLAN

California High-Speed Rail Authority

Merced to Fresno Section: Central Valley Wye

Mitigation Monitoring and Enforcement Plan

September 2020

CALIFORNIA High-Speed Rail Authority

The environmental review, consultation, and other actions required by applicable Federal environmental laws for this project are being or have been carried out by the State of California pursuant to 23 U.S.C. 327 and a Memorandum of Understanding dated July 23, 2019, and executed by the Federal Railroad Administration and the State of California.

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California High-Speed Rail Project

Merced to Fresno Section: Central Valley Wye

Mitigation Monitoring and Enforcement Plan

Prepared by: _____ _____
Date

Checked by: _____ _____
Date

Approved by: _____ _____
Date

Released by: _____ _____
Mark McLoughlin, Director of
Environmental Services
California High-Speed Rail Authority
Date

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1 Introduction

In August 2020, the California High-Speed Rail Authority (Authority), as the state lead agency and as the federal lead agency pursuant to the National Environmental Policy Act (NEPA) Assignment Memorandum of Understanding (July 23, 2019), prepared a Final Supplemental Environmental Impact Report (EIR)/Environmental Impact Statement (EIS) (Final Supplemental EIR/EIS) for the Merced to Fresno Section: Central Valley Wye of the California High-Speed Rail (HSR) Project (Project). The Final Supplemental EIR/EIS satisfies the requirements of the California Environmental Quality Act (CEQA) and NEPA and has been prepared to support a proposed Board action selecting the SR 152 (North) to Road 11 Wye Alternative. This alternative will extend approximately 51 miles through Merced and Madera Counties and will follow the existing Henry Miller Road and SR 152 rights-of-way as closely as practicable in the east-west direction and the Road 11, SR 99, and BNSF rights-of-way in the north-south direction.

This Mitigation Monitoring and Enforcement Plan (MMEP)[1] has been prepared for the Merced to Fresno Section: Central Valley Wye of the HSR Project. This MMEP supplements the MMEP for the Merced to Fresno Section, originally approved in 2012 and as subsequently amended. This MMEP applies to the implementation of the SR 152 (North) to Road 11 Wye portion of the Merced to Fresno Section. For purposes of this MMEP, the SR 152 (North) to Road 11 Wye portion of the Merced to Fresno Section is referred to as the "Preferred Alternative." References to the "Project" herein may also refer to the Merced to Fresno Section as a whole or to the entire California High-Speed Rail System.

Table 1 of this MMEP describes mitigation measures that will mitigate the adverse environmental impacts of the Preferred Alternative. These measures were developed by the Authority in consultation with appropriate agencies, as well as input from the public, to meet the requirements of CEQA and NEPA. The mitigation measures in Table 1 are conditions of approval that the Authority is required to comply with as it implements the Preferred Alternative.

The Preferred Alternative incorporates impact avoidance and minimization features (IAMFs) including best management practices (BMPs) identified in the Final Supplemental EIR/EIS and described in detail in the technical reports that support the environmental document. As a result of incorporating these IAMFs, the Preferred Alternative will avoid potential adverse environmental impacts in several resource areas, including air quality and global climate change; noise and vibration; biological resources and wetlands; hazardous materials and wastes; land use and development; agricultural farmland; parks, recreation, and open space; aesthetics and visual resources; and cultural resources. In addition, the regulatory requirements, including permitting and coordination with regulatory agencies, for many project-related activities provide additional assurance that potential adverse environmental impacts will not occur. Three cooperating agencies are part of the NEPA review process: the U.S. Army Corps of Engineers (USACE), U.S. Bureau of Reclamation, and Surface Transportation Board (STB). As part of the CEQA process, the responsible agencies include the California Department of Fish and Wildlife (CDFW), Caltrans, the California Public Utilities Commission, the California State Lands Commission, the Central Valley Regional Water Quality Control Board, the Central Valley Flood Protection Board, and the San Joaquin Valley Air Pollution Control District (SJVAPCD). Like the mitigation measures listed in Table 1, the project IAMFs and compliance with regulatory requirements are a condition of approval and must be implemented by the Authority during design, construction, and operation of the Preferred Alternative.

The IAMFs that are part of the Preferred Alternative are listed in Table 2, and they are described in Appendix 2-B, California High-Speed Rail: Impact Avoidance and Minimization Features of the Final Supplemental EIR/EIS. The laws and orders the Preferred Alternative are subject to are described for the following resource areas in more detail in the corresponding sections of Chapter 3 of the Final Supplemental EIR/EIS.

- Transportation – Section 3.2.2
- Air Quality and Global Climate Change – Section 3.3.2
- Noise and Vibration – Section 3.4.2
- Electromagnetic Fields and Electromagnetic Interference – Section 3.5.2
- Public Utilities and Energy – Section 3.6.2
- Biological Resources and Wetlands – Section 3.7.2
- Hydrology and Water Resources – Section 3.8.2
- Geology, Soils, Seismicity, and Paleontological Resources – Section 3.9.2
- Hazardous Materials and Wastes – Section 3.10.2
- Safety and Security – Section 3.11.2
- Socioeconomics and Communities – Section 3.12.2
- Land Use and Development – Section 3.13.2
- Agricultural Farmland – Section 3.14.2
- Parks, Recreation, and Open Space – Section 3.15.2
- Aesthetics and Visual Resources – Section 3.16.2
- Cultural Resources – Section 3.17.2
- Regional Growth – Section 3.18.2
- Cumulative Impacts – Section 3.19.2

The MMEP adheres to the Council on Environmental Quality's (CEQ) regulations (40 Code of Federal Regulations Section 1505) and Federal Railroad Administration Procedures for Considering Environmental Impacts (64 Federal Register 28545, May 26, 1999) and was prepared based on the CEQ finalized guidance entitled *Appropriate Use of Mitigation and Monitoring and Clarifying the Appropriate Use of Mitigated Findings of No Significant Impact* (CEQ January 14, 2011). The CEQ guidance assists NEPA lead agencies to develop mitigation programs that provide effective documentation, implementation, and monitoring of mitigation commitments.

[1] The MMEP is consistent with CEQA requirements for mitigation monitoring as set forth in Section 15097 of the CEQA Guidelines (Title 14 California Code of Regulations, Division 6, Chapter 3).

2 Mitigation Monitoring and Enforcement Plan

The environmental effects of the Preferred Alternative will result in impacts considered significant under CEQA and in impacts under NEPA. Mitigation measures that will reduce or eliminate potential adverse environmental impacts are described in Chapter 3 of Volume 1 of the Final Supplemental EIR/EIS. The specific provisions contained in this MMEP are presented as a table and include mitigation measures identified in the Final Supplemental EIR/EIS, organized by environmental issue and topical areas addressed in the Final Supplemental EIR/EIS. In collaboration with the appropriate agencies, the Authority may refine the means by which it will implement a mitigation measure, as long as the alternative means would ensure compliance during implementation. This MMEP describes implementation and monitoring procedural guidance, responsibilities, and timing for each mitigation measure identified in the Final Supplemental EIR/EIS. Components include:

Significant Impact: Provides the impact expected to occur from the Preferred Alternative as identified in the Final Supplemental EIR/EIS.

Mitigation Measure(s): Provides the mitigation measure and monitoring requirements as identified in the Final Supplemental EIR/EIS.

Implementing Party/Monitoring/Reporting Party: Identifies the entity that will be responsible for directly implementing the mitigation measures, monitoring, and reporting. Implementation can be the responsibility of the Authority or its Design-Build Contractor (Contractor). Monitoring will generally be the responsibility of the Contractor, with oversight provided by the Authority during construction. Long-term mitigation monitoring will be the responsibility of the Authority. The following roles are utilized in the text of mitigation measures in this MMEP.

Mitigation Timing (Implementation Schedule/Reporting Schedule): Not all mitigation actions will occur at the same time. Depending upon the measure, it may be undertaken prior to construction, during construction, or during project operations. Measures may also be undertaken in conjunction with different construction packages or at such time as project operations reach a certain level. The “Phase” and “Action” columns of the table respectively identify the stage of the project during which the mitigation action will be taken and when reporting is to occur, if reporting is required.

Implementation Mechanism: Identifies the actions required to implement the measures, including any required agreements and/or conditions.

Roles and Responsibilities

As the lead agency and proponent of this Project, the Authority will implement the mitigation measures through its own actions, those of its Contractors, and actions taken in cooperation with other agencies and entities. The Authority is ultimately accountable for the overall administration of the MMEP and for assisting relevant individuals and parties in their oversight and reporting responsibilities. The responsibilities of mitigation implementation, monitoring, and reporting extended to several entities as discussed above; however, the Authority will bear the primary responsibility for verifying that the mitigation measures are implemented. The Authority defines the mitigation measures required for the Project. When work is undertaken by the Authority’s contractor, the Contractor shall implement the mitigation measures that are pertinent to its scope of work. The Contractor shall monitor construction activities to ensure that the mitigation measures are being properly implemented and accurately report its activity and results to the Authority. The Authority will periodically check the Contractor’s activity, reports, and effectiveness of mitigation activities.

- Authority: While the Authority retains responsibility for the implementation and reporting on mitigation measures and IAMFs as specified in this MMEP, activities may be carried out by an Authority representative or an Authority-approved contractor. Authority responsibilities may also include certain measures outside of the scope of the Design-Build Contractor such as future studies or operations-phase implementation. In addition, oversight of implementation and reporting may be provided by Authority contractor or representatives as lead agency representatives to facilitate regulatory oversight agency coordination and compliance during implementation and reporting.
- Contractor: The Design-Build Contractor (or the environmental team provided by the Design-Build Contractor) will be responsible for implementing or monitoring mitigation measures and IAMFs as specified in this MMEP.
- Mitigation Manager: The Design-Build Contractor’s representative responsible for overseeing their environmental team’s implementation and reporting of environmental commitments reports the status of each mitigation measure to Authority in accordance with this MMEP.
- Biological Monitor(s): The Design-Build Contractor-provided Biological Monitor(s) will be approved by and report directly to the Contractor’s Biologist. The Biological Monitor(s) will be present onsite within a reasonable monitoring distance during all ground-disturbing activities that have the potential to affect biological resources as directed by the Project Biologist and will be the principal agent(s) in the direct implementation of the MMEP and compliance assurance.
- Cultural Resources Compliance Manager/Principal Investigator: This position must be an Archaeologist who meets relevant Secretary of the Interior qualifications for an archaeologist. The Cultural Resources Compliance Manager/Principal Investigator is responsible for implementing mitigation measures in compliance with the terms and conditions outlined in the MMEP and treatment plans, and coordinating the status of archaeological mitigation with the Authority in accordance with this MMEP, the Authority’s Programmatic Agreement with the California SHPO, and the Merced to Fresno Memorandum of Agreement.
- Cultural Resources Monitor(s): The Design-Build Contractor-provided Cultural Resources Monitor(s) will be approved by and report directly to the Cultural Resources Compliance Manager/Principal Investigator. This/these Monitor(s) will be present onsite within a reasonable monitoring distance during ground-disturbing activities in areas indicated as culturally sensitive and will be the principal agent(s) in the direct implementation of the MMEP and compliance assurance as directed by the Cultural Resources Compliance Manager/Principal Investigator.
- Paleontological Resources Specialist: The Design-Build Contractor-provided Paleontological Resources Specialist is responsible for implementing mitigation measures in compliance with the terms and conditions outlined in the MMEP, including preparation of the Paleontological Resources Management Plan and approval and direction of the Paleontological Resource Monitor(s).
- Paleontological Resources Monitor(s): The Design-Build Contractor-provided Paleontological Resources Monitor(s) will be approved by and report directly to the Paleontological Resources Specialist. The Paleontological Resources Monitor(s) will be present onsite within a reasonable monitoring distance during ground-disturbing activities in areas indicated as resource sensitive and will be the principal agent(s) in the direct implementation of the MMEP and compliance assurance as directed by the Paleontological Resources Specialist.

3 Environmental Mitigation Management and Assessment (EMMA) System

The Authority will implement an Environmental Mitigation Management and Assessment (EMMA) system consisting of strategic planning, policies, and procedures, organizational structure, staffing and responsibilities, milestones, schedule, and resources devoted to achieving the Authority's environmental commitments. The EMMA will also include a component that tracks the implementation of mitigation measures (as well as environmental commitments, BMPs, and IAMFs) and can produce reports on compliance. Authority staff will receive periodic reports on compliance and may request additional reports as necessary to ensure that the MMEP is fully implemented. This system will rely on data provided by the Design-Build Contractor, its consultants, and others to produce status reports regarding construction status, permitting activities, monitoring, inspections, and other compliance activities.

Table 1 Merced to Fresno Section: Central Valley Wye: Mitigation Monitoring and Enforcement Plan

Mitigation Measure	Title	Mitigation Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
Air Quality and Global Climate Change										
AQ-MM#1	Reduce Criteria Exhaust Emissions from Construction Equipment	Prior to issuance of construction contracts, the Authority will incorporate the following construction equipment exhaust emissions requirements into the contract specifications: All heavy-duty off-road construction diesel equipment used during the construction phase will use the cleanest reasonably available equipment (including newer equipment or tailpipe retrofits), but in no case less clean than the average fleet mix for the current calendar year, as set forth in CARB's OFFROAD 2011 database, and no less than a 40 percent reduction compared to a Tier 2 engine standard for NO_X emissions. The contractor will document efforts undertaken to locate newer equipment (such as, in order of priority, Tier 4, Tier 3, or Tier 2 equipment) or tailpipe retrofit equivalents. The contractor will provide documentation to the Authority of such efforts, including correspondence with at least two construction equipment rental companies. A copy of each unit's certified tier specification and any required CARB or air pollution control district operating permit will be made available by the Authority at the time of mobilization of each piece of equipment. The contractor will keep a written record (supported by equipment-hour meters where available) of equipment usage during Central Valley Wye alternatives construction for each piece of equipment. The contractor will provide the Authority with monthly reports of equipment operating hours (through the EMMA system) and annual reports documenting compliance.	Pre-construction	Contract requirements; Compliance reporting	Monthly and annually	Contractor	Contractor	Daily record keeping and monthly/annual reporting	A copy of each unit's certified tier specification and any required CARB or air pollution control district operating permit will be made available by the Authority at the time of mobilization of each piece of equipment	Impact AQ#1: Temporary Direct Impacts on Air Quality within the SJVAB Impact AQ#2: Temporary Direct Impacts on Implementation of an Applicable Air Quality Plan
AQ-MM#2	Reduce Criteria Exhaust Emissions from On-Road Construction Equipment	Prior to issuance of construction contracts, the Authority will incorporate the following material hauling truck fleet mix requirements into the contract specifications: All on-road trucks used to haul construction materials, including fill, ballast, rail ties, and steel, will consist of an average fleet mix of equipment model year 2010 or newer, but no less than the average fleet mix for the current calendar year as set forth in CARB's EMFAC2014 database. The contractor will provide documentation to the Authority of efforts to secure such a fleet mix. The contractor will keep a written record of equipment usage during construction of the Central Valley Wye alternatives for each piece of equipment and provide the Authority with monthly reports of vehicle miles traveled (through the EMMA system) and annual reports documenting compliance.	Pre-construction	Contract requirements; Compliance reporting	Monthly and annually	Contractor	Contractor	Monthly and annual reporting	Contract requirements and specifications	Impact AQ#1: Temporary Direct Impacts on Air Quality within the SJVAB Impact AQ#2: Temporary Direct Impacts on Implementation of an Applicable Air Quality Plan
AQ-MM#3	Reduce the Potential Impact of Concrete Batch Plants	Prior to construction of any concrete batch plant, the contractor will provide the Authority with a technical memorandum documenting consistency with the Authority's concrete batch plant siting criteria and utilization of typical control measures. Concrete batch plants will be sited at least 1,000 feet from sensitive receptors, including daycare centers, hospitals, senior	Pre-construction	Design measures; Compliance technical memorandum	Weekly	Contractor	Contractor	Weekly reporting	Contract requirements and specifications	Impact AQ#1: Temporary Direct Impacts on Air Quality within the SJVAB Impact AQ#2: Temporary Direct Impacts on

Mitigation Measure	Title	Mitigation Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		care facilities, residences, parks, and other areas where people may congregate. The concrete batch plant will utilize typical control measures to reduce fugitive dust, such as water sprays, enclosures, hoods, curtains, shrouds, movable and telescoping chutes, central dust collection systems and other suitable technology, to reduce emissions to be equivalent to the USEPA AP-42 controlled emission factors for concrete batch plants. The contractor will provide to the Authority documentation that each batch plant meets this standard during operation.								Implementation of an Applicable Air Quality Plan
AQ-MM#4	Offset Project Construction Emissions through an SJVAPCD Voluntary Emission Reduction Agreement (VERA)	On June 19, 2014, the SJVAPCD and the Authority entered an MOU that establishes the framework for fully mitigating to net-zero construction emissions of NO_X, VOC, PM_{10}, and $PM_{2.5}$ from the entire HSR Project within the SJVAB. Emissions generated by construction of the portion of the project within the SJVAB are subject to this MOU and therefore must be offset to net zero. Pursuant to the MOU, the Authority shall enter into a VERA with the SJVAPCD to cover the portion of the project approved and funded for construction within the SJVAB. The project-level VERA must be executed prior to commencement of construction and the mitigation fees and offsets delivered and achieved according to the requirements of the VERA and MOU.	Pre-construction	Reporting; Funding	Weekly	Authority	Contractor	Weekly reporting	Pursuant to the MOU, the Authority shall enter into a VERA (or modify the existing VERA) with the SJVAPCD to cover the portion of the project approved and funded for construction within the SJVAB	Impact AQ#1: Temporary Direct Impacts on Air Quality within the SJVAB Impact AQ#2: Temporary Direct Impacts on Implementation of an Applicable Air Quality Plan
AQ-MM#5	Purchase Offsets and Off-Site Emission Mitigation for Emissions Associated with Hauling Ballast Material in Certain Air Districts	By January 31 of each calendar year, the Contractor will inform the Authority through the submittal of a technical memorandum of any planned hauling of ballast material from quarries outside the SJVAB and if the hauling activities result in the exceedance of the annual applicable general conformity threshold(s) or local air basin CEQA threshold(s) for NOx. To determine whether an exceedance will occur based on actual hauling activities, the Authority will at the beginning of each calendar year or as soon as practicable thereafter to obtain the most up-to-date information, based on actual or projected contractor-specific information about hauling in the Mojave AQMD, South Coast AQMD and Bay Area AQMD, and calculate for the next calendar year using the same methodology used in this EIR/EIS the expected NOx emissions from hauling activities in those districts. If, based on that calculation, exceedance of the applicable NOx threshold(s) is anticipated to occur in that next calendar year, the Authority will secure from the appropriate air district(s) or other appropriate source the production or generation of a sufficient quantity of NOx offsets for that calendar year necessary to achieve conformity (in the case of exceedance of general conformity thresholds) and/or to result in net NOx generation below the applicable CEQA threshold(s). At a minimum, sufficient mitigation/offsets will be secured so they are generated in the year of impact or as otherwise permitted by 40 C.F.R. Part 93 Section 93.163.	Pre-construction/ Construction	Reporting (technical memorandums); Funding	Weekly	Contractor and Authority	Contractor and Authority	Weekly reporting	Authority to coordinate the purchase of offsets with pertinent AQMDs per contractor reports	Impact AQ#3: Temporary Indirect Impacts on Air Quality outside the SJVAB

Mitigation Measure	Title	Mitigation Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
Noise and Vibration										
NV-MM#1	Construction Noise Mitigation	Prior to construction (any ground-disturbing activities), the contractor will prepare a noise-monitoring program for Authority approval. The noise-monitoring program shall describe how during construction the contractor will monitor construction noise to verify compliance with the noise limits (an 8-hour Leq, dBA of 80 during the day and 70 at night for residential land use, 85 for both day and night for commercial land use, and 90 for both day and night for industrial land use) where a noise-sensitive receptor is present. The contractor will be given the flexibility to meet the FRA construction noise limits in the most efficient and cost-effective manner. This can be done by either prohibiting certain noise-generating activities during nighttime hours or providing additional noise control measures to meet the noise limits. In addition, the noise-monitoring program will describe the actions required of the contractor to meet required noise limits. These actions will include the following nighttime and daytime noise control mitigation measures, as necessary: ▪ Install a temporary construction site sound barrier near a noise source. ▪ Avoid nighttime construction in residential neighborhoods. ▪ Locate stationary construction equipment as far as possible from noise-sensitive sites. ▪ Re-route construction truck traffic along roadways that would cause the least disturbance to residents. ▪ During nighttime work, use smart back-up alarms, which automatically adjust the alarm level based on the background noise level, or switch off back-up alarms and replace with spotters. ▪ Use low-noise emission equipment. ▪ Implement noise-deadening measures for truck loading and operations. ▪ Monitor and maintain equipment to meet noise limits. ▪ Line or cover storage bins, conveyors, and chutes with sound-deadening material. ▪ Use acoustic enclosures, shields, or shrouds for equipment and facilities. ▪ Use high-grade engine exhaust silencers and engine-casing sound insulation. ▪ Prohibit aboveground jackhammering and impact pile driving during nighttime hours. ▪ Minimize the use of generators to power equipment. ▪ Limit use of public address systems. ▪ Grade surface irregularities on construction sites. ▪ Use moveable sound barriers at the source of the construction activity.	Construction	Reporting	Weekly	Contractor	Contractor	Weekly Reporting	Contract requirements and specifications	Impact NV#1: Temporary Exposure of Sensitive Receptors to Construction Noise Impact BIO#24: Indirect Impacts on Wildlife Movement Corridors

Mitigation Measure	Title	Mitigation Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		▪ Limit or avoid certain noisy activities during nighttime hours. ▪ To mitigate noise related to pile driving, the use of an auger to install the piles instead of a pile driver would reduce noise levels substantially. If pile driving is necessary, limit the time of day that the activity can occur. ▪ The Authority will establish and maintain in operation until completion of construction a toll-free "hotline" regarding the Section construction activities. The Authority will arrange for all incoming messages to be logged (with summaries of the contents of each message) and for a designated representative of the Authority to respond to hotline messages within 24 hours (excluding weekends and holidays). The Authority will make a reasonable good faith effort to address all concerns and answer all questions, and shall include on the log its responses to all callers. The Authority will make a log of the incoming messages and the Authority's responsive actions publicly available on its website. ▪ The contractor will provide the Authority with an annual report by January 31 of the following year documenting how it implemented the noise-monitoring program.								
NV-MM#2	Additional Noise Analysis during Final Design	During final design and prior to construction, the Authority will review the Central Valley Wye Noise and Vibration Technical Report. If final design or final vehicle specifications result in changes to the assumptions underlying the analysis in that report, the Authority will prepare additional environmental analysis, as required by CEQA and NEPA, to reassess noise impacts and potential mitigation.	Pre-construction/ Design	Reporting	Final design and prior to construction	Authority	Authority	Final design and prior to construction	Submit assessment and if required, supplemental environmental documentation	Impact NV#5: Intermittent Permanent Exposure of Sensitive Receptors to Noise from Operations Impact SO#18: Permanent impacts on Children's Health and Safety (Rail Operations)
NV-MM#3	Implement Proposed California High-Speed Rail Project Noise and Vibration Mitigation Guidelines	Various options exist to address the potentially severe noise effects from high-speed trains. With input from local jurisdictions and balancing technological factors, such as structural and seismic safety, cost, number of affected receptors, and effectiveness, mitigation measures will be selected and implemented. The mitigation measure or suite of mitigation measures for severe noise impacts shall be designed to reduce the noise level from HSR operations from severe to moderate according to the provisions of the FRA noise and vibration manual (FRA 2012). The noise guidelines include the following mitigation measures: Building Sound Insulation If sound barriers are not proposed or do not reduce sound levels to below a severe impact level, building sound insulation can be installed. Sound insulation of residences and institutional buildings to improve the outdoor-to-indoor	Pre-construction/ Construction/ Post-construction	Reporting	Weekly	Authority	Authority	Ongoing weekly monitoring during construction, and post-construction monitoring as needed to assess damage to buildings	Contract requirements and specifications; Noise and vibration mitigation guidelines	Impact NV#4: Permanent Traffic-Generated Noise from Realigned State Highways and Local Roads Impact NV#5: Intermittent Permanent Exposure of Sensitive Receptors to Noise from Operations Impact SO#8: Permanent impacts on Children's Health and Safety (Project-Related Roadway Changes) Impact SO#18:

Mitigation Measure	Title	Mitigation Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		noise reduction is a mitigation measure that can be considered when the use of sound barriers is not feasible in providing a reasonable level (5 to 7 dBA) of noise reduction. Although this approach has no effect on noise in exterior areas, it may be the best choice for sites where sound barriers are not feasible or desirable and for buildings where indoor sensitivity is of most concern. Substantial improvements in building sound insulation (on the order of 5 to 10 dBA) can often be achieved by adding an extra layer of glazing to windows, by sealing holes in exterior surfaces that act as sound leaks, and by providing forced ventilation and air conditioning so that windows do not need to be opened. Performance criteria would be established to balance existing noise events and ambient noise conditions as factors for determining mitigation measures. Noise Easements If a substantial noise reduction cannot be completed through the installation of sound barriers or building sound insulation, the Authority can acquire easements on properties severely affected by noise. This entails the establishment of an agreement between the Authority and the property owner wherein the Authority compensates the property owner for an easement that would encompass the property boundaries to the right-of-way of the rail line. In return, the property owner would accept the future noise conditions and release their right to petition the Authority regarding the noise level and subsequent disruptions. This approach would only be offered in isolated cases where other mitigation options are ineffective, infeasible, impractical, or too costly.								Permanent impacts on Children's Health and Safety (Rail Operations)
NV-MM#4	Vehicle Noise Specification	In the procurement of an HSR vehicle technology, the Authority will require bidders to meet the federal regulations (40 C.F.R. 201.12/13) at the time of procurement for locomotives (currently a 90-dBA level standard) and rail cars (currently a 93-dBA level standard for cars operating at speeds of greater than 45 mph). Depending on the available technology, this could substantially reduce HSR noise levels during operation throughout the corridor.	Pre-construction/ Construction/ Post-construction	Reporting	Weekly	Authority	Authority	Ongoing weekly monitoring during construction, and post-construction monitoring as needed	Contract requirements and specifications; Noise and vibration mitigation guidelines	Impact NV#5: Intermittent Permanent Exposure of Sensitive Receptors to Noise from Operations
Biological Resources and Wetlands										
BIO-MM#1a	Establish Environmentally Sensitive Areas, Wildlife Exclusion Fencing, and Non-Disturbance Zones	Prior to any ground-disturbing activity in a Work Area, the Project Biologist will use flagging to mark ESAs that support special-status species or aquatic resources and are subject to seasonal restrictions or other avoidance and minimization measures. The Project Biologist will also direct the installation of WEF to prevent special-status wildlife species from entering Work Areas. The WEF will have exit doors to allow animals that may be inside an enclosed area to leave the area. The Project Biologist will also direct the installation of construction exclusionary fencing (exclusionary fencing) at the boundary of the Work	Pre-construction/ Construction	Identify and establish ESAs, WEF, and construction exclusionary fencing	In accordance with reporting schedule established by agency permit requirements	Contractor	Contractor	In accordance with reporting schedule established by agency permit requirements	Condition of design-build contract	Impact BIO#1: Direct Impacts on Special-Status Plant Species Impact BIO#2: Indirect Impacts on Special-Status Plant Species and Other Native Plants Impact BIO#3:

Mitigation Measure	Title	Mitigation Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		Area, as appropriate, to avoid and minimize impacts on special-status species or aquatic resources outside of the Work Area during the construction period. The ESAs, WEF, and exclusionary fencing will be delineated by the Project Biologist based on the results of habitat mapping or modeling and any pre-construction surveys, and in coordination with the Authority. The ESAs, WEF, and exclusionary fencing will be regularly inspected and maintained by the Project Biologist. The ESAs, WEF, and exclusionary fencing locations will be identified and depicted on an exclusion fencing exhibit. The purpose of the ESAs and WEF will be explained at WEAP training, and the locations of the ESAs and WEF areas will be noted during worker tailgate sessions.								Direct Impacts on Special-Status Wildlife—Invertebrates Impact BIO#7: Direct Impacts on Special-Status Wildlife—Amphibians Impact BIO#9: Direct Impacts on Special-Status Wildlife—Reptiles Impact BIO#11: Direct Impacts on Special-Status Wildlife—Birds Impact BIO#13: Direct Impacts on Special-Status Wildlife—Mammals Impact BIO#14: Indirect Impacts on Special-Status Wildlife—Mammals Impact BIO#15: Direct Impacts on Special-Status Plant Communities Impact BIO#16: Indirect Impacts on Special-Status Plant Communities Impact BIO#17: Direct Impacts on Jurisdictional Aquatic Resources Impact BIO#21: Direct Impacts on Essential Fish Habitat
BIO-MM#1b	Establish and Implement a Compliance Reporting Program	The Project Biologist will prepare monthly and annual reports documenting compliance with all IAMFs, mitigation measures, and requirements set forth in regulatory agency authorizations. The Authority will review and approve all compliance reports prior to submittal to the regulatory agencies. Reports will be prepared in compliance with the content requirements outlined in the regulatory agency authorizations.	Construction	Compliance Report	Monthly or at other appropriate interval	Contractor	Contractor	In accordance with reporting schedule established by agency permit requirements	Condition of design-build contract	Impact BIO#1: Direct Impacts on Special-Status Plant Species Impact BIO#2: Indirect Impacts on Special-Status Plant Species and Other Native Plants

Mitigation Measure	Title	Mitigation Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		Pre-activity survey reports will be submitted within 15 days of completing the surveys and will include: ▪ Location(s) of where pre-activity surveys were completed, including latitude and longitude, Assessor Parcel Number, and HST parcel number. ▪ Written description of the surveyed area. A figure of each surveyed location will be provided that depicts the surveyed area and survey buffers over an aerial image. ▪ Date, time, and weather conditions observed at each location. ▪ Personnel who conducted the pre-activity surveys. ▪ Verification of the accuracy of the Authority's habitat mapping at each location, provided in writing and on a figure. ▪ Observations made during the survey, including the type and locations (written and GIS) of any sensitive resources detected. ▪ Identification of relevant measures from the BRMP to be implemented as a result of the survey observations. Daily Compliance Reports will be submitted to the Authority via EMMA within 24 hours of each monitoring day. Noncompliance events will be reported to the Authority the day of the occurrence. Daily Compliance Reports will include: ▪ Date, time, and weather conditions observed at each location where monitoring occurred. ▪ Personnel who conducted compliance monitoring. ▪ Project activities monitored, including construction equipment in use. ▪ Compliance conditions implemented successfully. ▪ Noncompliance events observed. Daily Compliance Reports will also be included in the Monthly Compliance Reports, which will be submitted to the Authority by the 10th of each month and will include: ▪ Summary of construction activities and locations during the reporting month, including any noncompliance events and their resolution, work stoppages, and take of threatened or endangered species. ▪ Summary of anticipated project activities and Work Areas for the upcoming month. ▪ Tracking of impacts to suitable habitats for each threatened and endangered species identified in USFWS and CDFW authorizations, including: – An accounting of the number of acres of habitats for which we provide compensatory mitigation								Impact BIO#3: Direct Impacts on Special-Status Wildlife—Invertebrates Impact BIO#7: Direct Impacts on Special-Status Wildlife—Amphibians Impact BIO#9: Direct Impacts on Special-Status Wildlife—Reptiles Impact BIO#11: Direct Impacts on Special-Status Wildlife—Birds Impact BIO#13: Direct Impacts on Special-Status Wildlife—Mammals Impact BIO#14: Indirect Impacts on Special-Status Wildlife—Mammals Impact BIO#15: Direct Impacts on Special-Status Plant Communities Impact BIO#16: Indirect Impacts on Special-Status Plant Communities Impact BIO#17: Direct Impacts on Jurisdictional Aquatic Resources Impact BIO#21: Direct Impacts on Essential Fish Habitat

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		that has been disturbed during the reporting month, and – An accounting of the cumulative total number of acres of threatened and endangered species habitat that has been disturbed during the project period. ▪ Up-to-date GIS layers, associated metadata, and photo documentation used to track acreages disturbed. ▪ Copies of all pre-activity survey reports, daily compliance reports, and noncompliance/work stoppage reports for the reporting month. Annual Reports will be submitted to the Authority by January 20 and will include: ▪ Summary of all Monthly Compliance Reports for the reporting year. ▪ A general description of the status of the project, including projected completion dates. ▪ All available information about project-related incidental take of threatened and endangered species. ▪ Information about other project impacts on the threatened and endangered species. ▪ A summary of findings from pre-construction surveys (e.g., number of times a threatened or endangered species or a den, burrow, or nest was encountered, location, if avoidance was achieved, if not, what other measures were implemented). ▪ Written description of disturbances to threatened and endangered species habitat within Work Areas, both for the preceding 12 months and in total since issuance of regulatory authorizations by USFWS and CDFW, and updated maps of all land disturbances and updated maps of identified habitat features suitable for threatened and endangered species within the project area. In addition to the compliance reporting requirements outlined above, the following items will be provided for compliance documentation purposes: ▪ If agency personnel visit the Construction Footprint in accordance with BIO-IAMF#2, the Project Biologist will prepare a memorandum within 1 day of the visit that memorializes the issues raised during the field meeting. This memorandum will be submitted to the Authority via EMMA. Any issues regarding regulatory compliance raised by agency personnel will be reported to the Authority and the Contractor. ▪ Compliance reporting will be submitted to the Authority via EMMA in accordance with the report schedule. The Project Biologist will prepare and								

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		submit compliance reports that document the following: – Compliance with BIO-MM#1a: Establish Environmentally Sensitive Areas, Wildlife Exclusion Fencing, and Non-Disturbance Zones. – Implementation and performance of the Restoration and Revegetation Plan described in BIO-MM#2a. – Summary of progress made regarding the implementation of the Weed Control Plan described in BIO-IAMF#7. – Compliance with BIO-IAMF#8: Establish Monofilament Restrictions. – Compliance with BIO-IAMF#9: Prevent Entrapment in Construction Materials and Excavations. – Compliance with BIO-IAMF#10: Delineate Equipment Staging Areas and Traffic Route. – Compliance with BIO-IAMF#11: Dispose of Construction Spoils and Waste. – Compliance with BIO-IAMF#12: Clean Construction Equipment. – BMP field manual implementation and any recommended changes to construction site housekeeping practices outlined in BIO-IAMF#13: Maintain Construction Sites. – Compliance with BIO-IAMF#15: Vehicle Traffic and Construction Site Speed Limits ▪ Work stoppages and measures taken under BIO-MM9a: Work Stoppage will be documented in a memorandum prepared by the Project Biologist and submitted to the Authority within 2 business days of the work stoppage.							
BIO-MM#1c	Conduct Presence/Absence Pre-construction Surveys for Special-Status Plant Species and Special-Status Plant Communities	Prior to any ground-disturbing activity, the Project Biologist will conduct presence/absence botanical field surveys for special-status plant species and special-status plant sensitive natural communities in all potentially suitable habitats within a Work Area. The surveys shall be consistent with CDFW's *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Sensitive Natural Communities* and USFWS's *Guidelines for Conducting and Report Botanical Inventories for Federally Listed, Proposed and Candidate Plants.* The Project Biologist will flag and record in GIS the locations of any observed special-status plant species and special-status plant sensitive natural communities. Portions of the project footprint that support special-status plant species that would be temporarily disturbed will be restored to pre-construction conditions as defined in the	Pre-construction/ Construction/ Post-construction	Conduct protocol level, pre-construction surveys; Report findings; Restore temporarily disturbed areas	Report findings at least 30 days prior to ground disturbance	Contractor	Contractor	Report findings at least 30 days prior to ground disturbance	Condition of design-build contract following requirements established by regulatory compliance permits	Impact BIO#1: Direct Impacts on Special-Status Plant Species Impact BIO#2: Indirect Impacts on Special-Status Plant Species and Other Native Plants Impact BIO#15: Direct Impacts on Special-Status Plant Communities Impact BIO#16: Indirect Impacts on Special-Status Plant Communities

Mitigation Measure	Title	Mitigation Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		BRMP prepared under BIO-IAMF#6. Before disturbance, pre-construction conditions, including species composition, species richness, and percent cover of key species will be documented, and photo points will be established. If special-status plant species cannot be avoided, mitigation for impacts on these species will be documented (density, percent cover, key habitat characteristics, including soil type, associated species, hydrology, topography, and photo documentation of pre-construction conditions) and incorporated into a relocation/compensation program, as described in BIO-MM#2. The Project Biologist will provide verification of survey results and report findings to the Authority to document compliance with this measure.								
BIO-MM#2a	Prepare and Implement a Restoration and Revegetation Plan	Prior to any ground-disturbing activity, the Project Biologist will prepare an RRP to address temporary impacts resulting from ground-disturbing activities within areas that potentially support special-status species, wetlands and/or other aquatic resources. Restoration activities may include, but not be limited to: grading landform contours to approximate pre-disturbance conditions, revegetating disturbed areas with native plant species, and using certified weed-free straw and mulch. The Authority will implement the RRP in all temporarily disturbed areas outside of the permanent right-of-way that potentially support special-status species, wetlands and/or other aquatic resources. Consistent with section 1415 of the Fixing America's Surface Transportation Act (FAST Act) restoration activities will provide habitat for native pollinators through plantings of native forbs and grasses. The Project Biologist will obtain a locally sourced native seed mix. The restoration success criteria will include limits on invasive species, as defined by the California Invasive Plant Council, to an increase no greater than 10 percent compared to the pre-disturbance condition, or to a level determined through a comparison with an appropriate reference site consisting of similar natural communities and management regimes. The RRP will outline at a minimum: a. Procedures for documenting pre-construction conditions for restoration purposes. b. Sources of plant materials and methods of propagation. c. Specification of parameters for maintenance and monitoring of re-established habitats, including weed control measures, frequency of field checks, and monitoring reports for temporary disturbance areas. d. Specification of success criteria for re-established plant communities.	Pre-construction	Prepare plan/ Compliance reporting	Annual	Contractor	Contractor	Annual reporting	EMMA	Impact BIO#1: Direct Impacts on Special-Status Plant Species Impact BIO#2: Indirect Impacts on Special-Status Plant Species and Other Native Plants Impact BIO#3: Direct Impacts on Special Status Wildlife—Invertebrates Impact BIO#7: Direct Impacts on Special-Status Wildlife—Amphibians Impact BIO#9: Direct Impacts on Special-Status Wildlife—Reptiles Impact BIO#11: Direct Impacts on Special-Status Wildlife—Birds Impact BIO#13: Direct Impacts on Special-Status Wildlife—Mammals Impact BIO#14: Indirect Impacts on Special-Status Wildlife—Mammals Impact BIO#15: Direct Impacts on Special-Status Plant Communities Impact BIO#16: Indirect Impacts on Special-Status Plant Communities

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		e. Specification of the remedial measures to be taken if success criteria are not met. f. Methods and requirements for monitoring restoration/replacement efforts, which may involve a combination of qualitative and/or quantitative data gathering. g. Maintenance, monitoring, and reporting schedules, including an annual report due to the Authority by January 31 of the following year. The RRP will be submitted to the Authority and regulatory agencies, as defined in the conditions of regulatory authorizations, for review and approval.								Impact BIO#17: Direct Impacts on Jurisdictional Aquatic Resources Impact BIO#21: Direct Impacts on Essential Fish Habitat
BIO-MM#2b	Prepare and Implement Plan for Salvage, Relocation, and/or Propagation of Special-Status Plant Species	Prior to construction (any ground-disturbing activity), the Project Biologist will collect seeds and plant materials and stockpile and segregate the top four inches of topsoil from locations within the Work Area where species listed as threatened or endangered under the FESA, threatened, endangered, or candidate for listing under CESA, state-designated "Rare" species, and California Rare Plant Rank 1B and 2 species were observed during surveys for use on off-site locations. Suitable sites to receive salvaged material include Authority mitigation sites, refuges, reserves, federal or state lands, and public/private mitigation banks. If relocation or propagation is required by authorizations issued under the FESA and/or CESA, the Project Biologist will prepare a plant species salvage plan to address monitoring, salvage, relocation, and/or seed banking of federal or State-listed species. The plan will include provisions that address the techniques, locations, and procedures required for the collection, storage, and relocation of seed or plant material; and collection, stockpiling, and redistribution of topsoil and associated seed. The plan will also include requirements related to outcomes such as percent absolute cover of highly invasive species, as defined by the California Invasive Plant Council (less than documented baseline conditions), maintenance, monitoring, implementation, and the annual reporting. The plan will reflect conditions required under regulatory authorizations issued for federal or state-listed species. The Project Biologist will submit the plan to the Authority for review and approval.	Pre-construction/ Construction/ Post-construction	Prepare and implement plan/ Report compliance	Follow reporting requirements as established by regulatory compliance permits	Contractor	Contractor	Follow reporting requirements as established by regulatory compliance permits	Condition of design-build contract: Salvage, relocation, and propagation of special-status plant species following requirements established by regulatory compliance permits	Impact BIO#1: Direct Impacts on Special-Status Plant Species Impact BIO#2: Indirect Impacts on Special-Status Plant Species and Other Native Plants Impact BIO#15: Direct Impacts on Special-Status Plant Communities Impact BIO#16: Indirect Impacts on Special-Status Plant Communities
BIO-MM#3a	Prepare and Implement a Compensatory Mitigation Plan (CMP) for Impacts to Aquatic Resources	The Authority will prepare and implement a CMP that identifies mitigation to address temporary and permanent loss, including functions and values, of aquatic resources defined as waters of the U.S. under the federal CWA and/or waters of the State under the Porter-Cologne Water Quality Control Act. The compensatory mitigation for state and federally protected aquatic resources will meet the federal and state policies for no net loss of functions and	Pre-construction/ Construction/ Post-construction	Compliance report	Before final design	Authority	Authority	Before final design	Authority to provide compensation for permanent and temporary impacts on jurisdictional aquatic resources as provided for in the final CMP approved by the	Impact BIO#1: Direct Impacts on Special-Status Plant Species Impact BIO#2: Indirect Impacts on Special-Status Plant Species Impact BIO#17: Direct Impacts on Jurisdictional Aquatic

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		values. Compensatory mitigation may involve the restoration, establishment, enhancement, and/or preservation of aquatic resources through one or more of the following methods: ▪ Purchase of credits from an agency-approved mitigation bank. ▪ Preservation of aquatic resources through acquisition of property. ▪ Establishment, restoration, or enhancement of aquatic resources. ▪ In lieu fee contribution determined through consultation with the applicable regulatory agencies. The following ratios will be used for compensatory mitigation for permanent impacts, unless a higher ratio is required pursuant to regulatory authorizations issued under Section 404 of the CWA and/or the Porter-Cologne Water Quality Control Act: ▪ Vernal pools: 2:1. ▪ Seasonal wetlands: between 1.1:1 and 1.5:1 based on impact type, function and values lost. ▪ All other wetland types: 1:1 ▪ All non-wetland types: mitigated onsite at 1:1 or offsite 1:1 if onsite mitigation is not possible For mitigation involving establishment, restoration, enhancement, or preservation of aquatic resources by the Authority, the CMP will contain the following information: ▪ Objectives. A description of the resource types and amounts that will be provided, the type of compensation (i.e., restoration, establishment, enhancement, and/or preservation), and the manner in which the resource functions of the compensatory mitigation project will address the needs of the watershed or ecoregion. ▪ Site selection. A description of the factors considered during the term sustainability of the resource. ▪ Adaptive management plan. A management strategy to address changes in site conditions or other components of the compensatory mitigation project. ▪ Financial assurances. A description of financial assurances that will be provided to ensure that the compensatory mitigation will be successful. Additional information required in a CMP as outlined in 33 C.F.R. 332.4(c), as deemed appropriate and necessary by the USACE will also be required in the CMP. In circumstances where the Authority intends to fulfill compensatory mitigation obligations by securing credits from approved mitigation banks or in-lieu fee programs, the CMP need only include the name of the specific mitigation bank or in-lieu fee program to be used, the							USACE	Resources

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		number of credits proposed to be purchased, and a rationale for why this number of credits was determined appropriate.								
BIO-MM#3b	Prepare a Compensatory Mitigation Plan (CMP) for Species and Habitat	The Authority will prepare a CMP that sets out the compensatory mitigation that will be provided to offset permanent and temporary impacts on federal and State-listed species and their habitat, fish and wildlife resources regulated under Section 1600 et seq. of the Fish and Game Code, and certain other special-status species. The CMP will include the following: ▪ A description of the species and habitat types for which compensatory mitigation is being provided. ▪ A description of the methods used to identify and evaluate mitigation options. Mitigation options will include one or more of the following: – Purchase of mitigation credits from an agency-approved mitigation bank. – Protection of habitat through acquisition of fee-title or conservation easement and funding for long-term management of the habitat. Title to lands acquired in fee will be transferred to CDFW and conservation easements will be held by an entity approved in writing by the applicable regulatory agency. In circumstances where the Authority protects habitat through a conservation easement, the terms of the conservation easement will be subject to approval of the applicable regulatory agencies, and the conservation easement will identify applicable regulatory agencies as third-party beneficiaries with a right of access to the easement areas. – Payment to an existing in-lieu fee program. ▪ A summary of the estimated direct permanent and temporary impacts to species and species habitat. ▪ A description of the process that will be used to confirm impacts. Actual impacts to species and habitat could differ from estimates. Should this occur, adjustments will be made to the compensatory mitigation that will be provided. Adjustments to impact estimates and compensatory mitigation will occur in the following circumstances: – impacts to species (typically measured as habitat loss) are reduced or increased as a result of changes in project design, o pre-construction site assessments indicate that habitat features are absent (e.g., because of errors in land cover mapping or land cover conversion), o the habitat is determined to be unoccupied based on negative species surveys, or	Construction/ Post-Construction	Implement the CMP and prepare monitoring reports and compliance memos	In accordance with reporting schedule established by agency permit requirements	Authority	Authority	In accordance with reporting schedule established by agency permit requirements		Impact BIO#1: Direct Impacts on Special-Status Plant Species Impact BIO#3: Direct Impacts on Special-Status Wildlife—Invertebrates Impact BIO#5: Direct Impacts on Special-Status Wildlife—Fish Impact BIO#7: Direct Impacts on Special-Status Wildlife—Amphibians Impact BIO#9: Direct Impacts on Special-Status Wildlife—Reptiles Impact BIO#11: Direct Impacts on Special-Status Wildlife—Birds Impact BIO#13: Direct Impacts on Special-Status Wildlife—Mammals Impact BIO#15: Direct Impacts on Special-Status Plant Communities Impact BIO#19: Direct Impacts on Critical Habitat Impact BIO#21: Direct Impacts on Essential Fish Habitat

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		○ impacts initially categorized as permanent qualify as temporary impacts. ▪ An overview of the strategy for mitigating effects on species. The overview will include the ratios to be applied to determine mitigation levels and the resulting mitigation totals. ▪ A description of habitat restoration or enhancement projects, if any, that will contribute to compensatory mitigation commitments. ▪ A description of the success criteria that will be used to evaluate the performance of habitat restoration or enhancement projects, and a description of the types of monitoring that will be used to verify that such criteria have been met. ▪ A description of the management actions that will be used to maintain the habitat on the mitigation sites, and the funding mechanisms for long-term management. ▪ A description of adaptive management approaches, if applicable, that will be used in the management of species habitat. ▪ A description of financial assurances that will be provided to demonstrate that the funding to implement mitigation is assured.								
BIO-MM#4	Implement Measures to Minimize Impacts during Off-Site Habitat Restoration, Enhancement, or Creation on Mitigation Sites	Prior to site preparation at the mitigation site(s), the Authority or its designee will consider the off-site habitat restoration, enhancement, or preservation program, and quantify short-term temporary and long-term permanent impacts associated with restoration/enhancement activities. A determination will be made on any impacts from the physical alteration of the site to on-site biological resources, including plant communities, land cover types, and the distribution of special-status plants and wildlife. Six potential mitigation/conservation banks and three potential PRM sites are under consideration for restoration, enhancement, or preservation of jurisdictional aquatic resources and special-status species habitat. Habitat restoration and enhancement activities on the six mitigation/conservation banks are already occurring and have been permitted by the bank operators. Therefore, any new impacts on resources present at off-site mitigation sites will be limited to the three PRM sites. All three PRM sites are located in the western foothills of the Sierra Nevada range and support the same types of jurisdictional aquatic resources and special-status species habitat that would be affected by the Central Valley Wye alternatives. Site 1 is an approximately 2,016-acre property in south-central Madera County that contains vernal pools, mixed riparian, seasonal wetlands, freshwater emergent marsh, natural watercourses, constructed basins, constructed watercourses, and open water. Given the high level of	Pre-construction/ Construction/ Post-construction	Compliance report	Prior to operation or as established by regulatory compliance permits	Authority	Authority	Prior to operation or as established by regulatory compliance permits	Authority to provide compensatory mitigation for impacts on biological resources affected by the Contractor. Off-site habitat restoration, enhancement, and preservation program will be designed, implementation and monitored consistent with the terms and conditions of regulatory permit requirements they apply to their jurisdiction and resources onsite.	Impact BIO#1: Direct Impacts on Special-Status Plant Species Impact BIO#2: Indirect Impacts on Special-Status Plant Species and Other Native Plants Impact BIO#3: Direct Impacts on Special-Status Wildlife—Invertebrates Impact BIO#5: Direct Impacts on Special-Status Wildlife—Fish Impact BIO#7: Direct Impacts on Special-Status Wildlife—Amphibians Impact BIO#9: Direct Impacts on Special-Status Wildlife—Reptiles

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		ecological functions currently supported at Site 1, restoration and enhancement opportunities are relatively limited, and will consist of restoration (rehabilitation) and enhancement of up to 20 acres of vernal pools and vernal swales. Site 2 is an approximately 3,300-acre property in northern Fresno County that contains vernal pools, mixed riparian, freshwater emergent marsh, natural watercourses, constructed watercourses, and open water. Restoration and enhancement opportunities at Site 2 include establishment or restoration (re-establishment) of up to 63 acres of vernal pools and enhancement of up to 62 acres of riparian habitat. Site 3 is an approximately 7,350-acre property on the border of eastern Merced County and western Mariposa County that contains vernal pools, natural watercourses, mixed riparian, seasonal wetlands, and open water. Numerous restoration and enhancement opportunities are apparent on Site 3, attributable largely to dry farming practices conducted between the 1930s and 1950s. Specifically, approximately 326 acres of clay slope wetlands, seasonal wetlands, vernal pools, vegetated swales, and riparian (stream) areas may be suitable for re-establishment and rehabilitation, and approximately 874 acres of upland grasslands may be suitable for enhancement. All three PRM sites provide habitat for special-status plants and wildlife. San Joaquin Valley Orcutt grass, succulent owl's-clover, and vernal pool fairy shrimp have been observed on all three sites. Other special-status wildlife species observed on PRM sites include Conservancy fairy shrimp (Site 2), vernal pool tadpole shrimp (Sites 2 and 3), California tiger salamander (Sites 1 and 2), western spadefoot (Sites 1 and 3), golden eagle (Site 2), Swainson's hawk (Sites 1 and 2), and San Joaquin kit fox (Sites 1 and 3). Aquatic features on the sites may support western pond turtle, and the extensive grassland on all three sites provides habitat for burrowing owl, grasshopper sparrow, northern harrier, short-eared owl, white-tailed kite, and American badger. Future restoration or enhancement activities on PRM Sites 1, 2, and 3 may include the following: ▪ Grading ▪ Removal of nonnative invasive plants by hand (e.g., hand-pulling), mechanical (e.g., string trimming, mowing) or chemical (i.e., herbicides) methods ▪ Removal and disposal of existing agricultural infrastructure ▪ Excavation of existing channels or basins ▪ Stockpiling, disposal, and reuse of soils								Impact BIO#11: Direct Impacts on Special-Status Wildlife—Birds Impact BIO#13: Direct Impacts on Special-Status Wildlife—Mammals Impact BIO#14: Indirect Impacts on Special-Status Wildlife—Mammals Impact BIO#15: Direct Impacts on Special-Status Plant Communities Impact BIO#16: Indirect Impacts on Special-Status Plant Communities Impact BIO#17: Direct Impacts on Jurisdictional Aquatic Resources Impact BIO#19: Direct Impacts on Critical Habitat Impact BIO#21: Direct Impacts on Essential Fish Habitat

Mitigation Measure	Title	Mitigation Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		▪ Collection and/or planting of native vegetation for wetland and upland habitat enhancement ▪ Installation and maintenance of erosion control and/or irrigation systems ▪ Installation of piezometers for groundwater monitoring ▪ Installation and maintenance of protective fencing and signage ▪ Periodic hydrological, botanical, and wildlife monitoring by field technicians Some of these activities, especially those involving ground disturbance, could result in the same type of impacts described in Section 3.7.7, Environmental Consequences, of the Final Supplemental EIR/EIS. Specifically, direct and indirect impacts on special-status plant and wildlife species (Impacts BIO#1–BIO#4 and BIO#7–BIO#14), special-status plant communities (Impacts BIO#15 and BIO#16), jurisdictional waters (Impacts BIO#17 and BIO#18), and critical habitat (Impacts BIO#19 and BIO#20) could occur where such resources are present on the PRM sites. The following IAMFs and mitigation measures will be applied at PRM sites to reduce, lessen, or avoid impacts on these resources: ▪ BIO-IAMF#1: Designate Project Biologist, Designated Biologists, Species-Specific Biological Monitors and General Biological Monitors ▪ BIO-IAMF#2: Facilitate Agency Access ▪ BIO-IAMF#3: Prepare Worker Environmental Awareness Program (WEAP) Training Materials and Conduct Construction Period WEAP Training ▪ BIO-IAMF#7: Prepare and Implement a Weed Control Plan ▪ BIO-IAMF#8: Establish Monofilament Restrictions ▪ BIO-IAMF#9: Prevent Entrapment in Construction Materials and Excavations ▪ BIO-IAMF#10: Delineate Equipment Staging Areas and Traffic Routes ▪ BIO-IAMF#11: Dispose of Construction Spoils and Waste ▪ BIO-IAMF#12: Clean Construction Equipment ▪ BIO-IAMF#13: Maintain Construction Sites ▪ BIO-IAMF#14: Dewatering and Water Diversion ▪ BIO-IAMF#15: Vehicle Traffic and Construction Site Speed Limits ▪ BIO-MM#1a: Establish Environmentally Sensitive Areas, Wildlife Exclusion Fencing, and Non-Disturbance Zones							

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		▪ BIO-MM#1c: Conduct Presence/Absence Pre-construction Surveys for Special-Status Plant Species and Special-Status Plant Communities ▪ BIO-MM#5: Conduct Pre-construction Surveys for Vernal Pool Wildlife Species ▪ BIO-MM#6: Implement Seasonal Vernal Pool Work Restriction ▪ BIO-MM#7: Implement and Monitor Vernal Pool Avoidance and Minimization Measures Within Temporary Impact Areas ▪ BIO-MM#9a: Work Stoppage ▪ BIO-MM#9b: Conduct Pre-construction Surveys for Special-Status Reptile and Amphibian Species ▪ BIO-MM#11: Conduct Pre-construction Surveys for California Tiger Salamander ▪ BIO-MM#12: Implement Avoidance and Minimization Measures for California Tiger Salamander ▪ BIO-MM#13: Conduct Emergence and Larval Surveys for Western Spadefoot Toad ▪ BIO-MM#16: Conduct Western Pond Turtle Pre-construction Surveys and Relocation ▪ BIO-MM#17: Conduct Western Pond Turtle Monitoring ▪ BIO-MM#18: Implement Western Pond Turtle Avoidance and Relocation ▪ BIO-MM#24a: Conduct Pre-construction Surveys and Delineate Active Nest Buffers and Exclusion Areas for Breeding Birds ▪ BIO-MM#24b: Conduct Pre-construction Surveys and Monitoring for Raptors ▪ BIO-MM#25a: Conduct Surveys and Implement Avoidance Measures for Active Tricolored Blackbird Nest Colonies ▪ BIO-MM#26: Conduct Surveys for Swainson's Hawk Nests ▪ BIO-MM#27: Implement Avoidance and Minimization Measures for Swainson's Hawk Nests ▪ BIO-MM#29: Conduct Protocol-level Surveys for Burrowing Owls ▪ BIO-MM#30: Implement Avoidance and Minimization Measures for Burrowing Owl ▪ BIO-MM#34: Conduct Pre-construction Surveys for American Badger Den Sites and Implement Minimization Measures ▪ BIO-MM#35: Conduct Pre-construction Surveys for Ringtail and Ringtail Den Sites and Implement Avoidance Measures ▪ BIO-MM#36: Conduct Pre-construction Surveys for San Joaquin Kit Fox								

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		▪ BIO-MM#37: Minimize Impacts on San Joaquin Kit Fox								
BIO-MM#5	Conduct Pre-construction Surveys for Vernal Pool Wildlife Species	Prior to any ground-disturbing activities, the Project Biologist will conduct an aquatic habitat assessment and survey for vernal pool wildlife species in seasonal wetlands and vernal pools that occur within both the Work Area and the area extending 250 feet from the outer boundary of the Work Area where access is available, consistent with USFWS vernal pool survey protocols. The Project Biologist will visit these areas after the first rain event of the season to determine whether seasonal wetlands and vernal pools have been inundated. A seasonal wetland/vernal pool will be considered to be inundated when it holds greater than 3 centimeters of standing water 24 hours after a rain event. Approximately 2 weeks after the pools have been determined to be inundated, the Project Biologist will conduct surveys in appropriate seasonal wetland and vernal pool habitats. The Project Biologist will submit a report to the Authority within 30 days of completing the work. BIO-MM#5 would have temporary impacts on listed vernal pool branchiopods due to take of a few individuals; however, the surveys are minimally invasive and would not result in additional physical disturbance outside the project footprint.	Pre-construction	Aquatic assessment and sampling; Reporting	Report findings at least 30 days prior to ground disturbance	Contractor	Contractor	Report findings at least 30 days prior to ground disturbance	Condition of design-build contract following requirements established by regulatory compliance permits	Impact BIO#3: Direct Impacts on Special-Status Wildlife—Invertebrates
BIO-MM#6	Implement Seasonal Vernal Pool Work Restriction	To the extent feasible, ground-disturbing activities will not occur within 250 feet of vernal pools or seasonal wetlands during the rainy season (October 15 to April 15). In the event ground-disturbing activities are to occur within the buffer area during the rainy season, such activities should, to the extent feasible, be undertaken when the aquatic features are not inundated. BIO-MM#6 would be beneficial to listed vernal pool branchiopods and special-status amphibians because it would minimize the chance of loss of vernal pool branchiopods and special-status amphibians. Implementing a seasonal work restriction would not result in additional physical disturbance outside the project footprint.	Construction	Exclusion fencing; Compliance reporting	Follow reporting requirements as established by regulatory compliance permits	Contractor	Contractor	Follow reporting requirements as established by regulatory compliance permits	Condition of design-build contract following requirements established by regulatory compliance permits	Impact BIO#3: Direct Impacts on Special-Status Wildlife—Invertebrates
BIO-MM#7	Implement and Monitor Vernal Pool Avoidance and Minimization Measures within Temporary Impact Areas	To the extent feasible, impacts on vernal pools in Work Areas outside of the permanent right-of-way will be avoided. The Project Biologist will install and maintain exclusionary fencing to prevent impacts to vernal pools from construction activities. When avoidance of impacts on vernal pools is not feasible, the construction activity will be scheduled to occur in the dry season, where feasible. Prior to the initiation of a ground-disturbing activity occurring during the dry season, the Project Biologist will collect a representative sampling of soils from the affected vernal pools to obtain viable plant seeds and vernal pool branchiopod cysts. After collecting soil, the Project Biologist may also put rinsed gravel in the vernal pools and cover with geotextile fabric to minimize damage to the	Construction	Exclusion fencing; Collection of soil material; Off-site compensatory mitigation; Compliance reporting	Monthly or reporting requirements as established by regulatory compliance permits	Contractor	Contractor	Monthly or reporting requirements as established by regulatory compliance permits	Condition of design-build contract following requirements established by regulatory compliance permits	Impact BIO#3: Direct Impacts on Special-Status Wildlife—Invertebrates

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		soils and protect the pools' contours, as provided by regulatory authorizations issued under the FESA. The soils containing seeds and cysts may later be returned to the affected pool after work has been completed or incorporated into other vernal pools, as provided by regulatory authorizations issued under the FESA. BIO-MM#7 would have no impacts on vernal pool branchiopods because ground disturbance would not be required. Overall, implementation of this measure would be beneficial to listed vernal pool branchiopods because it would minimize the chance of loss of vernal pool branchiopods.								
BIO-MM#8a	Work Windows for Fish	Near-water and in-water work will be conducted within specified work windows based on date, channel inundation, and water temperature. Work windows will include the general time periods when effects on migrating juvenile and adult California Central Valley steelhead and Central Valley spring-run Chinook salmon would be minimal. Additionally, in-water work will be allowed when salmonid use is temperature limited (defined as 1 week of average water temperature of 75°F or more); and work will be allowed in the channel and on the floodplain when channels are dry or ponded. Near-water work is defined as construction activities other than impact pile driving occurring within the floodplain but not in the wetted channel (i.e., located between the wetted channel and the landside toe of the bordering levees). In-water work is defined as all in-water work within the wetted channel and impact pile driving within the floodplain. For near-water work at the San Joaquin River and Eastside Bypass, the construction work window will be April 30 through December 1. For in-water work, the construction work window will be June 1 through December 1. If channels are dry or ponded (i.e., lack continuous flow), or water temperatures average 75°F or more for 7 consecutive days, in-water and near-water work can proceed outside of the work windows stated above. NMFS will be consulted to verify work can proceed if these conditions are present during construction.	Construction	Identify work windows	During construction	Authority	Authority	During construction	Condition of design-build contract following requirements established by regulatory compliance permits	Impact BIO#5: Direct Impacts on Special-Status Wildlife—Fish Impact BIO#21: Direct Impacts on Essential Fish Habitat
BIO-MM#8b	Pile Driving Underwater Sound Pressure Measures	If in-water pile driving occurs in the wetted channel during the in-water work window, one of the following means of attenuating underwater sound will be implemented: ▪ Cofferdam—a cofferdam will be established around the pile driving area to keep it dewatered during impact pile driving. ▪ Air barrier—a pipe with a larger diameter than the driven pile will be set to keep the area between the pile and the pipe completely dewatered with an air barrier.	Construction	Implement cofferdams, air barriers, and/or contained bubble curtain, if required	During construction	Contractor	Contractor	During construction	Condition of design-build contract following requirements established by regulatory compliance permits	Impact BIO#5: Direct Impacts on Special-Status Wildlife—Fish Impact BIO#21: Direct Impacts on Essential Fish Habitat

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		▪ Contained bubble curtain—a bubble curtain will be maintained around the driven pile. NMFS will be consulted regarding the measure(s) to install piles and notified of the selected measure(s). During implementation of any of these measures and installation of driven piles, underwater sound monitoring will be conducted. If underwater sound monitoring indicates that underwater sound exceeds 206 peak strike decibels (estimated at 10 meters from the driven pile), or that the daily accumulated sound exposure level is calculated to have exceeded 187 decibels (estimated at 10 meters from the driven pile), NMFS will be notified (within 24 hours) and construction will cease until corrections are made to the attenuation apparatus/protocol so that the thresholds are not exceeded.								
BIO-MM#8c	Water Diversion Measures for Fish	Construction within waterways may require temporary dewatering to minimize potential impacts on fisheries and minimize potential erosion, sediment loss, scour, or increases in turbidity. If deemed necessary by NMFS, the Contractor will construct cofferdams around the proposed Work Area or areas. Cofferdams will be kept to the minimum footprint necessary. The cofferdams will be constructed of sheet piles, gravel-filled sandbags, or comparable material. The temporary fill used to construct the cofferdam will be kept to the minimum footprint necessary. The cofferdams will be constructed over visqueen or similar material to facilitate clean-up and removal of materials. Upon completion of construction, all temporary fills associated with the dewatering including sandbags and/or rock will be removed and the area restored to pre-construction contours. During implementation of any of these measures and installation of driven piles, underwater sound monitoring will be conducted. If underwater sound monitoring indicates that underwater sound exceeds 206 peak strike decibels (estimated at 10 meters from the driven pile), or that the daily accumulated sound exposure level is calculated to have exceeded 187 decibels (estimated at 10 meters from the driven pile), NMFS will be notified (within 24 hours) and construction will cease until corrections are made to the attenuation apparatus/protocol so that the thresholds are not exceeded.	Construction	Implement cofferdams, if required; Monitoring	During construction	Contractor	Contractor	During construction	Condition of design-build contract following requirements established by regulatory compliance permits	Impact BIO#5: Direct Impacts on Special-Status Wildlife—Fish Impact BIO#21: Direct Impacts on Essential Fish Habitat
BIO-MM#8d	Fish Rescue Plan	If construction requires the installation of cofferdams or dewatering, a fish rescue plan will be developed by the Authority in coordination with NMFS. The fish rescue plan will be approved by NMFS prior to starting work that may result in fish stranding. The plan will contain the following content: ▪ Biologist Qualifications—Fish rescue and relocation will be conducted by a qualified fisheries biologist with a current CDFW Scientific Collecting Permit.	Construction	Implement fish rescue plan including minimization measures and monitoring, if required	During construction	Authority in coordination with NMFS	Authority	During construction	Condition of design-build contract following requirements established by regulatory compliance permits	Impact BIO#5: Direct Impacts on Special-Status Wildlife—Fish Impact BIO#21: Direct Impacts on Essential Fish Habitat

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		▪ Timing and Approach—The fish rescue effort will be implemented during the dewatering of the areas behind the cofferdam(s) and will involve capture and return of those fish to suitable habitat within the adjacent waterways. The area will first be seined, followed by electrofishing to remove fish that are behind the cofferdam. A fisheries biologist will be on-site during initial pumping (dewatering) to confirm compliance with the fish rescue plan. ▪ Minimization Measures—Implementation of the fish rescue plan will include measures to minimize potential adverse effects on listed fish species (if present) associated with fish stranding during dewatering activities. The fish rescue plan will also contain methods for minimizing the risk of stress and mortality from capture and handling of fish removed from the construction sites and returned to adjacent waterways. ▪ Monitoring and Reporting Requirements—The progress of dewatering will be monitored and allow for the fish rescue to occur prior to completely closing the cofferdam and again when water depths reach approximately 2 feet. The NMFS will be notified at least 48 hours prior to the start of fish rescue efforts. Information on the species, number, and sizes of fish collected will be recorded during the fish rescue and provided in a letter report to be submitted to NMFS within 30 days of the fish rescue.								
BIO-MM#9a	Work Stoppage	In the event that any special-status wildlife species is found in a Work Area, the Project Biologist will have the authority to halt work to prevent the death of or injury to the species. Any such work stoppage will be limited to the area necessary to protect the species and work may be resumed once the Project Biologist determines that the individuals of the species have moved out of harm's way or the Project Biologist has relocated them out of the Work Area. Any such work stoppages and the measures taken to facilitate the removal of the species, if any, will be documented in a memorandum prepared by the Project Biologist and submitted to the Authority within 2 business days of the work stoppage.	Construction	Reporting	In the event of work stoppage	Contractor	Contractor	Reporting within 48 hours of work stoppage	Condition of design-build contract	Impact BIO#3: Direct Impacts on Special-Status Wildlife—Invertebrates Impact BIO#5: Direct Impacts on Special-Status Wildlife—Fish Impact BIO#7: Direct Impacts on Special-Status Wildlife—Amphibians Impact BIO#9: Direct Impacts on Special-Status Wildlife—Reptiles Impact BIO#11: Direct Impacts on Special-Status Wildlife—Birds Impact BIO#13: Direct Impacts on Special-Status

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										Wildlife—Mammals
BIO-MM#9b	Conduct Pre-construction Surveys for Special-Status Reptile and Amphibian Species	Prior to any ground-disturbing activities, the Project Biologist will conduct pre-construction surveys in suitable habitat to determine the presence or absence of special-status reptiles and amphibian species within the Work Area. Surveys will be conducted no more than 30 days before the start of ground-disturbing activities in a Work Area. The results of the pre-construction survey will be used to guide the placement of Environmentally Sensitive Areas (ESA) or conduct species relocation.	Pre-construction/ Construction	Conduct pre-construction surveys; Establish ESAs, ERAs, and WEFs; Compliance reporting	Monthly	Contractor	Contractor	Surveys conducted 30 days prior to ground-disturbance; Submit monthly reports during construction	Condition of design-build contract following requirements established by regulatory compliance permits	Impact BIO#7: Direct Impacts on Special-Status Wildlife—Amphibians Impact BIO#9: Direct Impacts on Special-Status Wildlife—Reptiles
BIO-MM#10	Implement Avoidance and Minimization Measures for Special-Status Reptile and Amphibian Species	The Project Biologist will monitor all initial ground-disturbing activities that occur within suitable habitat for special-status reptiles and amphibians and will conduct clearance surveys of suitable habitat in the Work Area on a daily basis. If a special-status reptile or amphibian is observed, the Project Biologist will identify actions, to the extent feasible, sufficient to avoid impacts on the species and to allow it to leave the area on its own volition. Such actions may include establishing a temporary ESA in the area where a special-status reptile or amphibian has been observed and delineating a 50-foot no-work buffer around the ESA. In circumstances where a no-work buffer is not feasible, the Project Biologist will relocate any of the species observed from the Work Area. For federal or state-listed species, relocations will be undertaken in accordance with regulatory authorizations issued under the FESA and/or CESA.	Construction	Monitoring; Compliance reporting	Daily monitoring; Monthly reporting	Contractor	Contractor	Daily monitoring and monthly reporting during construction	Condition of design-build contract following requirements established by regulatory compliance permits	Impact BIO#7: Direct Impacts on Special-Status Wildlife—Amphibians Impact BIO#9: Direct Impacts on Special-Status Wildlife—Reptiles
BIO-MM#11	Conduct Pre-construction Surveys for California Tiger Salamander	Prior to any ground-disturbing activity scheduled to occur during the dry season (June 1–October 15), the Project Biologist will conduct a pre-construction survey of modeled suitable upland habitat within the Work Area and extending out 100 feet from the boundary of the Work Area, where access is available, to determine whether Central California tiger salamander are present. Such surveys will be conducted no earlier than 30 days prior to ground-disturbing activities in the Work Area. The Project Biologist may employ the use of conservation dogs (scent dogs) to augment focused species surveys. The Project Biologist will coordinate with USFWS and CDFW before using conservation dogs. In the event that ground-disturbing activities are scheduled to occur during the rainy season (October 15–June 1), in addition to upland surveys, the Project Biologist will survey potential breeding habitat in the Work Area for the presence of California tiger salamander using methods from the *Interim Guidance on Site Assessment and Field Surveys for Determining Presence or a Negative Finding of the California Tiger Salamander* or other more recent guidelines, if available.	Pre-construction	Conduct pre-construction survey	30 days prior to construction	Contractor	Contractor	30 days prior to construction	Condition of design-build contract following requirements established by regulatory compliance permits	Impact BIO#7: Direct Impacts on Special-Status Wildlife—Amphibians
BIO-MM#12	Implement Avoidance and Minimization Measures for California	Prior to any ground-disturbing activity, the Project Biologist will install WEF along the boundary of the Work Area containing California tiger salamander modeled suitable	Pre-construction/ Construction	Establish WEF	Daily or twice per week inspections (nonconsecutive	Contractor	Contractor	Daily or twice per week inspections (nonconsecutive	Condition of design-build contract	Impact BIO#7: Direct Impacts on Special-Status

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	Tiger Salamander	habitat or will implement similar measures as otherwise required pursuant to regulatory authorizations issued under the FESA and/or CESA. WEF must be trenched into the soil at least 4 inches in depth, with the soil compacted against both sides of the fence for its entire length to prevent California tiger salamander from passing under the fence, and must have intermittent exit points. During the dry season (June 1–October 15), the Project Biologist will inspect the WEF at least twice weekly on nonconsecutive days and on a daily basis between October 15 and June 1. WEF will be installed with turn-arounds at access points to direct California tiger salamander away from gaps in the fencing. To the extent feasible, construction activities will not be conducted within 250 feet of areas identified as occupied California tiger salamander breeding habitat during the rainy season (October 15–June 1). However, construction activities may begin within such areas after April 15 if the breeding habitat is no longer inundated.			days)			days)		Wildlife—Amphibians
BIO-MM#13	Conduct Emergence and Larval Surveys for Western Spadefoot	The Project Biologist or designee (qualified herpetologist) will conduct pre-construction emergence and larval surveys for western spadefoot during the fall and winter rainy season. Emergence surveys will be conducted within the appropriate period(s) after precipitation events as evaluated by a qualified herpetologist and would be conducted partially in tandem with California tiger salamander surveys. Potential breeding depressions, including vernal pools, will be surveyed for western spadefoot larvae concurrently with special-status vernal pool branchiopod and California tiger salamander pre-construction surveys. Adults found within the project footprint during emergence surveys will be relocated to an appropriate area adjacent to another pool suitable for breeding. The Project Biologist will document compliance after surveys are complete.	Pre-construction	Conduct pre-construction surveys; Compliance report	Pre-construction within the appropriate period(s) after precipitation events	Contractor	Contractor	Pre-construction within the appropriate period(s) after precipitation events	Condition of design-build contract	Impact BIO#7: Direct Impacts on Special-Status Wildlife—Amphibians
BIO-MM#14	Conduct Protocol-level Surveys for Blunt-Nosed Leopard Lizard	No more than 12 months before the start of any ground-disturbing activity, in accordance with authorizations under the FESA, a habitat assessment of the project footprint will be conducted by the Project Biologist to identify all habitat suitable for blunt-nosed leopard lizard within the project footprint. Within 12 months prior to any ground-disturbing activity, the Project Biologist will conduct surveys for blunt nosed leopard lizard in suitable habitats (e.g., areas containing burrows) within the Work Area. These surveys will be conducted in accordance with the CDFW's *Approved Survey Methodology for the Blunt-Nosed Leopard Lizard*, or other more recent guidelines, if available. In instances where blunt-nosed leopard lizards are observed at any time during presence/absence surveys, pre-construction surveys, or construction monitoring, USFWS and CDFW will be notified of the occurrence	Pre-construction	Conduct protocol level surveys	Within 1 year prior to construction or as required in Survey Methodology	Contractor	Contractor	Within 1 year prior to construction or as required in Survey Methodology	Condition of design-build contract	Impact BIO#9: Direct Impacts on Special-Status Wildlife—Reptiles

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		within 2 business days.								
BIO-MM#15	Implement Avoidance Measures for Blunt-Nosed Leopard Lizard	For Work Areas where surveys confirm that blunt-nosed leopard lizards are absent, the Project Biologist may install WEF along the perimeter of the Work Area. The WEF will be monitored daily and maintained. During the non-active season for blunt-nosed leopard lizards (October 16–April 14), to the extent feasible, ground-disturbing activities will not occur in areas where blunt-nosed leopard lizards or signs of the species have been observed and that contain burrows suitable for blunt-nosed leopard lizards. If ground-disturbing activities are scheduled during the non-active season, suitable burrows identified during the surveys will be avoided through establishment of 50-foot no-work buffers. The Project Biologist may reduce the size of the no-work buffers if information indicates that the extent of the underground portion of burrows is less than 50 feet. During the active season when blunt-nosed leopard lizards are moving above ground (April 15–October 15), the following measures will be implemented in areas where blunt-nosed leopard lizards or signs of blunt-nosed leopard lizards have been observed: ▪ Establishment of No-Work Buffers. The Project Biologist will establish, monitor, and maintain 50-foot no-work buffers around burrows and egg clutch sites identified during surveys. The 50-foot no-work buffers will be established around burrows in a manner that allows for a connection between the burrow site and the suitable natural habitat adjacent to the project footprint so that blunt-nosed leopard lizards and/or hatchlings may leave the area after eggs have hatched. Construction activities will not occur within the 50-foot no-work buffers until such time as the eggs have hatched and blunt-nosed leopard lizards have left the area. ▪ Fencing of Work Areas. Prior to installing WEF, the Project Biologist will confirm that no blunt-nosed leopard lizards are present within a Work Area by conducting focused blunt-nosed leopard lizard observational surveys for 12 days over the course of a 30- to 60-day period. At least one survey session will occur over 4 consecutive days. These observational surveys may be paired with scent detection dog surveys for blunt-nosed leopard lizard scat. Within 3 days of completing these surveys with negative results, WEF will be installed in a configuration that accounts for burrow locations and enables blunt-nosed leopard lizards to leave the Work Area. The following day, the Project Biologist will conduct an observational survey. If no blunt-nosed leopard lizards are observed, the Project	Construction	Establish buffers; Fencing of Work Areas	Daily monitoring	Contractor	Contractor	Daily monitoring	Condition of design-build contract	Impact BIO#9: Direct Impacts on Special-Status Wildlife—Reptiles

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		Biologist will install additional WEF to further enclose the Work Area. This Work Area will be monitored daily while the WEF is in place. If blunt-nosed leopard lizards are observed prior to installing the last of the WEF, the Project Biologist will continue observational surveys until the lizard is observed leaving the Work Area or until 30 days elapse with no blunt-nosed leopard lizard observations within the Work Area.								
BIO-MM#16	Conduct Western Pond Turtle Pre-construction Surveys and Relocation	Prior to ground-disturbing activities, conduct pre-construction surveys for western pond turtles to determine the presence or absence of western pond turtles within the project footprint. If western pond turtles are found within the project footprint, conduct daily clearance surveys prior to the initiation of any construction activities. If a western pond turtle nest would be affected by ground-disturbing activities, relocate the eggs according to relocation protocol coordinated with CDFW for all life stages of western pond turtles. Relocate hatchling and adult turtles outside of the project footprint in suitable habitat. The Project Biologist will submit a report to the Authority documenting compliance.	Pre-construction	Conduct pre-construction surveys; Relocation protocol; Compliance reporting	Daily monitoring	Contractor	Contractor	Daily monitoring	Condition of design-build contract	Impact BIO#9: Direct Impacts on Special-Status Wildlife—Reptiles
BIO-MM#17	Conduct Western Pond Turtle Monitoring	During ground-disturbing activities, the Project Biologist will observe all construction activities within habitat that supports populations of western pond turtles identified during the pre-construction surveys described under BIO-MM#16. If environmentally sensitive areas are deemed necessary, the Project Biologist will conduct a clearance survey for western pond turtles prior to the time the fence is installed. If necessary, conduct daily clearance surveys prior to construction. The Project Biologist will submit a report to the Authority documenting compliance.	Construction	Monitoring; Compliance reporting	Daily monitoring	Contractor	Contractor	Daily monitoring	Condition of design-build contract	Impact BIO#9: Direct Impacts on Special-Status Wildlife—Reptiles
BIO-MM#18	Implement Western Pond Turtle Avoidance and Relocation	Prior to ground-disturbing activities, if a western pond turtle nesting area is present and would be affected by ground-disturbing activities as determined by the Project Biologist during the pre-construction surveys described under BIO-MM#16, the Contractor will avoid western pond turtle nesting areas by at least 50 feet. If avoidance is not feasible, as determined by the Authority or its designee, the Project Biologist will coordinate with CDFW to identify where to relocate western pond turtles. The Project Biologist will coordinate specific trapping and relocation protocols with CDFW for adults, hatchlings, and eggs prior to ground-disturbing activities. The Contractor will not move eggs or hatchlings without prior coordination with the Project Biologist and concurrence from CDFW. The Project Biologist will document compliance on a weekly basis or as determined appropriate pending construction progress.	Pre-construction	Establish buffers; Conduct relocation protocols; Compliance reporting	Weekly	Contractor	Contractor	Weekly reporting	Condition of design-build contract	Impact BIO#9: Direct Impacts on Special-Status Wildlife—Reptiles
BIO-MM#19	Avoid Suitable Giant Garter Snake Habitat	The Contractor will avoid impacts on giant garter snake aquatic habitat (i.e., freshwater marsh, natural	Construction	Installing protective	Daily monitoring	Contractor	Contractor	Daily monitoring	Condition of design-build	Impact BIO#9: Direct Impacts on Special-Status

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		watercourses, open water, and rice field within mapped range of species) in the project footprint, but outside of permanent or temporary impact areas, by installing environmentally sensitive area fencing as directed by the Project Biologist or Biological Monitor(s) (consistent with BIO MM#1a). Protective fencing will be installed along the upper bank of aquatic habitat features within the project footprint (including temporary and permanent access roads). In addition, all construction equipment service and refueling procedures will be conducted at least 100 feet away from giant garter snake aquatic habitat.		fencing; Conduct construction equipment service and refueling procedures					contract	Wildlife—Reptiles
BIO-MM#20	Conduct Work in Giant Garter Snake Habitat during the Active Season	All construction activities affecting giant garter snake habitat will be conducted between May 1 and October 1, which is the active period for this species. Conducting construction activities during this period reduces the likelihood of mortality since snakes are expected to actively move and avoid danger. If construction activities in giant garter snake habitat are necessary between October 2 and April 30, the USFWS Sacramento Office will be contacted to determine whether additional take avoidance and minimization measures are necessary. Recommended measures will be implemented. After April 15, any dewatered habitat will remain dry for at least 15 consecutive days before workers excavate or fill the dewatered habitat.	Construction	All construction activities will be conducted between May 1 and October 1	Daily monitoring	Contractor	Contractor	Daily monitoring	Condition of design-build contract	Impact BIO#9: Direct Impacts on Special-Status Wildlife—Reptiles
BIO-MM#21	Conduct Pre-construction Surveys and Implement Minimization Measures for Giant Garter Snakes	Prior to any ground-disturbing activity that occurs within 200 feet of suitable giant garter snake aquatic habitat, the Project Biologist will conduct a pre-construction survey for giant garter snake no earlier than 24 hours before the commencement of the activity. The Project Biologist will remain on-site for the duration of the ground-disturbing activity. To the extent feasible, WEF will be installed along the upper bank of suitable aquatic habitat located within 200 feet of the boundary of the Work Area (provided access to such areas is available) to prevent snakes from moving into upland areas within the Work Area. If a giant garter snake is encountered during construction, the Project Biologist will direct that work that has the potential to injure the snake be stopped until it is determined that work can continue without potential harm to the snake, or the snake moves out of the immediate Work Area on its own volition. Pre-construction surveys in Work Areas will be repeated whenever construction activity lapses for 2 weeks or more.	Pre-construction	Conduct pre-construction surveys; install WEF	2 weeks	Contractor	Contractor	2 weeks	Condition of design-build contract	Impact BIO#9: Direct Impacts on Special-Status Wildlife—Reptiles
BIO-MM#22	Conduct Pre-construction Surveys for Blainville's Horned Lizards, San Joaquin Coachwhip, and Silvery Legless Lizards	Before the start of ground-disturbing activities, a Biological Monitor (designated by the Project Biologist) will conduct pre-construction surveys in suitable habitats within the species' range to determine the presence or absence of Blainville's horned lizards (California annual grassland, valley sink scrub, and ruderal), San Joaquin coachwhip, and silvery legless lizards (California annual grassland and valley sink scrub) within the project footprint. Surveys will be conducted no more than 30 days before the start of	Pre-construction	Conduct pre-construction surveys; Place ESA and/or ERA fencing	Weekly	Contractor	Contractor	Weekly reporting	Condition of design-build contract	Impact BIO#9: Direct Impacts on Special-Status Wildlife—Reptiles

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		ground-disturbing activities and will be phased with build-out of the Central Valley Wye alternatives. The results of the pre-construction survey will be used to guide the placement of the environmentally sensitive area and/or environmentally restricted area fencing.								
BIO-MM#23	Conduct Blainville's Horned Lizards, San Joaquin Coachwhip, and Silvery Legless Lizards Monitoring, Avoidance, and Relocation	During ground-disturbing activities, a Biological Monitor will observe all construction activities in habitat that supports Blainville's horned lizards, San Joaquin coachwhip, and silvery legless lizards as identified during the pre-construction surveys described under BIO-MM#22. If suitable habitat is present and environmentally sensitive areas or environmentally restricted areas are deemed necessary, the Biological Monitor will conduct a clearance survey within the area for Blainville's horned lizards, San Joaquin coachwhip, and silvery legless lizards and wildlife exclusion fencing will be installed. If a Blainville's horned lizard is present during construction, the Contractor will avoid the horned lizard, where feasible. Otherwise, the biological monitor will relocate Blainville's horned lizards, San Joaquin coachwhip, and silvery legless lizards found in the project footprint to an outside area approved by the CDFW. If necessary, clearance surveys will be conducted daily.	Construction	Monitoring; Compliance reporting	Daily monitoring; Monthly reporting	Contractor	Contractor	Daily monitoring and monthly reporting during construction	Condition of design-build contract	Impact BIO#9: Direct Impacts on Special-Status Wildlife—Reptiles
BIO-MM#24a	Conduct Pre-construction Surveys and Delineate Active Nest Buffers and Exclusion Areas for Breeding Birds	Prior to any ground-disturbing activity, including vegetation removal, scheduled to occur during the bird breeding season (February 1–September 1), the Project Biologist will conduct visual pre-construction surveys within the Work Area for nesting birds and active nests (nests with eggs or young) of non-raptor species listed under the Migratory Bird Treaty Act and/or the Fish and Game Code. In the event that active bird nests are observed during the pre-construction survey, the Project Biologist will delineate no-work buffers. No-work buffers will be set at a distance of 75 feet, unless a larger buffer is required pursuant to regulatory authorizations issued under the FESA and/or CESA. No-work buffers will be maintained until nestlings have fledged and are no longer reliant on the nest or parental care for survival or the Project Biologist determines that the nest has been abandoned. In circumstances where it is not feasible to maintain the standard no-work buffer, the no-work buffer may be reduced, provided that the Project Biologist monitors the active nest during the construction activity to ensure that the nesting birds do not become agitated. Additional measures that may be used when no-work buffers are reduced include visual screens and sound barriers.	Pre-construction	Conduct pre-construction surveys; Identify no-work buffers	Surveys conducted prior to ground disturbance	Contractor	Contractor	Surveys conducted prior to ground disturbance	Condition of design-build contract	Impact BIO#11: Direct Impacts on Special-Status Wildlife—Birds
BIO-MM#24b	Conduct Pre-construction Surveys and Monitoring for Raptors	If construction or other vegetation removal activities are scheduled to occur during the breeding season for raptors (January 1–September 1), no more than 14 days before the start of the activities, the Project Biologist will conduct pre-construction surveys for nesting raptors in areas where suitable habitat is present. Specifically, such	Pre-construction/ Construction	Conduct pre-construction surveys; Establish nest buffers	Surveys conducted no more than 14 days prior to construction; Monthly	Contractor	Contractor	Surveys conducted no more than 14 days prior to construction; Monthly	Condition of design-build contract	Impact BIO#11: Direct Impacts on Special-Status Wildlife—Birds

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		surveys will be conducted in habitat areas within the construction footprint, and additional buffer areas, with the buffer distance depending on the potential for fully protected raptors to occur. Surveys for all raptors will be conducted within 500 feet of the boundary of the construction footprint, or within 0.5 mile of the boundary of the construction footprint for fully protected raptors, where access is available. If breeding raptors with active nests are found, the Project Biologist will delineate a 500-foot buffer (or as modified by regulatory authorizations for species listed under the FESA and/or CESA) around the nest to be maintained until the young have fledged from the nest and are no longer reliant on the nest or parental care for survival or until such time as the Project Biologist determines that the nest has been abandoned. If fully protected raptors (e.g., white tailed-kite, golden eagle, American peregrine falcon, bald eagle) with active nests are found, the Project Biologist in conjunction with the Contractor will establish a 0.5-mile buffer around the nest to be maintained until the young have fledged from the nest or the nest fails (as determined by the Project Biologist). Nest buffers may be adjusted if the Project Biologist determines that smaller buffers would be sufficient to avoid impacts on nesting raptors.			reporting			reporting during construction		
BIO-MM#25a	Conduct Surveys and Implement Avoidance Measures for Active Tricolored Blackbird Nest Colonies	Prior to initiation of construction at any location within 300 feet of suitable nesting habitat, the Project Biologist with experience surveying for and observing tricolored blackbird will conduct pre-construction surveys to establish use of nesting habitat by tricolored blackbird colonies. Surveys will be conducted in suitable habitat within 300 feet of proposed construction areas, where access allows, during the nesting season (March 15–July 31). If construction is initiated near suitable habitat during the nesting season, three surveys will be conducted within 15 days prior to construction, with one of the surveys within 5 days prior to the start of construction. If active tricolored blackbird nesting colonies are identified, construction activities will avoid the nesting colonies during the breeding season (March 15–July 31) to the extent practicable within 300 feet of the colony, consistent with the CDFW's *Staff Guidance Regarding Avoidance of Impacts to Tricolored Blackbird Breeding Colonies on Agricultural Fields in 2015*. This minimum buffer may be reduced in areas with dense forest, buildings, or other habitat features between the construction activities and the active nest colony, or where there is sufficient topographic relief to protect the colony from excessive noise or visual disturbance as determined by a Project Biologist experienced with tricolored blackbird. If tricolored blackbirds colonize habitat adjacent to construction after construction has been initiated, the Authority will reduce disturbance through establishment of buffers or sound curtains, as determined by the Project Biologist.	Pre-construction/ Construction	Pre-construction surveys; Establish buffers	Surveys conducted prior to construction; Daily monitoring during construction	Contractor	Contractor	Surveys conducted prior to construction; Daily monitoring during construction	Condition of design-build contract	Impact BIO#11: Direct Impacts on Special-Status Wildlife—Birds

Mitigation Measure	Title	Mitigation Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
BIO-MM#25b	Provide Compensatory Mitigation for Impacts on Tricolored Blackbird Habitat	The Authority will provide compensatory mitigation to offset impacts on tricolored blackbird. Compensatory mitigation will replace permanent loss of habitat with habitat that is commensurate with the type (nesting, roosting, and foraging) and amount of habitat lost. Suitable tricolored blackbird nesting habitat will be permanently protected or restored and managed at a ratio of 3:1 (protected or restored: affected) at a location subject to CDFW approval, and in proximity to the nearest breeding colony observed within the past 15 years, if possible. Suitable breeding season foraging habitat will be protected and managed at a ratio of 1:1 (protected: affected) at a location subject to CDFW approval. Suitable roosting habitat will be protected or restored at a ratio of 1:1 (protected: affected) if not occupied, and a ratio of 2:1 (protected: affected) if occupied by tricolored blackbirds. Compensatory mitigation will be provided using one or more of the methods described in the Compensatory Mitigation Plan.	Pre-construction/ Construction/ Post-construction	Provide compensatory mitigation	Prior to operation	Authority	Authority	Prior to operation	Compensatory mitigation based on amount of habitat lost and methods described in Compensatory Mitigation Plan	Impact BIO#11: Direct Impacts on Special-Status Wildlife—Birds
BIO-MM#25c	Bird Protection	Prior to final construction design, the Authority will ensure that the catenary system, masts, and other structures such as fencing, electric lines, communication towers and facilities are designed to be bird- and raptor-safe in accordance with the applicable recommendations presented in *Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 2006* and *Reducing Avian Collisions with Power Lines: State of the Art in 2012*. Applicable APLIC recommendations include, but are not limited to: ▪ Ensuring sufficient spacing of phase conductors to prevent bird electrocution. ▪ Configuring lines to reduce vertical spread of lines and/or decreasing the span length if such options are feasible. ▪ Marking lines and fences (e.g., Bird Flight Diverter for fencing and lines) to increase the visibility of lines and reduce the potential for collision. Where fencing is necessary, using bird compatible design standards to increase visibility of fences to prevent collision and entanglement. ▪ Installing perch guards to discourage avian presence on and near project facilities. ▪ Minimizing the use of guywires. Where the use of guywires is unavoidable, demarcating guywires using the best available methods to minimize avian strikes (e.g. line markers). ▪ Reusing or co-locating new transmission facilities and other ancillary facilities with existing facilities and disturbed areas to minimize habitat impacts and avoid collision risks. ▪ Structures will be monopole or dual-pole design versus lattice tower design to minimize perching and	Pre-construction	Verify structures are bird and raptor safe in accordance with APLIC guidance; Compliance reporting	Prior to final design	Contractor	Contractor	Prior to final design	Condition of design-build contract; Condition of regulatory permits	Impact BIO#11: Direct Impacts on Special-Status Wildlife—Birds Impact BIO#23: Direct Impacts on Wildlife Movement Corridors

Mitigation Measure	Title	Mitigation Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		nesting opportunities. Communication towers will conform to USFWS's *Recommended Best Practices for Communication Tower Design, Siting, Construction, Operation, Maintenance, and Decommissioning.* ▪ Use of facility lighting that does not attract birds or their prey to project sites. These include using nonsteady burning lights (red, dual red and white strobe, strobe-like flashing lights) to meet Federal Aviation Administration requirements, using motion or heat sensors and switches to reduce the time when lights are illuminated, using appropriate shielding to reduce horizontal or skyward illumination, and avoiding the use of high-intensity lights (e.g., sodium vapor, quartz, and halogen). Lighting will not be installed under viaduct and bridge structures in riparian habitat areas.								
BIO-MM#26	Conduct Surveys for Swainson's Hawk Nests	Surveys must be performed no more than 1 year prior to the commencement of construction activities. The Project Biologist will conduct surveys for Swainson's hawk during the nesting season (March through August) within both the Work Area and a 0.5-mile buffer surrounding the Work Area, provided access to such areas is available. No sooner than 30 days prior to any ground-disturbing activity, the Project Biologist will conduct pre-construction surveys of nests identified during the earlier surveys to determine if any are occupied. The initial nesting season surveys and subsequent pre-construction nest surveys will follow the protocols set out in the Swainson's Hawk Technical Advisory Committee's *Recommended Timing and Methodology for Swainson's Hawk Nesting Surveys in California's Central Valley.*	Pre-construction	Conduct pre-construction surveys; Compliance reporting	Monthly	Contractor	Contractor	Monthly reporting	Condition of design-build contract; Condition of regulatory permits	Impact BIO#11: Direct Impacts on Special-Status Wildlife—Birds
BIO-MM#27	Implement Avoidance and Minimization Measures for Swainson's Hawk Nests	Any active Swainson's hawk nests (defined as a nest used one or more times in the last 5 years) found within 0.5 mile of the boundary of the Work Area during the nesting season (February 1–September 1) will be monitored daily by the Project Biologist to assess whether the nest is occupied. If the nest is occupied, the Project Biologist will establish no-work buffers following CDFW's *Staff Report Regarding Mitigation for Impacts to Swainson's Hawks (Buteo swainsoni) in the Central Valley of California*, and the status of the nest will be monitored until the young fledge or for the length of construction activities, whichever occurs first. Adjustments to the buffer(s) may be made in consultation with CDFW. If an occupied Swainson's hawk nest tree is to be removed, an incidental take permit under CESA will be obtained and impacts will be minimized and fully mitigated.	Pre-construction/ construction	Establish active nest buffers; Compliance reporting	Pre-construction daily monitoring if required; Monthly reporting	Contractor	Contractor	Pre-construction daily monitoring if required; Monthly reporting	Condition of design-build contract; Condition of regulatory permits	Impact BIO#11: Direct Impacts on Special-Status Wildlife—Birds
BIO-MM#28	Monitor Removal of Nest Trees for Swainson's Hawks	Prior to construction (any ground-disturbing activity), the biological monitor will monitor nest trees for Swainson's hawks in the project footprint following the Swainson's	Pre-construction/ construction	Monitoring; Compliance reporting	Monthly	Contractor	Contractor	Monthly reporting	Condition of design-build contract; Condition of	Impact BIO#11: Direct Impacts on Special-Status

Mitigation Measure	Title	Mitigation Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		Hawk Technical Advisory Committee Survey Recommendations. If an occupied Swainson's hawk nest must be removed, the Authority will obtain take authorization through a Section 2081 Incidental Take Permit (including compensatory mitigation to offset the loss of the nest tree) from CDFW. If ground-disturbing activities or other activities may cause nest abandonment by a Swainson's hawk or forced fledging within the specified buffer area, monitoring of the nest site by the Biological Monitor(s) will be conducted to determine if the nest was abandoned. Removal of nesting trees outside of the nesting season (generally between October 1 and February 1) does not require authorization under the Section 2081 Incidental Take Permit. The Project Biologist will report to the Authority on a monthly basis during the nesting season to document compliance with this measure.							regulatory permits	Wildlife—Birds
BIO-MM#29	Conduct Protocol-level Surveys for Burrowing Owls	Prior to any ground-disturbing activity, the Project Biologist will conduct protocol-level surveys for burrowing owl within suitable habitat located in the Work Area and/or extending 500 feet from the boundary of the Work Area, where access is available. Surveys will be conducted in accordance with guidelines in the CDFW *Staff Report on Burrowing Owl Mitigation*.	Pre-construction	Conduct protocol-level surveys; Compliance reporting	Monthly	Contractor	Contractor	Monthly reporting	Condition of design-build contract	Impact BIO#11: Direct Impacts on Special-Status Wildlife—Birds
BIO-MM#30	Implement Avoidance and Minimization Measures for Burrowing Owl	Occupied burrowing owl burrows that will be directly affected by ground-disturbing activities will be relocated in accordance with CDFW's *Staff Report on Burrowing Owl Mitigation*. To the extent feasible, the Project Biologist will establish 600-foot no-work buffers around occupied burrowing owl burrows in the Work Area during the nesting season (February 1–September 1). If the no-work buffer is not feasible and occupied burrows will be relocated during the nesting season, relocation will occur either before the birds have begun egg-laying and incubation or after the Project Biologist has determined that the juveniles from the occupied burrows are foraging independently and are capable of independent survival.	Pre-construction	Establish no-work buffers	Pre-construction	Contractor	Contractor	Pre-construction	Condition of design-build contract	Impact BIO#11: Direct Impacts on Special-Status Wildlife—Birds
BIO-MM#31	Conduct Pre-construction Surveys for Special-Status Bat Species	No more than 1 year before the replacement or modification of any bridges or removal of other structures identified as bat habitat and where access is available, the Project Biologist will conduct a survey of the bridge looking for evidence of roosting bats. If bat sign is detected, biologists will conduct an evening visual emergence survey of the bridge or structure, from a half hour before sunset to 1 to 2 hours after sunset for a minimum of 2 nights within the season that construction would be taking place. If a potentially active bat roost is in the bridge or structure, passive monitoring with full-spectrum bat detectors will be used to assist in determining species present. To the extent possible, all monitoring will be conducted during favorable weather conditions (calm	Pre-construction	Conduct pre-construction surveys; Compliance reporting	Monthly	Contractor	Contractor	Monthly reporting	Condition of design-build contract	Impact BIO#13: Direct Impacts on Special-Status Wildlife—Mammals Impact BIO#14: Indirect Impacts on Special-Status Wildlife—Mammals

Mitigation Measure	Title	Mitigation Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		nights with temperatures conducive to bat activity and no precipitation predicted). The biologists will analyze the bat call data using appropriate software and will prepare a report that will be submitted to the Authority, including an assessment of the significance of the roost for local bat populations.								
BIO-MM#32	Implement Bat Avoidance and Relocation Measures	Prior to any ground-disturbing activity, the Project Biologist will survey for active hibernacula or maternity roosts. If active hibernacula or maternity roosts are identified in the Work Area or 500 feet extending from the Work Area during pre-construction surveys, they will be avoided to the extent feasible. If avoidance of a hibernacula is not feasible, the Project Biologist will prepare a relocation plan to remove the hibernacula and provide for construction of an alternative bat roost outside of the Work Area with CDFW guidance. Compensation will include the installation of nearby suitable alternative roosting structures if displacements are long term or permanent. The alternative roosting structure, if required, will be constructed in accordance with CDFW guidance and will be designed to have comparable size and quality of the impacted habitat. The Project Biologist will implement the relocation plan before the commencement of any ground-disturbing activities that would occur within 500 feet of the hibernacula. Removal of roosts will be guided by accepted exclusion and deterrent techniques.	Pre-construction	Prepare BMP memorandum and possibly a relocation plan; Compliance reporting	Monthly	Contractor	Contractor	Monthly reporting	Condition of design-build contract	Impact BIO#13: Direct Impacts on Special-Status Wildlife—Mammals Impact BIO#14: Indirect Impacts on Special-Status Wildlife—Mammals
BIO-MM#33	Implement Bat Exclusion and Deterrence Measures	If non-breeding or non-hibernating individuals or groups of bats are found roosting within the Work Area, the Project Biologist will facilitate the eviction of the bats by either opening the roosting area to change the lighting and airflow conditions or installing one-way doors or other appropriate methods. To the extent feasible, the Authority will leave the roost undisturbed by project activities for a minimum of 1 week after implementing exclusion and/or eviction activities. Steps will not be taken to evict bats from active maternity or hibernacula; instead such features may be relocated pursuant to a relocation plan.	Pre-construction	Prepare BMP memorandum; Implement safe exclusion or eviction activities; Compliance reporting	Monthly	Contractor	Contractor	Monthly reporting	Condition of design-build contract	Impact BIO#13: Direct Impacts on Special-Status Wildlife—Mammals Impact BIO#14: Indirect Impacts on Special-Status Wildlife—Mammals
BIO-MM#34	Conduct Pre-construction Surveys for American Badger Den Sites and Implement Minimization Measures	Prior to any ground-disturbing activity, the Project Biologist will conduct pre-construction surveys for American Badger den sites within suitable habitat located within the Work Area. These surveys will be conducted no less than 14 days and no more than 30 days prior to the start of ground-disturbing activities in a Work Area. The Project Biologist will establish a 100-foot no-work buffer around occupied maternity dens throughout the pup-rearing season (February 15–July 1) and a 50-foot no-work buffer around occupied dens during other times of the year. If nonmaternity dens are found and cannot be avoided during construction activities, they will be monitored for badger activity. If the Project Biologist determines that dens may be occupied, passive den exclusion measures	Pre-construction	Conduct pre-construction surveys; Compliance reporting	Monthly	Contractor	Contractor	Monthly reporting	Condition of design-build contract	Impact BIO#13: Direct Impacts on Special-Status Wildlife—Mammals Impact BIO#14: Indirect Impacts on Special-Status Wildlife—Mammals

Mitigation Measure	Title	Mitigation Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		will be implemented for 3 to 5 days to discourage the use of these dens prior to project disturbance activities.								
BIO-MM#35	Conduct Pre-construction Surveys for Ringtail and Ringtail Den Sites and Implement Avoidance Measures	Prior to any ground-disturbing activity, the Project Biologist will conduct pre-construction surveys for ringtail and ringtail den sites within suitable habitat located within the Work Area. These surveys will be conducted no more than 30 days before the start of ground-disturbing activities in a Work Area. The Project Biologist will establish 100-foot no-work buffers around occupied maternity dens throughout the pup-rearing season (May 1–June 15) and a 50-foot no work buffer around occupied dens during other times of the year.	Pre-construction	Establish buffer around active dens; Compliance reporting	Monthly	Contractor	Contractor	Monthly reporting	Condition of design-build contract	Impact BIO#13: Direct Impacts on Special-Status Wildlife—Mammals Impact BIO#14: Indirect Impacts on Special-Status Wildlife—Mammals
BIO-MM#36	Conduct Pre-construction Surveys for San Joaquin Kit Fox	Within 30 days prior to the start of any ground-disturbing activity, the Project Biologist will conduct pre-construction surveys in modeled suitable habitat in the Work Area. The surveys will be conducted in accordance with USFWS' *San Joaquin Kit Fox Survey Protocol for the Northern Range* between May 1 and September 30 for the purpose of identifying potential San Joaquin kit fox dens. If any occupied or potential dens are found during pre-construction surveys, they will be flagged and a 50-foot no-work buffer will be established around the den until the den is cleared, if necessary to allow construction activities to proceed.	Pre-construction	Conduct pre-construction surveys; Compliance reporting	Monthly	Contractor	Contractor	Monthly reporting	Condition of design-build contract; Condition of regulatory permits	Impact BIO#13: Direct Impacts on Special-Status Wildlife—Mammals Impact BIO#14: Indirect Impacts on Special-Status Wildlife—Mammals
BIO-MM#37	Minimize Impacts on San Joaquin Kit Fox	The Authority will implement USFWS' *Standardized Recommendations for Protection of the San Joaquin Kit Fox Prior to or During Ground Disturbance* to minimize impacts on this species, including: ▪ Disturbance to all kit fox dens will be avoided to the extent feasible. ▪ Construction activities that occur within 200 feet of any occupied dens will cease within one-half hour after sunset and will not begin earlier than one-half hour before sunrise, to the extent feasible. ▪ All construction pipes, culverts, or similar structures with a diameter of 4 inches or greater that are stored within the construction footprint for one or more overnight periods will be thoroughly inspected for kit foxes before the pipe is subsequently buried, capped, or otherwise used or moved. ▪ If a San Joaquin kit fox is detected within a Work Area during construction, the Project Biologist will request approval from the USFWS and CDFW to capture and relocate the kit fox if it does not safely leave the area by its own volition. ▪ To minimize the temporary impacts of WEF and construction exclusion fencing on San Joaquin kit fox and their movement/migration corridors during construction, artificial dens will be installed along the outer perimeter of WEF and construction exclusion fencing. Artificial dens or similar escape structures	Pre-construction	Prepare and implement BMPs; Compliance reporting	Monthly	Contractor	Contractor	Monthly reporting	Condition of design-build contract; Condition of regulatory permits	Impact BIO#13: Direct Impacts on Special-Status Wildlife—Mammals Impact BIO#14: Indirect Impacts on Special-Status Wildlife—Mammals

Mitigation Measure	Title	Mitigation Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		will also be installed at dedicated wildlife crossing structures to provide escape cover and protection against predation. The artificial dens will be located on parcels owned by the Authority or at locations where access is available.								
BIO-MM#38	Construction in Wildlife Movement Corridors	Prior to construction (any ground-disturbing activity), the Contractor's Project Biologist will submit a construction avoidance and minimization plan for wildlife movement linkages (as described in any permits or approvals) to the Authority via the Mitigation Manager for concurrence. The plan will limit the use of construction and avoid permanent fencing in wildlife movement linkages in areas where viaducts (e.g., elevated platforms) or bridges are included in the final design. The Contractor will minimize ground-disturbing activities within the wildlife linkages during nighttime hours to the extent practicable. The Contractor will also keep nighttime illumination (e.g., for security) from spilling into the linkages or shield nighttime lighting to avoid illumination spilling into the linkages. Inspections by the Project Biologist will verify compliance with this measure. The Project Biologist will report to the Authority on a monthly basis to document compliance with this measure.	Pre-construction	Prepare Avoidance and Minimization Plan; Compliance reporting	Monthly	Contractor	Contractor	Monthly reporting	Condition of design-build contract construction in wildlife movement linkages plan	Impact BIO#13: Direct Impacts on Special-Status Wildlife—Mammals Impact BIO#14: Indirect Impacts on Special-Status Wildlife—Mammals Impact BIO#23: Direct Impacts on Wildlife Movement Corridors
BIO-MM#39a	Establish Wildlife Crossings	The Authority will create dedicated wildlife crossings to accommodate wildlife movement across permanently fenced infrastructure (consistent with any wildlife corridor assessment prepared), where wildlife movement would be significantly reduced. Prior to final construction design, the Project Biologist will confirm appropriate placement and dimensions of wildlife crossings. For terrestrial wildlife, crossings will conform to the minimum design specifications below, unless different designs are specified in authorizations issued under the FESA or CESA. To the extent feasible, all wildlife crossings created specifically for terrestrial species will include the following features and design considerations: ▪ Native earthen bottom ▪ Ledges or tunnels incorporated into the design to facilitate safe passage of small mammals ▪ Unobstructed entrances (e.g., no riprap, energy dissipaters, grates), although vegetative cover, adjacent to and near the entrances of crossings, is permissible ▪ Openness and clear line of sight from end to end ▪ Year-round absence of water for a portion of the width of the crossing (i.e., no flowing water) ▪ Slight grade at approaches to prevent flooding ▪ Limited open space between crossing and cover/habitat	Pre-construction	Create dedicated wildlife crossings in final construction plan	Final construction design	Authority	Contractor	Final construction design	Condition of design-build contract	Impact BIO#13: Direct Impacts on Special-Status Wildlife—Mammals Impact BIO#14: Indirect Impacts on Special-Status Wildlife—Mammals Impact BIO#23: Direct Impacts on Wildlife Movement Corridors

Mitigation Measure	Title	Mitigation Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		▪ Separation from human use areas (e.g., trails, multiuse undercrossings) ▪ Avoidance of artificial light at approaches to wildlife crossings In addition, the Authority will incorporate features to accommodate wildlife movement into the design of bridges and culverts that are replaced or modified as part of project construction, wherever feasible. Project Biologist review of final construction design for consistency with placement and dimensions of wildlife crossings will be verified in a memorandum provided to the Authority.								
BIO-MM#39b	Install Aprons or Barriers within Security Fencing	Prior to final construction design the Project Biologist will review the fencing plans along any portion of the permanent right-of-way that is adjacent to natural habitats and confirm that the permanent security fencing will be enhanced with a barrier (e.g., fine mesh fencing) that extends at least 12 inches below ground and 12 inches above ground to prevent special-status reptiles, amphibians, and mammals from moving through or underneath the fencing and gaining access to areas within the right-of-way. At the 12-inch depth of the below-grade portion of the apron, it will extend or be bent at an approximately 90-degree angle, oriented outward from the right-of-way a minimum of 12 inches, to prevent fossorial mammals, reptiles, and amphibians from digging or tunneling below the security fence and gaining access to the right-of-way. A climber barrier (e.g., rigid curved or bent overhang) will be installed at the top of the apron to prevent reptiles, amphibians, and mammals from climbing over the apron. The Project Biologist will ensure that the selected apron material and climber barrier does not cause harm, injury, entanglement, or entrapment to wildlife species. The Authority will provide for quarterly inspection and repair of the fencing. The specific design and method for installation of an apron or barrier may vary as required by regulatory authorizations issued under the FESA and/or CESA. Prior to operation, the Project Biologist will field inspect the fencing along any portion of the permanent right-of-way that is adjacent to natural habitats and confirm that the fencing has been appropriately installed. Fencing plan review and field inspection will be documented in a memorandum from the Project Biologist and provided to the Authority.	Pre-construction	Install aprons or barriers; field inspection and Reporting	Quarterly inspection and repair	Contractor	Authority	Quarterly inspection and repair	Condition of design-build contract; Requirement of regulatory agency permits	Impact BIO#13: Direct Impacts on Special-Status Wildlife—Mammals Impact BIO#14: Indirect Impacts on Special-Status Wildlife—Mammals Impact BIO#23: Direct Impacts on Wildlife Movement Corridors
BIO-MM#40	Conduct Pre-construction Surveys for Giant Kangaroo Rat, Nelson's Antelope Ground Squirrel, and Fresno Kangaroo Rat	Prior to construction (any ground-disturbing activity), the Project Biologist will conduct pre-construction surveys for giant kangaroo rat, Nelson's antelope ground squirrel, and Fresno kangaroo rat burrows within suitable habitats (California annual grassland and valley sink scrub) in the project footprint plus a 50-foot buffer. Pre-construction surveys for giant kangaroo rat, Nelson's antelope ground	Pre-construction	Conduct pre-construction surveys; Compliance reporting	Monthly	Contractor	Contractor	Monthly reporting	Condition of design-build contract; Condition of regulatory permits	Impact BIO#13: Direct Impacts on Special-Status Wildlife—Mammals Impact BIO#14: Indirect Impacts on Special-Status

Mitigation Measure	Title	Mitigation Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		squirrel, and Fresno kangaroo rat will be conducted 14 days prior to any ground-disturbing activities within the range of each of the species to identify known or potential burrows. If potential burrows are identified, live trapping surveys to determine occupancy by giant kangaroo rat Nelson's ground squirrel, or Fresno kangaroo rat may be used in coordination with the USFWS and CDFW.								Wildlife—Mammals
BIO-MM#41	Monitoring, Avoidance, and Relocation of Giant Kangaroo Rat, Nelson's Antelope Ground Squirrel, and Fresno Kangaroo Rat	At least 14 days prior to construction (any ground-disturbing activity), the Contractor, under the direction of the Project Biologist, will establish a 50-foot buffer around potential giant kangaroo rat, Nelson's antelope ground squirrel, and Fresno kangaroo rat burrows identified during the pre-construction surveys described under BIO-MM#40. The Contractor will cease construction activities within 50 feet of any potential burrow one-half hour before sunset and will not begin construction activities earlier than one-half hour after sunrise to avoid indirect impacts from artificial light to this nocturnal species. If any burrow cannot be avoided, and it is determined that the burrow is occupied by a giant kangaroo rat or Nelson's ground squirrel, the rodent will be allowed to leave the burrow and move to an area that will not be disturbed. A non-disturbance exclusion fence with one-way exit/escape points will be placed to exclude special-status rodents from the construction area. The wildlife exclusion fence will be established around burrows in a manner that allows special-status rodent species to leave the project footprint. Additional measures such as vegetation trimming and live trapping within the exclusion fence may be implemented in coordination with CDFW and USFWS. Adjustments to the buffer(s) would require prior approval by CDFW and USFWS as coordinated by the Project Biologist, under the supervision of the Mitigation Manager. The Project Biologist will report to the Authority on a monthly basis to document compliance with this measure.	Pre-construction/ construction	Monitoring; Establish buffer; Compliance reporting	Monthly	Contractor	Contractor	Monthly reporting	Condition of design-build contract; Condition of regulatory permits	Impact BIO#13: Direct Impacts on Special-Status Wildlife—Mammals Impact BIO#14: Indirect Impacts on Special-Status Wildlife—Mammals
BIO-MM#42	Measure Pile Driving Sound Pressure and Attenuate Underwater Sound	If in-water pile driving occurs in the wetted channel during the in-water work window, one of the following means of attenuating underwater sound will be implemented: ▪ Cofferdam—a cofferdam will be established around the pile driving area to keep it dewatered during impact pile driving. ▪ Air barrier—a pipe with a larger diameter than the driven pile will be set to keep the area between the pile and the pipe completely dewatered with an air barrier. ▪ Contained bubble curtain—a bubble curtain will be maintained around the driven pile. NMFS will be consulted regarding the measure(s) to install piles and notified of the selected measure(s). During implementation of any of these measures and installation of driven piles, underwater sound monitoring will be conducted. If underwater sound monitoring	Construction	Implement cofferdams, air barriers, and/or contained bubble curtain, if required; Monitoring	During construction	Contractor	Contractor	During construction	Condition of design-build contract following requirements established by regulatory compliance permits	Impact BIO#5: Direct Impacts on Special-Status Wildlife—Fish Impact BIO#21: Direct Impacts on Essential Fish Habitat

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		indicates that underwater sound exceeds 206 peak strike decibels (estimated at 10 meters from the driven pile), or that the daily accumulated sound exposure level is calculated to have exceeded 187 decibels (estimated at 10 meters from the driven pile), NMFS will be notified (within 24 hours) and construction will cease until corrections are made to the attenuation apparatus/protocol so that the thresholds are not exceeded.								
BIO-MM#43	Compensate for Impacts to Listed Plant Species	The Authority will provide compensatory mitigation for direct impacts on federal and State-listed plant species based on the number of acres of plant habitat directly affected. Such mitigation will include the following measures: ▪ Compensatory mitigation will be provided at a 1:1 ratio to offset direct impacts on federally listed plant species habitat, unless a higher ratio is required pursuant to regulatory authorizations issued under the FESA. ▪ Compensatory mitigation will be provided at a 1:1 ratio to offset direct impacts on State-listed plant species habitat, unless a higher ratio is required pursuant to regulatory authorizations issued under CESA. Compensatory mitigation will be provided using one or more of the methods described in the Compensatory Mitigation Plan.	Pre-construction/ Construction/ Post-construction	Compliance report	Before final design	Authority	Authority	Before final design	Authority to provide compensation based on extent of special-status plant species affected by the Contractor; Regulatory agency permit requirements	Impact BIO#1: Direct Impacts on Special-Status Plant Species
BIO-MM#44	Provide Compensatory Mitigation for Impacts on Vernal Pool Fairy Shrimp and Vernal Pool Tadpole Shrimp Habitat	The Authority will provide compensatory mitigation for direct and indirect impacts, including both temporary and permanent impacts, on vernal pool branchiopod habitat at a 1:1 ratio, unless a higher ratio is required by the FESA. Compensatory mitigation will be provided using one or more of the methods described in the Compensatory Mitigation Plan.	Pre-construction/ Construction/ Post-construction	Compliance report	Prior to operation	Authority	Authority	Prior to operation	Authority to provide compensation based on amount suitable habitat for vernal pool fairy shrimp and vernal pool tadpole shrimp affected by the Contractor; Regulatory agency permit requirements	Impact BIO#3: Direct Impacts on Special-Status Wildlife—Invertebrates
BIO-MM#45	Provide Compensatory Mitigation for Impacts on Valley Elderberry Longhorn Beetle Habitat	The Authority will provide compensatory mitigation for impacts on valley elderberry longhorn beetle habitat, including through transplantation and replacement of elderberry shrubs and maintenance of replacement shrubs, consistent with the USFWS' *Framework for Assessing Impacts to the Valley Elderberry Longhorn Beetle*, as follows: ▪ Suitable riparian habitat will be replaced at a 3:1 ratio (acres of mitigation to acres of impact). ▪ Suitable non-riparian habitat will be replaced at a ratio of 1:1. ▪ Individual valley elderberry shrubs in riparian areas will be replaced through a purchase of two credits at a USFWS-approved bank for each shrub that is	Pre-construction/ Construction/ Post-construction	Compliance report	Transplant pre-construction; Compensation prior to operation	Authority	Authority	Transplant pre-construction; Compensation prior to operation	Authority to provide compensation based on amount suitable habitat for valley elderberry longhorn beetle affected by the Contractor; Regulatory agency permit requirements	Impact BIO#3: Direct Impacts on Special-Status Wildlife—Invertebrates

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		trimmed or removed, regardless of the presence of beetle exit holes. ▪ Individual valley elderberry shrubs in non-riparian areas will be replaced through a purchase of one credit at a USFWS-approved bank for each shrub trimmed if beetle exit holes have been found in any shrub in or within 165 feet of the area to be disturbed. ▪ If an elderberry shrub is to be completely removed by the activity, the entire shrub will be transplanted to a USFWS-approved location in addition to the specified credit purchase, and the transplanted shrub will be monitored for 10 years. For transplanted valley elderberry plants, a survival rate of at least 60 percent of the elderberry plants and 60 percent of the associated native plants must be maintained throughout the 10-year monitoring period. If survival rates drop below 60 percent during the monitoring period, failed plantings will be replaced and maintained until the 60 percent survival rate is achieved.							
BIO-MM#46	Provide Compensatory Mitigation for Impacts on California Tiger Salamander Habitat	The Authority will provide compensatory mitigation to offset the loss of California tiger salamander habitat. Compensatory mitigation will be provided in the following ratios, unless higher ratios are required through regulatory authorizations issued under the FESA and/or CESA. Permanent and temporary impacts on California tiger salamander habitat will be mitigated at ratios of 1:1 (acres preserved, enhanced, or restored: acres affected) and 0.5:1, respectively. Compensatory mitigation will be provided using one or more of the methods described in the Compensatory Mitigation Plan.	Pre-construction/ Construction/ Post-construction	Compliance report	Prior to operation	Authority in consultation USFWS	Authority	Prior to operation	Authority to provide compensation based on amount suitable habitat for California tiger salamander affected by the Contractor; Regulatory agency permit requirements	Impact BIO#7: Direct Impacts on Special-Status Wildlife—Amphibians
BIO-MM#47	Compensate for Impacts on Blunt-nosed Leopard Lizard and Nelson's Antelope Squirrel	The Authority will provide compensatory mitigation to offset the permanent and temporary loss of suitable habitat for the blunt-nosed leopard lizard and Nelson's antelope squirrel. Mitigation will be provided at a ratio of 1:1, unless a higher ratio is required by authorizations issued under the FESA for blunt-nosed leopard lizard or under CESA for Nelson's antelope squirrel. Compensatory mitigation will be provided using one or more of the methods described in the Compensatory Mitigation Plan.	Pre-construction/ Construction/ Post-construction	Compliance report	Prior to operation	Authority	Authority	Prior to operation	Authority to provide compensation based on amount suitable habitat for blunt-nosed leopard lizard and Nelson's antelope squirrel affected by the Contractor; Regulatory agency permit requirements	Impact BIO#9: Direct Impacts on Special-Status Wildlife—Reptiles Impact BIO#13: Direct Impacts on Special-Status Wildlife—Mammals
BIO-MM#48	Provide Compensatory Mitigation for Loss of Swainson's Hawk Nesting Trees and Habitat	To compensate for permanent impacts on active Swainson's hawk nest trees (i.e., trees in which Swainson's hawks were observed building nests during surveys described in BIO-MM#26) and foraging habitat, the Authority will provide project-specific compensatory mitigation that replaces affected nest trees and provides foraging habitat. Lands proposed as compensatory mitigation for Swainson's hawk will meet the following minimum criteria: ▪ Support at least three mature native riparian trees suitable for Swainson's hawk nesting (i.e., valley oak,	Pre-construction/ Construction/ Post-construction	Compliance report	Prior to operation	Authority	Authority	Prior to operation	Authority to provide compensation based on amount of habitat for Swainson's hawks affected by the Contractor; Regulatory agency permit requirements	Impact BIO#11: Direct Impacts on Special-Status Wildlife—Birds

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		Fremont cottonwood, or willow) for each Swainson's hawk nest tree removed by construction of the project extent. ▪ Support at least one Swainson's hawk nesting territory in the last 5 years. ▪ Contribute to the project extent's mitigation commitment for Swainson's hawk foraging habitat, which will be calculated based on the following ratios: – 1:1 for impacts on Active primary foraging habitat – 0.75:1 for impacts on active secondary foraging habitat – 0.5:1 for impacts on active tertiary foraging habitat								
BIO-MM#49	Provide Compensatory Mitigation for Loss of Burrowing Owl Active Burrows and Habitat	To compensate for permanent impacts on occupied burrowing owl breeding habitat, the Authority will provide compensatory mitigation at a minimum 1:1 ratio for occupied breeding and foraging habitat. Lands proposed as compensatory mitigation will meet one of the following criteria: ▪ Support at least two breeding adult owls for every breeding adult owl displaced by construction of the project. ▪ Support at least 1 acre of burrowing owl breeding habitat for every acre of habitat affected (i.e., 1:1 mitigation ratio). For the purposes of this measure, burrowing owl breeding habitat is defined as any land cover type with all of the following attributes: – Open terrain with well-drained soils – Short, sparse vegetation with few shrubs and no trees – Underground burrows or burrow surrogates (e.g., debris piles, culverts, pipes) for nesting and shelter from predators or weather. Burrows in earthen levees, berms, or canal banks within or along the margins of agricultural fields can be counted as compensatory breeding habitat as long as adjacent fields or pastures are suitable for foraging. – Abundant and accessible prey (arthropods, small rodents, amphibians, lizards)	Pre-construction/ Construction/ Post-construction	Compliance report	Prior to operation	Authority	Authority	Prior to operation	Authority to provide compensation number of burrowing owl burrows affected by the Contractor; Regulatory agency permit requirements	Impact BIO#11: Direct Impacts on Special-Status Wildlife—Birds
BIO-MM#50	Provide Compensatory Mitigation for Impacts to San Joaquin Kit Fox Habitat	The Authority will provide compensatory mitigation for impacts on modeled San Joaquin kit fox habitat through the acquisition of suitable habitat that is acceptable to USFWS and CDFW. Habitat will be replaced at a minimum ratio of 1:1 for natural lands and at a ratio of 0.1:1 for suitable urban or agricultural lands, unless a higher ratio is required by regulatory authorizations issued under the FESA and/or CESA.	Post-construction	Compliance report	Prior to operation	Authority	Authority	Prior to operation	Authority to provide compensation based on area of habitat for San Joaquin kit fix affected by the Contractor; Regulatory agency permit requirements	Impact BIO#13: Direct Impacts on Special-Status Wildlife—Mammals

Mitigation Measure	Title	Mitigation Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
BIO-MM#51	Provide Compensatory Mitigation for Impacts to Giant Garter Snake Habitat	The Authority will mitigate the destruction of giant garter snake habitat by the purchase of suitable, approved habitat (USFWS and CDFW). Habitat will be replaced at a minimum ratio of 1:1 for aquatic habitat and a ratio of 0.1:1 for suitable upland habitat to provide additional protection and habitat in a location that is consistent with the recovery of the species. The Authority will mitigate the impacts on giant garter snake in accordance with the USFWS Biological Opinion and/or CDFW 2081(b) Incidental Take Permit. The Authority will submit a memorandum to the USFWS and CDFW to document compliance with this measure.	Post-construction	Compliance report	Prior to operation	Authority	Authority	Prior to operation	Authority to provide compensation based on area of habitat for giant garter snake affected by the Contractor; Regulatory agency permit requirements	Impact BIO#9: Direct Impacts on Special-Status Wildlife—Reptiles
BIO-MM#52	Conduct Surveys and Implement Avoidance Measures for Crotch Bumble Bee	Surveys for Crotch bumble bee in suitable habitat (identified by species habitat suitability modeling) in the project footprint will be conducted by qualified biologists within 1 year prior to the start of construction. Surveys will be conducted during four evenly spaced sampling periods during the flight season (March–September). For each sampling event, the biologist(s) will survey suitable habitat within the project footprint and 100-foot buffer surrounding the project footprint using nonlethal netting methods for 1 person-hour per 3 acres of the highest quality habitat or until 150 bumble bees are sighted, whichever comes first. If initial sampling of a given habitat area indicates that the habitat is of low quality or nonexistent, no further sampling of that area would be required. General guidelines and best practices for bumble bee surveys will follow USFWS' *Survey Protocols for the Rusty Patched Bumble Bee (Bombus affinis)*, which are consistent with other bumble bee survey protocols used by The Xerces Society. If the surveys conducted within 1 year prior to construction identify occupied Crotch bumble bee habitat within the project footprint or the 100-foot buffer, the Project Biologist will then conduct additional pre-construction surveys of such habitat for active bee nest colonies and associated floral resources (i.e., flowering vegetation on which bees from the colony are observed foraging) no more than 30 days prior to any ground disturbance from March through September. The purpose of this pre-construction survey would be to identify active nest colonies and associated floral resources outside of impact areas that could be avoided by construction personnel. The Project Biologist will establish, monitor, and maintain no-work buffers around nest colonies and floral resources identified during surveys. The size and configuration of the no-work buffer will be based on best professional judgment of the Project Biologist. At a minimum, the buffer will provide at least 50 feet of clearance around nest entrances and maintain disturbance-free airspace between the nest and nearby floral resources. Construction activities will not occur within the no-work buffers until the colony is no longer active (i.e., no bees are seen flying in or out of the nest for 3 consecutive days indicating the colony has completed its	Pre-construction	Conduct pre-construction surveys; Compliance reporting	Four evenly spaced sampling periods during March through September	Contractor	Contractor	Prior to construction	Condition of design-build contract; Condition of regulatory permits	Impact BIO#3: Direct Impacts on Special-Status Wildlife—Invertebrates

Mitigation Measure	Title	Mitigation Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		nesting season and the next season's queen has dispersed from the colony).								
BIO-MM#53	Provide Compensatory Mitigation for Impacts on Crotch Bumble Bee Habitat	The Authority will provide compensatory mitigation for impacts on occupied habitat for Crotch bumble bee. Impacts on occupied habitat (confirmed through surveys as described in BIO-MM#52) will be compensated for at a ratio of 3:1, unless a higher ratio is required pursuant to an authorization issued under CESA, through the purchase of CDFW-approved bank credits (if available), or through preservation of habitat in perpetuity including suitable habitat currently preserved by the Authority.	Post-construction	Compliance report	Prior to operation	Authority	Authority	Prior to operation	Authority to provide compensation based on area of habitat for Crotch bumble bee affected by the Contractor; Regulatory agency permit requirements	Impact BIO#3: Direct Impacts on Special-Status Wildlife—Invertebrates
Hazardous Materials and Wastes										
HMW-MM#1	Limit Use of Extremely Hazardous Materials near Schools during Construction	Prior to construction the Contractor will prepare a memorandum regarding hazardous materials BMPs related to construction activity for approval by the Authority. The memorandum will confirm that the Contractor will not handle or store an extremely hazardous substance (as defined in California Public Resources Code Section 21151.4) or a mixture containing extremely hazardous substances in a quantity equal to or greater than the state threshold quantity specified pursuant to subdivision (j) of Section 25532 of the Health and Safety Code within 0.25 mile of a school. The memorandum will acknowledge that prior to construction activities, signage will be installed to delimit all Work Areas within 0.25 mile of a school, informing the Contractor not to bring extremely hazardous substances into the area. The Contractor will be required to monitor all use of extremely hazardous substances. The above construction mitigation measure for hazardous materials and wastes is consistent with California Public Resources Code Section 21151.4 and would be effective in reducing the impact to a less than significant level. The memorandum will be submitted to the Authority prior to any construction involving an extremely hazardous substance.	Construction	Reporting; Monitoring	Weekly	Contractor	Contractor	Weekly reporting	Contract requirements and specifications	Impact HMW#5: Temporary Effects from Hazardous Materials and Wastes Activities in Proximity to Schools and Recreational Areas Impact SO#7: Temporary Impacts on Children's Health and Safety
Socioeconomics and Communities										
SO-MM#1	Implement Measures to Reduce Impacts Associated with the Division of Residential Neighborhoods	Prior to construction (in residential areas), the Authority will minimize impacts associated with the Preferred Alternative in residential areas by conducting special outreach to affected homeowners and residents to understand their special relocation needs fully. The Authority will make efforts to locate suitable replacement properties that are comparable to those currently occupied by these residents, including constructing suitable replacement facilities if necessary. In cases where residents wish to remain in the immediate vicinity, the Authority will take measures to purchase vacant land or buildings in the area, and consult with local authorities over matters such as zoning, permits, and moving of homes and replacement of services and utilities, as appropriate. Before land acquisition, the Authority will	Pre-construction/ Construction/ Post-construction	Reporting	Annual	Authority	Authority	Annual reporting	The Authority will conduct special outreach to affected homeowners and residents to design appropriate measures to minimize impacts.	Impact SO#2: Permanent Impacts on Communities—Community Cohesion Impact LU#3: Permanent Direct Impacts on Land Use Patterns

Mitigation Measure	Title	Mitigation Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		conduct community workshops to obtain input from those homeowners whose property would not be acquired, but whose community would be substantially altered by construction of HSR facilities, including the loss of many neighbors, to identify measures that could be taken to mitigate impacts on those who remain (including placement of sound barriers and landscaping, and potential uses for nonagricultural remnant parcels that could benefit the community in the long term). The Authority will document implementation of this measure through annual reporting.								
SO-MM#2	Implement Measures to Reduce Impacts Associated with the Division of Communities	The Authority, in consultation with the community of Fairmead, will incorporate the following features into the final design of the Preferred Alternative to maintain a robust sense of community cohesion in Fairmead: ▪ Two vehicular crossings, one each at Road 18 3/4 and Road 20 ▪ A multiuse trail along Road 19 1/2 between Avenue 24 and Avenue 22 3/4 to maintain pedestrian and bicycle access between the northern and southern portions of Fairmead (1.25 miles) ▪ Sidewalk installation at Avenue 23 (0.75 mile) and Arnott Drive (0.15 mile), and roadway repairs and sidewalk installations at Avenue 22 3/4 (0.5 mile), Moore Street (0.15 mile), Yates Avenue (0.33 mile), Road 19 1/2 (0.25 mile), Elm Street (0.33 mile), Fairmead Circle (0.12 mile), and Hickory Street (0.25 mile) ▪ Grading of Sycamore Street between Avenue 22 1/2 and Avenue 22 3/4 (0.25 mile) ▪ Roadway improvements, sidewalk installations, and landscaping at Fairmead Boulevard (1.65 miles), Sinclair Drive (0.2 mile), and Maple Street (0.4 mile) ▪ Street repair, sidewalk installation, and stormwater management at Avenue 22 1/2 (0.75 mile) ▪ Installation of streetlights at the Avenue 22 1/2 bus stop ▪ Landscaping along the HSR corridor (1.75 miles) In addition, prior to construction, the Authority will minimize impacts associated with the Preferred Alternative in the existing established communities through a program of outreach to homeowners, residents, business owners, and community organizations in affected neighborhoods. The objective will be to maintain community cohesion and avoid physical deterioration. The Authority will also conduct community workshops about the future use of the area beneath the rail guideway, where these exist. These meetings shall provide residents and business owners with the opportunity to identify design and use options that could strengthen community cohesion and be compatible with the existing community character.	Pre-construction/ Construction/ Post-construction	Reporting	Annual	Authority	Authority	Annual reporting	The Authority will conduct special outreach to affected homeowners and residents to design appropriate measures to minimize impacts, and hold workshops and create reports based on workshop and design findings	Impact SO#2: Permanent Impacts on Communities—Community Cohesion. Impact LU#3: Permanent Direct Impacts on Land Use Patterns

Mitigation Measure	Title	Mitigation Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		The Authority will present information at the workshops, giving the community options for areas along the right-of-way or beneath the rail guideway, and providing an opportunity for individuals to provide feedback. For example, if safety considerations prohibit such uses as bike paths or community gardens, alternatives, such as sculpture gardens or managed landscaping, could be considered. As part of the Central Valley Wye alternatives planning and development, the Authority has already initiated workshops in the community of Fairmead and received feedback from community members. The Authority will be responsible for interpreting the results of the community workshops and incorporating appropriate features into the design of the Preferred Alternative and measures that address the long-term management of the areas along the right-of-way or beneath the elevated HSR guideway. This would involve documenting the desired design concepts, incorporating them into the final design, and facilitating ongoing maintenance. The Authority will identify potential uses that may be developed in the right-of-way of the HSR system. These uses shall be compatible with the character of the adjacent community and sensitive to their needs. The costs associated with the development of these corridor improvements and how these costs would be paid would be determined during consultations with the affected city, county, parks district, or other community organizations. Furthermore, the parties or entities (i.e., the Authority, local government, park or recreation district, or nonprofit organization) responsible for some ongoing maintenance of these community areas would be determined. The Authority will document compliance with this measure through annual reporting.								
Agricultural Farmland										
AG-MM#1	Conserve Important Farmland (Prime Farmland, Farmland of Statewide Importance, Farmland of Local Importance, and Unique Farmland)	The Authority has entered into an agreement with the Department of Conservation California Farmland Conservancy Program to implement agricultural land mitigation for the HSR system. The Authority will fund the California Farmland Conservancy Program's work to identify suitable agricultural land for mitigation of impacts and to fund the purchase of agricultural conservation easements from willing sellers. The performance standards for this measure are to preserve Important Farmland in an amount commensurate with the quantity and quality of the converted farmlands, within the same agricultural regions as the impacts occur, at a replacement ratio of not less than 1:1 for lands that are permanently converted to nonagricultural use by the project. In addition to mitigation for Important Farmlands that are permanently converted to nonagricultural use, the Authority will fund the purchase of an additional increment of acreage for agricultural conservation easements at a ratio of not less than 0.5:1 for Important Farmland within a	Pre-construction	Compliance reporting	Monthly	Authority and California Farmland Conservancy	Authority	Monthly reporting prior to construction	The Authority has entered into an agreement with the DOC and its California Farmland Conservancy Program to implement agricultural land mitigation for the HSR system.	Impact AG#2: Permanent Conversion of Important Farmland to Nonagricultural Use Impact AG#3: Creation of Remnant Parcels of Important Farmland

Mitigation Measure	Title	Mitigation Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		25-foot-wide area adjacent to HSR permanently fenced infrastructure. The Authority will document implementation of this measure through issuance of a compliance memorandum annually.								
Aesthetics and Visual Resources										
AVR-MM#1	Minimize Visual Disruption from Construction Activities	Prior to construction (any ground-disturbing activity) the Contractor will prepare a technical memorandum identifying how the project would adhere to local jurisdiction construction requirements (if applicable) regarding construction-related visual/aesthetic disruption. In order to minimize visual disruption, construction will employ the following activities: ▪ Minimize pre-construction clearing to that necessary for construction. ▪ Limit the removal of buildings to those that would obstruct project components. ▪ Preserve existing vegetation, when possible, particularly vegetation along the edge of construction areas that may help screen views. ▪ After construction, regrade areas disturbed by construction, staging, and storage to original contours and revegetate with plant material similar in replacement numbers and types to that which was removed based upon local jurisdictional requirements. If there are no local jurisdictional requirements, replace removed vegetation at a 1:1 replacement ratio for shrubs and small trees, and a 2:1 replacement ratio for mature trees. For example, if 10 mature trees in an area are removed, replant 20 younger trees that after 5 to 15 years (depending upon the growth rates of the trees) would provide coverage similar to the coverage provided by the trees that were removed for construction. ▪ To the extent feasible, do not locate construction staging sites within the immediate foreground distance (0 to 500 feet) of existing residential, recreational, or other high-sensitivity receptors. Where such siting is unavoidable, staging sites will be screened from sensitive receptors using appropriate solid screening materials such as temporary fencing and walls. Any graffiti or visual defacement of temporary fencing and walls will be painted over or removed within 5 business days. ▪ The technical memorandum will be submitted to the Authority for review and approval.	Pre-construction/ Construction/ Post-construction	Prepare technical memorandum	Prior to construction	Contractor	Contractor	Prior to construction	Contract requirements and specifications	Impact AVR#1: Degraded Visual Quality for Residential Viewers during Construction
AVR-MM#2	Minimize Light Disturbance during Construction	Prior to construction (any ground-disturbing activity requiring nighttime construction), the Contractor will prepare a technical memorandum verifying how the Contractor will shield nighttime construction lighting and direct it downward in such a manner to minimize the light that falls outside the construction site boundaries.	Pre-construction/ Construction	Prepare technical memorandum	Prior to construction	Contractor	Contractor	Prior to construction	Contract requirements and specifications	Impact AVR#1: Degraded Visual Quality for Residential Viewers during Construction Impact BIO#24:

Mitigation Measure	Title	Mitigation Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		The technical memorandum will be submitted to the Authority for review and approval.								Indirect Impacts on Wildlife Movement Corridors
AVR-MM#3	Incorporate Design Criteria for Elevated Guideways and Station Elements That Can Adapt to Local Context	Prior to construction (any ground-disturbing activity), the Contractor will work with the Authority and local jurisdictions to incorporate the Authority-approved aesthetic preferences for non-station structures into final design and construction. Refer to *Aesthetic Options for Non-Stations Structures* (Authority 2017). A technical memorandum will be submitted to the Authority to document compliance.	Pre-construction/ Construction	Compliance technical memorandum	Prior to construction	Contractor	Contractor	Prior to construction	Contract requirements and specifications	Impact AVR#4: Decreased Visual Quality in the Robertson Boulevard Landscape Unit Impact LU#3: Permanent Direct Impacts on Land Use Patterns
AVR-MM#4	Provide Vegetation Screening along At-Grade and Elevated Guideways Adjacent to Residential Areas	Prior to operation and maintenance of the HSR system, the Contractor will plant trees (minimum 24-inch box and 8 feet in height) along the edges of the HSR rights-of-way in locations adjacent to residential areas to visually screen the elevated guideway and the residential area. The species of trees to be installed will be selected based on their mature size and shape, growth rate, hardiness, and drought tolerance. No species on the Invasive Species Council of California's list will be planted. Upon maturity, the crowns of trees used will be tall enough to partially, or fully, screen views of the elevated guideway from adjacent at-grade areas. Upon maturity, trees will allow ground-level views under the crowns (with pruning if necessary) and will not interfere with the 15-foot clearance requirement for the guideway. The trees will be maintained. Irrigation systems will be installed within the tree-planting areas. The Contractor will prepare a technical memorandum within 90 days of completing any construction section or segment documenting the species of trees that were incorporated into the edges of the HSR right-of-way adjacent to residential uses. The technical memorandum will be submitted to the Authority to document compliance.	Construction/ Post-construction	Plant trees; Compliance technical memorandum	Prior to operation planting trees; within 90 days of completing any construction section or segment documenting the species of trees that were incorporated into design	Contractor	Contractor	Prior to operation planting trees; within 90 days of completing any construction section or segment documenting the species of trees that were incorporated into design	Contract requirements, specifications; Landscaping, and maintenance will be provided by the Contractor for its scope of work until completion of the work at which time the Authority will assume responsibility for landscaping or assign the responsibility to other third parties	Impact AVR#4: Decreased Visual Quality in the Robertson Boulevard Landscape Unit Impact AVR#5: Decreased Visual Quality in the Fairmead Landscape Unit
AVR-MM#5	Replant Unused Portions of Lands Acquired for the HSR	Prior to operation and maintenance, the Contractor will plant vegetation within lands acquired for the project (e.g., shifting roadways) that are not used for the HSR or related supporting infrastructure, or other higher or better use. Plantings will allow adequate space between the vegetation and the HSR alignment and catenary lines. All street trees and other visually important vegetation removed in these areas during construction will be replaced with similar vegetation that, upon maturity, will be similar in size and character to the removed vegetation. Replaced shrubs shall be minimum 5 gallon and trees shall be minimum 24-inch box and 8 feet in height. The Authority will provide for continuous maintenance with appropriate irrigation systems. The Contractor will install the irrigation system within the planting areas. No species listed on the Invasive Species Council of California's list of invasive species will be planted.	Post-construction/ Operations	Plant vegetation; Reporting	Prior to operation and maintenance planting trees; Monthly reporting	Authority	Authority	Prior to operation and maintenance planting trees; Monthly reporting	Authority to implement appropriate landscape and maintenance plan	Impact AVR#4: Decreased Visual Quality in the Robertson Boulevard Landscape Unit Impact AVR#5: Decreased Visual Quality in the Fairmead Landscape Unit
AVR-MM#6	Landscape Treatments along the HSR	During final design, the Authority will consult with cities and counties regarding the landscaping program for	Construction/	Landscaping program	During final design	Authority	Contractor	During final design	Contract requirements and	Impact AVR#4:

Mitigation Measure	Title	Mitigation Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
	Overcrossings and Retained Fill Elements	planting the slopes of the overcrossings and retained fill. Within 90 days from the completion of construction, the Contractor will plant the surface of the ground below overpasses (slope-fill overpasses) and retained fill elements with plant species that are consistent with the surrounding landscape (in terms of vegetative type, color, texture, and form) and based on their mature size and shape, growth rate, and drought tolerance. No species on the Invasive Species Council of California's list shall be planted. The landscaping will be continuously maintained, and appropriate irrigation systems will be installed if needed by the Authority. Where wall structures supporting the overpass or retained fill are proposed, architectural details, low-maintenance trees, and other vegetation will be employed to screen the structure, minimize graffiti, and reduce the effects of large walls. Surface coatings shall be applied on wood and concrete to facilitate cleaning and the removal of graffiti. Any graffiti or visual defacement or damage of fencing and walls will be painted over or repaired by the Authority within a reasonable time (approximately 10 business days) after notification. The Contractor will prepare a technical memorandum documenting implementation and submit the memorandum to Authority to document compliance.	Final design	implemented; Compliance technical memorandum	implement landscaping program; Monthly reporting			implement landscaping program; Monthly reporting	specifications; Landscaping and maintenance will be provided by the Contractor for its scope of work until completion of the work at which time the Authority will assume responsibility for landscaping or assign the responsibility to other third parties	Decreased Visual Quality in the Robertson Boulevard Landscape Unit Impact AVR#5: Decreased Visual Quality in the Fairmead Landscape Unit
Cultural Resources										
CUL-MM#1	Amend Archaeological and Built Environment Treatment Plans	As required by the Merced Fresno MOA[2], the ATP will be amended, as needed by the Authority, in consultation with the signatories to the Merced Fresno MOA, and shall be consistent with the requirements of the PA Stipulation VIII.B. The ATP amendment will identify specific steps and responsible parties for Merced Fresno MOA compliance (for example, the roles and qualifications of staff; a process consistent with Section 106 and the PA; summary of archaeological resources and anticipated archaeological types; expectations for survey design; excavation strategy; relevant research questions; a monitoring plan specifying protocols of monitoring; reporting requirements; curation planning). The BETP amendment will add a commitment for the Authority to require the Contractor to refine the design in the vicinity of the Robertson Boulevard Tree Row to minimize the number of trees affected. Implementation will be coordinated with the construction schedule; the related timing requirements will be included in the BETP.	Pre-construction	Reporting	Pre-construction weekly reporting or as dictated by the ATP and BETP	Authority	Authority	Pre-construction weekly reporting or as dictated by the ATP and BETP	MOA/ATP/PA/BETP	Impact CUL#1: Permanent Disturbance of Unknown Archaeological Sites Impact CUL#3: Permanent Demolition, Destruction, Relocation, or Alteration of Historic Architectural Resources or Setting
CUL-MM#2	Mitigate Adverse Impacts on Archaeological and Built Environment	Once parcels are accessible and surveys have been completed, including consultation as stipulated in the MOA, additional archaeological and built environment resources may be identified. For newly identified eligible	Pre-construction	Reporting	Pre-construction weekly reporting or as dictated by the ATP and	Contractor	Contractor	Pre-construction weekly reporting or as dictated by the ATP and	MOA/ATP/PA/BETP	Impact CUL#1: Permanent Disturbance of Unknown Archaeological Sites

[2] *California High-Speed Train Merced to Fresno Section: Memorandum of Agreement for the Treatment of Adverse Effects on Historic Properties under Section 106 of the National Historic Preservation Act.*

Mitigation Measure	Title	Mitigation Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
	Resources Identified during Phased Identification. Comply with the Stipulations Regarding the Treatment of Archaeological and Historic Built Resources in the PA and MOA	properties that will be adversely affected, the following process will be followed, which is presented in detail in the BETP and ATP: ▪ The Authority will consult with the MOA signatories and concurring parties to determine the preferred treatment of the properties/resources and appropriate mitigation measures. ▪ For CRHR-eligible archaeological resources, the Authority will determine if these resources can feasibly be preserved in place, or if data recovery is necessary. The methods of preservation in place shall be considered in the order of priority provided in CEQA Guidelines Section 15126.4(b)(3). If data recovery is the only feasible treatment the Authority will adopt a data recovery plan as required under CEQA Guidelines Section 15126.4(b)(3)(C). ▪ Should data recovery be necessary, the Contractor's Principal Investigator, in consultation with the MOA signatories and consulting parties, will prepare a data recovery plan for approval from the Authority and in consultation with the MOA signatories. Upon approval, the Contractor's Principal Investigator will implement the plan. ▪ For archaeological resources, the Authority will also determine if the resource is a unique archaeological site under CEQA. If the resource is not a historical resource but is an archaeological site, the resource will be treated as required in California Public Resources Code 21083.2 by following protection, data recovery, and/or other appropriate steps outlined in the ATP. The review and approval requirements for these documents are outlined in the ATP. ▪ For historic built resources, the Contractor's Principal Investigator will amend the BETP to include the treatment and mitigation measures identified by the Authority/FRA in consultation with the MOA signatories and concurring parties. The Contractor's Principal Investigator will implement the treatment and mitigation measures accordingly.			BETP			BETP		
CUL-MM#3	Halt Work in the Event of an Archaeological Discovery and Comply with the PA, MOA, ATP, and all State and Federal Laws, as Applicable	During construction (any ground-disturbing activities, including clearing and grubbing), should there be an unanticipated discovery, the Contractor will follow the procedures for unanticipated discoveries as stipulated in the PA, MOA, and associated ATP. The procedures must also be consistent with the following: the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation (48 Fed. Reg. 44716-42), as amended (National Park Service); and Guidelines for the Implementation of CEQA, as amended (Title 14 California Code of Regulations Chapter 3, Article 9, Sections 15120-15132). Should the discovery include human remains, the	Construction	Reporting	Daily logs during active monitoring	Contractor and Authority	Contractor	Daily logs during active monitoring	MOA/ATP/PA	Impact CUL#1: Permanent Disturbance of Unknown Archaeological Sites

Mitigation Measure	Title	Mitigation Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		Contractor and the Authority will comply with federal and state regulations and guidelines regarding the treatment of human remains, including relevant sections of Native American Graves Protection and Repatriation Act (Section 3(c)(d)); California Health and Safety Code, Section 8010 et seq.; and California Public Resources Code Section 5097.98; and consult with the Native American Heritage Commission, tribal groups, and the SHPO. In the event of an unanticipated archaeological discovery, the Contractor will cease work in the immediate vicinity of the find, based on the direction of the archaeological monitor or the apparent location of cultural resources if no monitor is present. If no Qualified Archaeologist is present, no work can commence until it is approved by the Qualified Archaeologist in accordance with the MOA, ATP, and monitoring plan. The Contractor's Qualified Archaeologist will assess the potential significance of the find and make recommendations for further evaluation and treatment as necessary. These steps may include evaluation for the CRHR and NRHP and necessary treatment to resolve significant effects if the resource is a historical resource or historic property. If, after documentation is reviewed by the Authority and they determine it is a historic property, and the SHPO concurs that the resource is eligible for the NRHP, or the Authority determines it is eligible for the CRHR, preservation in place will be considered by the Authority in the order of priority provided in CEQA Guidelines Section 15126.4(b)(3) and in consultation with the signatories and consulting parties to the MOA. If data recovery is the only feasible mitigation the Contractor's qualified Principal Investigator will prepare a data recovery plan as required under CEQA Guidelines Section 15126.4(b)(3)(C), the MOA, and ATP, for the Authority's approval. The Contractor will notify the Authority, which will notify the California State Lands Commission, if the find is a cultural resource on or in the submerged lands of California and consequently under the jurisdiction of the California State Lands Commission. The Authority will comply with all applicable rules and regulations promulgated by California State Lands Commission with respect to cultural resources in submerged lands. If human remains are discovered on state-owned or private lands, the Contractor will contact the relevant county coroner to allow the coroner to determine if an investigation regarding the cause of death is required. If no investigation is required and the remains are of Native American origin, the Authority will contact the Native American Heritage Commission to identify the MLD. The MLD will be empowered to reinter the remains with appropriate dignity. If the MLD fails to make a recommendation, the remains will be reinterred in a location not subject to further disturbance and the location								

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		will be recorded with the Native American Heritage Commission and relevant information center of the California Historical Resources Information System. If human remains are part of an archaeological site, the Authority and Contractor will, in consultation with the MLD and other consulting parties, consider preservation in place as the first option, in the order of priority called for in CEQA Guidelines Section 15126.4(b)(3). In consultation with the relevant Native American Tribes, the Authority may conduct scientific analysis on the human remains if called for under a data recovery plan and amenable to all consulting parties. The Authority will work with the MLD to satisfy the requirements of California Public Resources Code Section 5097.98. Performance tracking of this mitigation measure will be based on successful implementation and acceptance of the documentation by the SHPO and appropriate consulting parties.								
CUL-MM#4	Mitigation for Permanent Demolition, Destruction, Relocation, or Alteration of Historic Architectural Resources or Setting—Robertson Boulevard Tree Row	The Merced Fresno MOA outlines specific mitigation measures for the Robertson Boulevard Tree Row. Because the effect is similar, these same mitigation measures are appropriate for the Central Valley Wye alternatives impacts. These measures are detailed in the Merced Fresno MOA. Overall, these measures include conducting pre-construction conditions assessments of the trees, preparing plans for protection and stabilization, preparing response plans for unanticipated effect and inadvertent damage, preparing and submitting Historic American Landscape Survey documentation, and relocation of selected trees. Consequently, no changes to the Merced Fresno MOA would be necessary.	Pre-construction/ Construction	Implement measures per Merced Fresno MOA	Pre-construction weekly reporting or as dictated by the MOA	Contractor	Contractor	Pre-construction weekly reporting or as dictated by the MOA	MOA	Impact CUL#3: Permanent Demolition, Destruction, Relocation, or Alteration of Historic Architectural Resources or Setting
Environmental Justice										
EJ-MM#1	Provide a Community Center for the Community of Fairmead	The Authority will provide Madera County with funding for the County to construct a community center in Fairmead. The Authority will base its funding estimate on comparable facilities in the region. The County will be responsible for construction, operation, and maintenance of the facility. For the purposes of the current environmental review, the Authority assumes that the construction of the community center will adhere to the following performance standards: 1. The project site does not contain any of the following: – Important Farmland – Any protected biological or wetland resources – Any eligible cultural resources (and no such resources on adjacent/nearby sites) – Any existing residence or business that would be displaced – Incompatible land use on or associated with the proposed community center site	Pre-construction	Funding	As set forth in Authority agreement with Madera County	Authority	Authority	Provision of funding to Madera County	Authority agreement with Madera County	Not Applicable

Mitigation Measure	Title	Mitigation Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		2. Further performance standards related to construction will include at least the following: – Construction will be completed before trains are operating on the HSR system. EJ-MM#2 would already have been implemented by the time of community center construction, so that no separate new infrastructure extension would be required. 3. Construction of the community center will adhere to all IAMFs and mitigation measures applied to the Preferred Alternative. The Authority, through coordination with community leaders and Madera County, will provide guidance on the long-term sustainability of the center. This coordination will include identification of funding mechanisms for operation, maintenance, and insurance of the community center. The community center will provide residents a permanent meeting place for community gatherings and events. In concert with EJ-MM#2, this will reduce the adverse impacts on community cohesion from construction of the Preferred Alternative.								
EJ-MM#2	Provide Water and Sewer Service for the Community of Fairmead	Water Service The Authority will provide funding assistance and will work with Madera County to secure grant funds for the community of Fairmead to connect to the nearest safe and reliable municipal water supply system. The implementation of this connection will provide an improved water supply system for the community of Fairmead and Madera County. Ongoing operations and maintenance responsibility for the water supply system will remain with the community of Fairmead and Madera County. Access to a safe and reliable municipal water supply would improve the community's opportunity for future stability and growth. Providing water service for the community of Fairmead would, in concert with EJ-MM#1, reduce the impacts on community cohesion from construction of the Preferred Alternative. In addition, it would eliminate inadequate water service, a major stress facing residents, encourage business development (not possible without a reliable water supply), and increase the incentive of residents to remain in the community. Sewer Service The City of Chowilla has agreed to provide capacity for the community of Fairmead at the Chowchilla Wastewater Treatment Plant, but additional funding is needed to connect the community to the treatment plant. The Authority will provide funding assistance and will work with the City of Chowchilla to connect the community of Fairmead to the Chowchilla Wastewater Treatment Plant. In addition, the Authority will continue to work with the City of Chowchilla on grant applications to provide funding for the design and construction of a sewer distribution system	Pre-construction	Funding	As set forth in agreements pending between Authority and Madera County, and Authority and City of Chowchilla	Authority	Authority	Provision of funding to Madera County and City of Chowchilla	Pending Authority agreements with Madera County and City of Chowchilla	Not Applicable

Mitigation Measure	Title	Mitigation Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		from Fairmead to Chowchilla with a sewer collection system located in the community of Fairmead. A centralized sewer system and access to a municipal wastewater treatment plant would provide a needed improvement to a critical community infrastructure system necessary for future stability and growth. Providing a centralized sewer service for the community of Fairmead would, in concert with EJ-MM#1, reduce impacts on community cohesion from the construction of the Preferred Alternative. In addition, it would eliminate decentralized sewer treatment and the potential for groundwater contamination that are major stresses facing residents, encourage business development (not possible without a centralized sewer system and wastewater treatment), and increase the incentive for residents to remain in the community.								

°F	degrees Fahrenheit	CWA	Clean Water Act	MOA	memorandum of agreement	SJVAPCD	San Joaquin Valley Air Pollution Control District
AQMD	Air Quality Management District	dBA	A-weighted decibels	MOU	memorandum of understanding	SR	State Route
APLIC	Avian Power Line Interaction Committee	DOC	Department of Conservation	mph	miles per hour	SWRCB	State Water Resources Control Board
ATP	Archaeological Treatment Plan	EIR	environmental impact report	NAHC	Native American Heritage Commission	USACE	U.S. Army Corps of Engineers
Authority	California High-Speed Rail Authority	EIS	environmental impact statement	NEPA	National Environmental Policy Act	USEPA	U.S. Environmental Protection Agency
BAAQMD	Bay Area Air Quality Management District	EMMA	Environmental Mitigation Management and Assessment system	NHPA	National Historic Preservation Act	USFWS	U.S. Fish and Wildlife Service
BETP	built environment treatment plan	ERA	environmentally restricted area	NMFS	National Marine Fisheries Service	VERA	Voluntary Emission Reduction Agreement
BMP	best management practice	ESA	environmentally sensitive area	NO_x	nitrogen oxides	VOC	volatile organic compounds
BRMP	biological resources management plan	FESA	Federal Endangered Species Act	NRHP	National Register of Historic Places	WEAP	worker environmental awareness program
CARB	California Air Resources Board	FRA	Federal Railroad Administration	OCS	overhead contact system	WEF	wildlife exclusion fencing
CDFW	California Department of Fish and Wildlife	GIS	Geographic Information System	PA	Programmatic Agreement		
CEQA	California Environmental Quality Act	HMP	habitat mitigation plan	PM	particulate matter		
CESA	California Endangered Species Act	HSR	high-speed rail	PRM	permittee-responsible mitigation		
C.F.R.	Code of Federal Regulations	HST	high-speed train	RRP	Restoration and Revegetation Plan		
CMP	Compensatory Mitigation Plan	IAMF	Impact Avoidance and Minimization Feature	SFBAAB	San Francisco Bay Area Air Basin		
CRHR	California Register of Historical Resources	Leq	equivalent sound level	SHPO	State Historic Preservation Officer		
		MLD	most likely descendent	SJVAB	San Joaquin Valley Air Basin		

Table 2 Merced to Fresno Section: Central Valley Wye Impact Avoidance and Minimization Features

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
Air Quality and Global Climate Change										
AQ-IAMF#1	Fugitive Dust Emissions	During construction, the Contractor will employ the following measures to minimize and control fugitive dust emissions. The Contractor will prepare a fugitive dust control plan for each distinct construction segment. At a minimum, the plan will describe how each measure would be employed and identify an individual responsible for ensuring implementation. At a minimum, the plan will address the following components unless alternative measures are approved by the applicable air quality management district. ▪ Cover all vehicle loads transported on public roads to limit visible dust emissions, and maintain at least 6 inches of freeboard space from the top of the container or truck bed. ▪ Clean all trucks and equipment before exiting the construction site using an appropriate cleaning station that does not allow runoff to leave the site or mud to be carried on tires off the site. ▪ Water exposed surfaces and unpaved roads at a minimum three times daily with adequate volume to result in wetting of the top 1 inch of soil but avoiding overland flow. Rain events may result in adequate wetting of top 1 inch of soil thereby alleviating the need to manually apply water. ▪ Limit vehicle travel speed on unpaved roads to 15 mph. ▪ Suspend any dust-generating activities when average wind speed exceeds 25 mph. ▪ Stabilize all disturbed areas, including storage piles that are not being used on a daily basis for construction purposes, by using water, a chemical stabilizer/suppressant, hydro mulch or by covering with a tarp or other suitable cover or vegetative ground cover, to control fugitive dust emissions effectively. In areas adjacent to organic farms, the Authority would use non-chemical means of dust suppression. ▪ Stabilize all on-site unpaved roads and off-site unpaved access roads, using water or a chemical stabilizer/suppressant, to effectively control fugitive dust emissions. In areas adjacent to organic farms, the Authority would use non-chemical means of dust suppression. ▪ Carry out watering or presoaking for all land clearing, grubbing, scraping, excavation, land leveling, grading, cut and fill, and demolition activities. ▪ For buildings up to 6 stories in height, wet all exterior surfaces of buildings during demolition.	Construction	Prepare plan/ Reporting	Weekly	Contractor	Contractor	Weekly reporting	Condition of design-build contract	Impact AQ#1: Temporary Direct Impacts on Air Quality within the SJVAB Impact AQ#2: Temporary Direct Impacts on Implementation of an Applicable Air Quality Plan Impact AQ#5: Temporary Direct Impacts on Air Quality —Asbestos and Lead-Based Paint Impact AQ#6: Temporary Direct Impacts on Air Quality —Localized Health Impacts Impact SS#7: Temporary Exposure to Valley Fever Impact SO#7: Temporary Impacts on Children's Health and Safety Impact LU#2: Temporary Indirect Impacts on Land Use Patterns Related to Areas Used for Construction Impact PK#3: Temporary Impacts from Noise and Dust on School Play Areas and Recreational Facilities

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		▪ Limit or expeditiously remove the accumulation of mud or dirt from adjacent public streets at a minimum of once daily, using a vacuum type sweeper. ▪ After the addition of materials to or the removal of materials from surface or outdoor storage piles, apply sufficient water or a chemical stabilizer/suppressant.								
AQ-IAMF#2	Selection of Coatings	During construction, the Contractor will use: ▪ Low- VOC paint that contains less than 10 percent of VOC contents (VOC, 10%). ▪ Super-compliant or Clean Air paint that has a lower VOC content than that required by San Joaquin Valley Unified Air Pollution Control District Rule 4601, when available. If not available, the Contractor will document lack of availability, recommend alternative measure(s) to comply with Rule 4601 or disclose absence of measure(s) for full compliance and obtain concurrence from the Authority.	Construction	Contractor	Monthly	Contractor	Contractor	At incorporation or completion of design/monthly reporting (during construction)	Condition of design-build contract	Impact AQ#1: Temporary Direct Impacts on Air Quality within the SJVAB Impact AQ#2: Temporary Direct Impacts on Implementation of an Applicable Air Quality Plan Impact SO#7: Temporary Impacts on Children's Health and Safety
Noise and Vibration										
NV-IAMF#1	Noise and Vibration	Prior to construction, the Contractor will prepare and submit to the Authority a noise and vibration technical memorandum documenting how the Federal Transit Administration and FRA guidelines for minimizing construction noise and vibration impacts would be employed when work is being conducted within 1,000 feet of sensitive receptors. Typical construction practices contained in the Federal Transit Administration and FRA guidelines for minimizing construction noise and vibration impacts include the following: ▪ Construct noise barriers, such as temporary walls or piles on excavated material, between noisy activities and noise sensitive resources. ▪ Route truck traffic away from residential streets, when possible. ▪ Construct walled enclosures around especially noisy activities or around clusters or noise equipment. ▪ Combine noisy operations so that they occur in the same period. ▪ Phase demolition, earthmoving, and ground-impacting operations so as not to occur in the same time period. ▪ Avoid impact pile driving where possible in vibration sensitive areas.	Pre-construction/ Construction	Prepare technical memorandum/ Compliance reporting	Monthly	Contractor	Contractor	At incorporation or completion of design/monthly reporting (during construction)	Condition of design-build contract	Impact NV#1: Temporary Exposure of Sensitive Receptors to Construction Noise Impact NV#2: Temporary Exposure of Sensitive Receptors and Buildings to Vibration from Construction Impact SO#1: Temporary Impacts on Communities—Community Cohesion Impact LU#2: Temporary Indirect Impacts on Land Use Patterns Related to Areas Used for Construction Impact LU#5: Permanent Conversion of Existing Land Uses to Transportation or Electrical Utility Resulting in Adjacent Incompatible Uses Impact PK#3: Temporary Impacts from Noise and Dust on School Play Areas and Recreational

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
										Facilities
Electromagnetic Fields and Electromagnetic Interference										
EMF/EMI-IAMF#1	Preventing Interference with Adjacent Railroads	TM 3.00.10. Implementation Stage Electromagnetic Compatibility Program Plan (ISEP) requires coordination with adjacent railroads. During project design, the Contractor will work with the engineering departments of railroads that operate parallel the HSR to apply standard design practices to prevent interference with the electronic equipment operated by these railroads. Prior to operation and maintenance of each operating segment, the Contractor will certify through issuance of a technical memorandum to the Authority that design provisions to prevent interference have been established and have been determined to be effective prior to the activation of potentially interfering systems of the HSR. The Contractor will work with the railroad engineering departments where these railways parallel the HSR to apply the standard design practices to prevent interference with the electronic equipment operated by these railroads. Design provisions to prevent interference would be put in place and determined to be adequately effective by a qualified electrical engineering professional prior to the HSR activation of potentially interfering systems. The Authority's Design Criteria Manual Chapter 26 summarizes the applicable EMI/EMF design standards that the Authority will use for the project.	Design/ Construction	Prepare technical memorandum/ Compliance reporting	Monthly	Contractor	Contractor/ Authority	At incorporation or completion of design/monthly reporting (during construction)	ISEP	Impact EMF/EMI#5: Permanent Interference with Signal Systems of Adjacent Railroads
EMF/EMI-IAMF#2	Controlling Electromagnetic Fields/ Electromagnetic Interference	Prior to construction, the Contractor will prepare an EMI/EMF technical memorandum for review and approval by the Authority. The HSR project shall adhere to international guidelines and comply with applicable federal and state laws and regulations. The HSR project design will follow TM 300.10, ISEP, the Authority's Design Criteria Manual Chapter 26, which provides detailed EMC design criteria for the HSR systems and equipment, and the Authority's Design Criteria Manual Chapter 22, which addresses grounding requirements for third-party metallic structures, including fences and pipelines, which are parallel and adjacent to the HSR right-of-way. These documents describe the design practices to avoid EMI and to provide for HSR operational safety. Some measures of the ISEP include: ▪ During the planning stage through system design, the Authority will perform electromagnetic compatibility (EMC)/EMI safety analyses, which would include identification of existing nearby radio systems, design of systems to prevent EMI with identified neighboring uses, and incorporation of these design requirements into bid specifications used to procure radio systems. ▪ Pipelines and other linear metallic objects that are not sufficiently grounded through the direct contact with earth would be separately grounded in coordination with the affected owner or utility to avoid possible	Design/ Construction	Prepare technical memorandum/ Compliance reporting	Monthly	Contractor	Contractor/ Authority	At incorporation or completion of design/monthly reporting (during construction)	Reporting contractor	Impact EMF/EMI#2: Permanent Human Exposure to EMF Impact EMF/EMI#5: Permanent Interference with Signal Systems of Adjacent Railroads Impact EMF/EMI#6: Permanent Corrosion of Underground Pipelines and Cables

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		shock hazards. For cases where metallic fences are purposely electrified to inhibit livestock or wildlife from traversing the barrier, specific insulation design measures would be implemented. ▪ HSR standard corrosion protection measures would be implemented to eliminate risk of substantial corrosion of nearby metal objects.								
Public Utilities and Energy										
PUE-IAMF#1	Design Measures	The HSR project design incorporates utilities and design elements that minimize electricity consumption (e.g., using regenerative braking, energy-saving equipment on rolling stock and at station facilities, implementing energy saving measures during construction, and automatic train operations to maximize energy efficiency during operations). Thus, the project would not overburden utility services. The design elements are included in the design-build contract. Additionally, the Authority has adopted a sustainability policy that establishes project design and construction requirements that avoid and minimize impacts.	Design/ Construction	Reporting	Monthly	Contractor	Contractor	At incorporation or completion of design/monthly reporting (during construction)	Condition of design-build contract	Impact PUE#1: Planned Temporary Interruption of Major Utility Services Impact PUE#7: Permanent Impacts on Wastewater or Stormwater Pipelines Impact PUE#8: Temporary Impacts from Energy Consumption
PUE-IAMF#2	Irrigation Facility Relocation	Where relocating an irrigation facility is necessary, the Contractor will verify the new facility is operational prior to disconnecting the original facility, where feasible. Irrigation facility relocation preferences are included in the design-build contract and reduce unnecessary impacts on continued operation of irrigation facilities. The Contractor will document all relocations in a memorandum for Authority review and approval.	Design/ Pre-construction	Reporting	Monthly	Contractor	Contractor	At incorporation or completion of design/monthly reporting (during construction)	Condition of design-build contract	Impact PUE#1: Planned Temporary Interruption of Major Utility Services Impact PUE#5: Permanent Conflicts with Existing Utilities Requiring Relocation Impact AG#4: Disruption of Agricultural Infrastructure
PUE-IAMF#3	Public Notifications	Prior to construction in areas where utility service interruptions are unavoidable, the Contractor will notify the public through a combination of communication media (e.g., by phone, email, mail, newspaper notices, or other means) within that jurisdiction and the affected service providers of the planned outage. The notification will specify the estimated duration of the planned outage and will be published no fewer than 7 days prior to the outage. Construction will be coordinated to avoid interruptions of utility service to hospitals and other critical users. The Contractor will submit the public communication plan to the Authority 60 days in advance of the work for verification that appropriate messaging and notification are to be provided.	Pre-construction/ Construction	Public notification	Monthly	Contractor	Contractor	60 days in advance of work for verification	Condition of design-build contract	Impact PUE#1: Planned Temporary Interruption of Major Utility Services Impact PUE#5: Permanent Conflicts with Existing Utilities Requiring Relocation Impact AG#4: Disruption of Agricultural Infrastructure
PUE-IAMF#4	Utilities and Energy	Prior to construction, the Contractor will prepare a technical memorandum documenting how construction activities would be coordinated with service providers to minimize or avoid interruptions. It would include upgrades of existing power lines to connect the HSR system to	Design/ Pre-construction	Prepare a technical memorandum	Monthly	Contractor	Contractor	At incorporation or completion of design/monthly reporting (during	Condition of design-build contract	Impact PUE#1: Planned Temporary Interruption of Major

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		existing utility substations. The technical memorandum will be provided to the Authority for review and approval.						construction)		Utility Services Impact PUE#5: Permanent Conflicts with Existing Utilities Requiring Relocation Impact AG#4: Disruption of Agricultural Infrastructure
Biological Resources and Wetlands										
BIO-IAMF#1	Designate Project Biologist, Designated Biologists, Species-Specific Biological Monitors and General Biological Monitors	At least 15 business days prior to commencement of any ground-disturbing activity, including but not limited to geotechnical investigations, utility realignments, creation of staging areas, or initial clearing and grubbing, the Authority will submit the name(s) and qualifications of Project Biologists, Designated Biologists, Species-Specific Biological Monitors, and General Biological Monitors retained to conduct biological resource monitoring activities and implement avoidance and minimization measures. No ground-disturbing activity will begin until the Authority has received written approval from the USFWS, NMFS, where applicable, and the CDFW that the biologists and monitors have been approved to conduct the specified work. The Project Biologist is responsible for ensuring the timely implementation of the biological avoidance and minimization measures as outlined in the BRMP, and for guiding and directing the work of the Designated Biologists and Biological Monitors. Designated Biologists will be responsible for directly overseeing and reporting the implementation of general and species-specific conservation measures. In some instances, Designated Biologists will only be approved for specific species, in which case they will only be authorized to conduct surveys and implement measures for the species for which they have been approved. Species-Specific Biological Monitors will be responsible for implementation of species-specific measures for the species for which they have been approved, and will report directly to a Designated Biologist. General Biological Monitors will report directly to a Designated Biologist or to the Project Biologist. General Biological Monitors will be responsible for conducting WEAP training, implementing general conservation measures, conducting general compliance monitoring, and reporting on compliance monitoring activities. The term Project Biologist is used in these IAMFs to mean the Project Biologist, Designated Biologists, Species-Specific Biological Monitors, and General Biological Monitors, as appropriate. When the Authority is specified as implementing an IAMF, it is assumed that the Authority, or its contractor or agent, is implementing the IAMF under the supervision of biologists and biological monitors, as appropriate	Pre-construction	Compliance reporting	Monthly	Contractor	Contractor	At incorporation or completion of design/monthly reporting (during construction)	EMMA	Impact BIO#1: Direct Impacts on Special-Status Plant Species Impact BIO#2: Indirect Impacts on Special-Status Plant Species and Other Native Plants Impact BIO#3: Direct Impacts on Special-Status Wildlife—Invertebrates Impact BIO#4: Indirect Impacts on Special-Status Wildlife—Invertebrates Impact BIO#5: Direct Impacts on Special-Status Wildlife—Fish Impact BIO#6: Indirect Impacts on Special-Status Wildlife—Fish Impact BIO#7: Direct Impacts on Special-Status Wildlife—Amphibians Impact BIO#8: Indirect Impacts on Special-Status Wildlife—Amphibians Impact BIO#9: Direct Impacts on Special-Status Wildlife—Reptiles

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
										Impact BIO#10: Indirect Impacts on Special-Status Wildlife—Reptiles Impact BIO#11: Direct Impacts on Special-Status Wildlife—Birds Impact BIO#12: Indirect Impacts on Special-Status Wildlife—Birds Impact BIO#13: Direct Impacts on Special-Status Wildlife—Mammals Impact BIO#14: Indirect Impacts on Special-Status Wildlife—Mammals Impact BIO#15: Direct Impacts on Special-Status Plant Communities Impact BIO#16: Indirect Impacts on Special-Status Plant Communities Impact BIO#17: Direct Impacts on Jurisdictional Aquatic Resources Impact BIO#18: Indirect Impacts on Jurisdictional Aquatic Resources Impact BIO#19: Direct Impacts on Critical Habitat Impact BIO#20: Indirect Impacts on Critical Habitat Impact BIO#21: Direct Impacts on Essential Fish Habitat

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
										Impact BIO#22: Indirect Impacts on Essential Fish Habitat Impact BIO#23: Direct Impacts on Wildlife Movement Corridors Impact BIO#24: Indirect Impacts on Wildlife Movement Corridors
BIO-IAMF#2	Facilitate Agency Access	Throughout the construction period, the Authority will allow access by the USFWS, NMFS, USACE, CDFW, and SWRCB to the project site. Because of safety concerns, all visitors will check in with the Authority's resident engineer prior to entering the project footprint. In the event that agency personnel visit the project footprint, the Project Biologist will prepare a memorandum within 3 business days after the visit documenting the issues raised during the field meeting. The Project Biologist will report any issues regarding regulatory compliance raised by agency personnel to the Authority.	Construction	Compliance reporting	Daily	Contractor	Contractor	Daily reporting	Condition of design-build contract	Impact BIO#1: Direct Impacts on Special-Status Plant Species Impact BIO#2: Indirect Impacts on Special-Status Plant Species and Other Native Plants Impact BIO#3: Direct Impacts on Special-Status Wildlife—Invertebrates Impact BIO#5: Direct Impacts on Special-Status Wildlife—Fish Impact BIO#7: Direct Impacts on Special-Status Wildlife—Amphibians Impact BIO#9: Direct Impacts on Special-Status Wildlife—Reptiles Impact BIO#11: Direct Impacts on Special-Status Wildlife—Birds Impact BIO#13: Direct Impacts on Special-Status Wildlife—Mammals Impact BIO#14: Indirect Impacts on Special-Status Wildlife—Mammals

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
										Impact BIO#15: Direct Impacts on Special-Status Plant Communities Impact BIO#16: Indirect Impacts on Special-Status Plant Communities Impact BIO#17: Direct Impacts on Jurisdictional Aquatic Resources Impact BIO#19: Direct Impacts on Critical Habitat Impact BIO#21: Direct Impacts on Essential Fish Habitat
BIO-IAMF#3	Prepare Worker Environmental Awareness Program (WEAP) Training Materials and Conduct Construction Period WEAP Training	Prior to any ground-disturbing activity, the Project Biologist will prepare a WEAP for the purpose of training construction crews to recognize and identify sensitive biological resources that may be encountered in the vicinity of the project footprint. The WEAP training materials will be submitted to the Authority for review and approval. A video of the WEAP training prepared and presented by the Project Biologist and approved by the Authority may be used if the Project Biologist is not available to present the training in person. At a minimum, WEAP training materials will include the following information: key provisions of the FESA, the CESA, the Bald and Golden Eagle Protection Act, the Migratory Bird Treaty Act, California Fish and Game Code 1600, Porter-Cologne Water Quality Control Act, and the Clean Water Act; the consequences and penalties for violation or noncompliance with these laws and regulations and project authorizations; identification and characteristics of special-status plants, special-status wildlife, jurisdictional waters, and special-status plant communities and explanations about their ecological value; hazardous substance spill prevention and containment measures; the contact person in the event of the discovery of a dead or injured wildlife species; and review of avoidance, minimization, and mitigation measures. The Project Biologist will present WEAP training to all construction personnel before they work in the project footprint. As part of the WEAP training, construction timing in relation to species' habitat and life-stage requirements will be detailed and discussed on project maps, which will show areas of planned minimization and avoidance	Pre-construction	Training program/ Reporting	Annual (training)/ Monthly (reporting)	Contractor/ Authority	Contractor/ Authority	Annual (training)/ monthly (reporting)	WEAP	Impact BIO#1: Direct Impacts on Special-Status Plant Species Impact BIO#2: Indirect Impacts on Special-Status Plant Species and Other Native Plants Impact BIO#3: Direct Impacts on Special-Status Wildlife—Invertebrates Impact BIO#4: Indirect Impacts on Special-Status Wildlife—Invertebrates Impact BIO#5: Direct Impacts on Special-Status Wildlife—Fish Impact BIO#6: Indirect Impacts on Special-Status Wildlife—Fish Impact BIO#7: Direct Impacts on Special-Status Wildlife—Amphibians

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		measures. Crews will be informed during the WEAP training that, except when necessary as determined in consultation with the Project Biologist, travel within the project footprint is restricted to established roadbeds, which include all pre-existing and project-constructed unimproved and improved roads. A fact sheet conveying this information will be prepared by the Project Biologist for distribution to the construction crews and to others who enter the project footprint. Fact sheet information will be duplicated in a wallet-sized format and will be provided in other languages as necessary to accommodate non-English speaking workers. All construction staff will attend the WEAP training prior to beginning work on-site, and will attend the WEAP training on an annual basis thereafter. Upon completion of the WEAP training, each member of the construction crew will sign a form stating that they attended the training, understood the information presented, and agreed to comply with the requirements set out in the WEAP training. The Project Biologist will submit the signed WEAP training forms to the Authority on a monthly basis. On an annual basis, the Authority will certify that WEAP training had been provided to all construction personnel. On a monthly basis, the Project Biologist will provide updates relevant to the training to construction personnel during the daily safety ("tailgate") meeting.								Impact BIO#8: Indirect Impacts on Special-Status Wildlife—Amphibians Impact BIO#9: Direct Impacts on Special-Status Wildlife—Reptiles Impact BIO#10: Indirect Impacts on Special-Status Wildlife—Reptiles Impact BIO#11: Direct Impacts on Special-Status Wildlife—Birds Impact BIO#12: Indirect Impacts on Special-Status Wildlife—Birds Impact BIO#13: Direct Impacts on Special-Status Wildlife—Mammals Impact BIO#14: Indirect Impacts on Special-Status Wildlife—Mammals Impact BIO#15: Direct Impacts on Special-Status Plant Communities Impact BIO#16: Indirect Impacts on Special-Status Plant Communities Impact BIO#17: Direct Impacts on Jurisdictional Aquatic Resources Impact BIO#18: Indirect Impacts on Jurisdictional Aquatic Resources

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
										Impact BIO#19: Direct Impacts on Critical Habitat Impact BIO#20: Indirect Impacts on Critical Habitat Impact BIO#21: Direct Impacts on Essential Fish Habitat Impact BIO#22: Indirect Impacts on Essential Fish Habitat Impact BIO#23: Direct Impacts on Wildlife Movement Corridors Impact BIO#24: Indirect Impacts on Wildlife Movement Corridors
BIO-IAMF#4	Conduct Operation and Maintenance Period Worker Environmental Awareness Program (WEAP) Training	Prior to initiating O&M activities, O&M personnel will attend a WEAP training session arranged by the Authority. At a minimum, O&M WEAP training materials will include the following information: key provisions of the FESA, CESA, the Bald and Golden Eagle Protection Act, the Migratory Bird Treaty Act, the Porter-Cologne Water Quality Control Act, and the Clean Water Act; the consequences and penalties for violation or noncompliance with these laws and regulations and project authorizations; identification and characteristics of special-status plants, special-status wildlife, jurisdictional waters, and special-status plant communities and explanations about their ecological value; hazardous substance spill prevention and containment measures; and the contact person in the event of the discovery of a dead or injured wildlife species. The training will include an overview of provisions of the BRMP, annual vegetation, and management plan, weed control plan and security fencing and wildlife exclusion fencing maintenance plans pertinent to O&M activities. A fact sheet prepared by the Authority environmental compliance staff will be prepared for distribution to the O&M employees. The training will be provided by the Authority environmental compliance staff. The training sessions will be provided to employees prior to their involvement in any O&M activity and will be repeated for all O&M employees on an annual basis. Upon completion of the WEAP training, O&M employees will, in writing, verify their attendance at the training sessions and confirm their willingness to comply with the requirements set out in those sessions.	Post-construction	Training program/ Reporting	Annual	Contractor/ Authority	Contractor/ Authority	Annual reporting	WEAP	Impact BIO#25: Direct Impacts on Special-Status Plant Species Impact BIO#26: Indirect Impacts on Special-Status Plants Impact BIO#27: Direct Impacts on Special-Status Wildlife—Invertebrates Impact BIO#29: Direct Impacts on Special-Status Wildlife—Fish Impact BIO#30: Indirect Impacts on Special-Status Wildlife—Fish Impact BIO#31: Direct Impacts on Special-Status Wildlife—Amphibians and Reptiles Impact BIO#32: Indirect Impacts on Special-Status

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
										Wildlife—Amphibians and Reptiles Impact BIO#33: Direct Impacts on Special-Status Wildlife—Birds Impact BIO#34: Indirect Impacts on Special-Status Wildlife—Birds Impact BIO#35: Direct Impacts on Special-Status Wildlife—Mammals Impact BIO#36: Indirect Impacts on Special-Status Wildlife—Mammals Impact BIO#37: Direct Impacts on Special-Status Plant Communities Impact BIO#39: Direct Impacts on Aquatic Resources Impact BIO#40: Indirect Impacts on Aquatic Resources Impact BIO#41: Direct Impacts on Critical Habitat Impact BIO#43: Direct Impacts on Essential Fish Habitat Impact BIO#44: Indirect Impacts on Essential Fish Habitat Impact BIO#45: Indirect Impacts on Wildlife Movement Corridors
BIO-IAMF#5	Prepare and Implement a Biological Resources Management Plan	Prior to any ground-disturbing activity, the Project Biologist will prepare the BRMP, which will include a compilation of the biological resources avoidance and minimization measures applicable to the HSR project section. All project environmental plans, such as the Restoration and	Pre-construction	Prepare plan	Prior to any ground-disturbing activity	Contractor	Contractor	Prior to any ground-disturbing activity	USFWS, USACE, SWRCB, and CDFW permits	Impact BIO#1: Direct Impacts on Special-Status Plant Species

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		Revegetation Plan and Weed Control Plan, will be included as appendices to the BRMP. The BRMP is intended to serve as a comprehensive document that sets out the range of avoidance and minimization measures to support the appropriate and timely implementation of those measures. The implementation of these measures will be tracked through final design, construction, and operation phases. The BRMP will contain, but not be limited to, the following information: ▪ A master schedule that shows construction of the project, pre-construction surveys, and establishment of buffers and exclusions zones to protect sensitive biological resources. ▪ Specific measures for the protection of special-status species. ▪ Identification (on construction plans) of the locations and quantity of habitats to be avoided or removed, along with the locations where habitats are to be restored. ▪ Identification of agency-approved Project Biologist(s) and Biological Monitor(s), including those responsible for notification and report of injury or death of federally or State-listed species. ▪ Measures to preserve topsoil and control erosion. ▪ Design of protective fencing around Environmentally Sensitive Areas and the construction staging areas. ▪ Locations of trees to be protected as wildlife habitat (roosting sites) and locations for planting replacement trees. ▪ Specification of the purpose, type, frequency, and extent of chemical use for insect and disease control operations as part of vegetative maintenance within sensitive habitat areas. ▪ Specific measures for the protection of vernal pool habitat and riparian areas. These measures may include erosion and siltation control measures, protective fencing guidelines, dust control measures, grading techniques, construction area limits, and biological monitoring requirements. ▪ Provisions for biological monitoring during ground-disturbing activities to confirm compliance and success of protective measures. The monitoring will: (1) identify specific locations of wildlife habitat and sensitive species to be monitored; (2) identify the frequency of monitoring and the monitoring methods (for each habitat and sensitive species to be monitored); (3) list required qualifications of biological monitor(s); (4) identify the reporting requirements; and (5) provide an accounting of impacts to special-status species habitat compared to pre-construction impact estimates.								Impact BIO#2: Indirect Impacts on Special-Status Plant Species and Other Native Plants Impact BIO#3: Direct Impacts on Special-Status Wildlife—Invertebrates Impact BIO#4: Indirect Impacts on Special-Status Wildlife—Invertebrates Impact BIO#5: Direct Impacts on Special-Status Wildlife—Fish Impact BIO#6: Indirect Impacts on Special-Status Wildlife—Fish Impact BIO#7: Direct Impacts on Special-Status Wildlife—Amphibians Impact BIO#8: Indirect Impacts on Special-Status Wildlife—Amphibians Impact BIO#9: Direct Impacts on Special-Status Wildlife—Reptiles Impact BIO#10: Indirect Impacts on Special-Status Wildlife—Reptiles Impact BIO#11: Direct Impacts on Special-Status Wildlife—Birds Impact BIO#12: Indirect Impacts on Special-Status Wildlife—Birds Impact BIO#13:

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		The BRMP will be submitted to the Authority for review and approval prior to any ground-disturbing activity.								Direct Impacts on Special-Status Wildlife—Mammals Impact BIO#14: Indirect Impacts on Special-Status Wildlife—Mammals Impact BIO#15: Direct Impacts on Special-Status Plant Communities Impact BIO#16: Indirect Impacts on Special-Status Plant Communities Impact BIO#17: Direct Impacts on Jurisdictional Aquatic Resources Impact BIO#18: Indirect Impacts on Jurisdictional Aquatic Resources Impact BIO#19: Direct Impacts on Critical Habitat Impact BIO#20: Indirect Impacts on Critical Habitat Impact BIO#21: Direct Impacts on Essential Fish Habitat Impact BIO#22: Indirect Impacts on Essential Fish Habitat Impact BIO#23: Direct Impacts on Wildlife Movement Corridors Impact BIO#24: Indirect Impacts on Wildlife Movement Corridors Impact BIO#25: Direct Impacts on Special-Status Plant

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
										Species Impact BIO#26: Indirect Impacts on Special-Status Plants Impact BIO#27: Direct Impacts on Special-Status Wildlife—Invertebrates Impact BIO#28: Indirect Impacts on Special-Status Wildlife—Invertebrates Impact BIO#29: Direct Impacts on Special-Status Wildlife—Fish Impact BIO#30: Indirect Impacts on Special-Status Wildlife—Fish Impact BIO#31: Direct Impacts on Special-Status Wildlife—Amphibians and Reptiles Impact BIO#32: Indirect Impacts on Special-Status Wildlife—Amphibians and Reptiles Impact BIO#33: Direct Impacts on Special-Status Wildlife—Birds Impact BIO#34: Indirect Impacts on Special-Status Wildlife—Birds Impact BIO#35: Direct Impacts on Special-Status Wildlife—Mammals Impact BIO#36: Indirect Impacts on Special-Status Wildlife—Mammals

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
										Impact BIO#37: Direct Impacts on Special-Status Plant Communities Impact BIO#38: Indirect Impacts on Special-Status Plant Communities Impact BIO#39: Direct Impacts on Jurisdictional Aquatic Resources Impact BIO#40: Indirect Impacts on Jurisdictional Aquatic Resources Impact BIO#41: Direct Impacts on Critical Habitat Impact BIO#42: Indirect Impacts on Critical Habitat Impact BIO#43: Direct Impacts on Essential Fish Habitat Impact BIO#44: Indirect Impacts on Essential Fish Habitat Impact BIO#45: Indirect Impacts on Wildlife Movement Corridors
BIO-IAMF#6	Prepare and Implement an Annual Vegetation Management Plan	Prior to O&M activities, the Authority will prepare an annual vegetation control plan. The Authority will generally follow the procedures established in Chapter C2 of the Caltrans Maintenance Manual to manage vegetation on Authority property. Vegetation will be controlled by chemical, thermal, biological, cultural, mechanical, structural, and manual methods. The annual vegetation control plan would be updated each winter for implementation no later than April 1 of each year. The plan will consist of site-specific vegetation control methods, as outlined below: ▪ Chemical vegetation control noting planned usage ▪ Mowing program consistent section 1415 of the Fixing America's Surface Transportation Act (FAST Act)	Post-construction	Prepare control plan	Annual	Authority	Authority	Annual plan	Condition of design-build contract	Impact BIO#25: Direct Impacts on Special-Status Plant Species Impact BIO#26: Indirect Impacts on Special-Status Plants Impact BIO#27: Direct Impacts on Special-Status Wildlife—Invertebrates Impact BIO#29: Direct Impacts on Special-Status

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		▪ Other nonchemical vegetation control plans (manual, biological, cultural, thermal (includes the use of propane heat or steam and is not specific to controlled burning) and structural) ▪ List of sensitive areas ▪ Other chemical pest control plans (e.g., insects, snail, rodent) Only Caltrans-approved herbicides will be used in the vegetation control program. Pesticide application would be conducted in accordance with all requirements of the California Department of Pesticide Regulation and County Agricultural Commissioners by certified pesticide applicators. Noxious/invasive weeds would be treated where requested by county agricultural commissioners. The Authority will cooperate in area-wide control of noxious/invasive weeds if established by local agencies. Farmers/landowners who request weed control on state right-of-way that is not identified in the annual vegetation control plan would be encouraged to submit a permit request application for weed control that identifies the target weeds and control method desired. The Authority will require that HSR maintenance crews follow the guidelines in the Contractor's Weed Control Plan and annual vegetation control plan during project operation and maintenance. The Authority or its designee will appoint the responsible party during the operations and maintenance period to verify the annual vegetation control plan is being carried out appropriately and effectively. The annual vegetation control plan update will include a section addressing issues encountered during the prior year and adaptive measures incorporated in the update as proactive measures.								Wildlife—Fish Impact BIO#30: Indirect Impacts on Special-Status Wildlife—Fish Impact BIO#31: Direct Impacts on Special-Status Wildlife—Amphibians and Reptiles Impact BIO#32: Indirect Impacts on Special-Status Wildlife—Amphibians and Reptiles Impact BIO#33: Direct Impacts on Special-Status Wildlife—Birds Impact BIO#35: Direct Impacts on Special-Status Wildlife—Mammals Impact BIO#36: Indirect Impacts on Special-Status Wildlife—Mammals Impact BIO#39: Direct Impacts on Aquatic Resources Impact BIO#41: Direct Impacts on Critical Habitat Impact BIO#42: Indirect Impacts on Critical Habitat Impact BIO#43: Direct Impacts on Essential Fish Habitat Impact BIO#44: Indirect Impacts on Essential Fish Habitat
BIO-IAMF#7	Prepare and Implement a Weed Control Plan	Prior to any ground-disturbing activity, the Contractor's Project Biologist will develop and implement a construction-phase Weed Control Plan. The purpose of the plan is to minimize and avoid the spread of noxious and invasive weeds during ground-disturbing activities.	Design/ Pre-construction	Prepare plan/ Reporting	Monthly	Contractor	Contractor	Monthly reporting	Condition of design-build contract	Impact BIO#1: Direct Impacts on Special-Status Plant Species

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		The Weed Control Plan will include the following, at a minimum: ▪ Prior to implementation, delineate environmentally sensitive area and environmentally restricted area (on plans and in field). ▪ Schedule for noxious weed surveys to be conducted in coordination with the BRMP. The success criteria for noxious and invasive weed control, as established by a Qualified Biologist. The success criteria would be linked to the BRMP standards for on-site work during ground-disturbing activities. In particular, the criteria would limit the introduction and spread of invasive species, as defined by the California Invasive Plant Council, to less than or equal to the pre-disturbance conditions in areas temporarily affected by ground-disturbing activities. If invasive species cover is found to exceed pre-disturbance conditions by 10 percent or is 10 percent more compared with a similar, nearby reference site with similar vegetation composition, a control effort would be implemented. If the target, or other success criteria identified in the Weed Control Plan, has not been met by the end of the Weed Control Plan monitoring and implementation period, the Authority or its designee would continue the monitoring and control efforts, and remedial actions would be identified and implemented until the success criteria are met. Depending on monitoring results, additional or revised measures may be necessary to verify that the introduction and spread of noxious weeds are not promoted by the construction and operation of the project. ▪ Provisions to verify that developing the Weed Control Plan would be coordinated with the Restoration and Revegetation Plan so the Restoration and Revegetation Plan incorporates measures minimizing the spreading and establishing of noxious weeds. This coordination also provides for the Restoration and Revegetation Plan to specify the percentage of noxious weeds coverage in the revegetation performance standards. ▪ Identification of weed control treatments, including the use of permitted herbicides, and manual and mechanical removal methods. Herbicide application would be restricted from use in Environmentally Sensitive Areas and on compensatory mitigation sites. ▪ Determination of timing of the weed control treatment for each plant species. ▪ Identification of fire prevention measures. The Project Biologist will prepare a monthly memorandum to document the progress of the plan and its								Impact BIO#2: Indirect Impacts on Special-Status Plant Species and Other Native Plants Impact BIO#3: Direct Impacts on Special-Status Wildlife—Invertebrates Impact BIO#5: Direct Impacts on Special-Status Wildlife—Fish Impact BIO#4: Indirect Impacts on Special-Status Wildlife—Invertebrates Impact BIO#7: Direct Impacts on Special-Status Wildlife—Amphibians Impact BIO#8: Indirect Impacts on Special-Status Wildlife—Amphibians Impact BIO#9: Direct Impacts on Special-Status Wildlife—Reptiles Impact BIO#10: Indirect Impacts on Special-Status Wildlife—Reptiles Impact BIO#11: Direct Impacts on Special-Status Wildlife—Birds Impact BIO#13: Direct Impacts on Special-Status Wildlife—Mammals Impact BIO#14: Indirect Impacts on Special-Status Wildlife—Mammals Impact BIO#15:

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		implementation. The Contractor will implement the Weed Control Plan during the construction period. The Authority will appoint the responsible party during the operations period. The Weed Control Plan will be submitted to the Authority prior to any ground disturbance activity.								Direct Impacts on Special-Status Plant Communities Impact BIO#16: Indirect Impacts on Special-Status Plant Communities Impact BIO#17: Direct Impacts on Jurisdictional Aquatic Resources Impact BIO#18: Indirect Impacts on Jurisdictional Aquatic Resources Impact BIO#19: Direct Impacts on Critical Habitat Impact BIO#20: Indirect Impacts on Critical Habitat Impact BIO#21: Direct Impacts on Essential Fish Habitat Impact BIO#25: Direct Impacts on Special-Status Plant Species Impact BIO#26: Indirect Impacts on Special-Status Plants Impact BIO#27: Direct Impacts on Special-Status Wildlife – Invertebrates Impact BIO#28: Indirect Impacts on Special-Status Wildlife—Invertebrates Impact BIO#31: Direct Impacts on Special-Status Wildlife—Amphibians and Reptiles Impact BIO#32: Indirect Impacts on Special-Status

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
										Wildlife—Amphibians and Reptiles Impact BIO#33: Direct Impacts on Special-Status Wildlife—Birds Impact BIO#34: Indirect Impacts on Special-Status Wildlife—Birds Impact BIO#35: Direct Impacts on Special-Status Wildlife—Mammals Impact BIO#36: Indirect Impacts on Special-Status Wildlife—Mammals Impact BIO#37: Direct Impacts on Special-Status Plant Communities Impact BIO#38: Indirect Impacts on Special-Status Plant Communities Impact BIO#39: Direct Impacts on Jurisdictional Aquatic Resources Impact BIO#40: Indirect Impacts on Jurisdictional Aquatic Resources Impact BIO#41: Direct Impacts on Critical Habitat Impact BIO#42: Indirect Impacts on Critical Habitat
BIO-IAMF#8	Establish Monofilament Restrictions	Prior to any ground-disturbing activity, the Project Biologist will verify that plastic monofilament netting (erosion control matting) or similar material is not being used as part of erosion control activities. The Project Biologist will identify acceptable material for such use, including: geomembranes, coconut coir matting, tackified hydroseeding compounds, and rice straw wattles (e.g.,	Pre-construction	Compliance reporting	Monthly	Contractor	Contractor	Monthly reporting	Condition of design-build contract	Impact BIO#1: Direct Impacts on Special-Status Plant Species Impact BIO#2: Indirect Impacts on Special-Status Plant

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		Earthsaver wattles: biodegradable, photodegradable, burlap). Within developed or urban areas, the Project Biologist may allow exceptions to the restrictions on the type of erosion control material if the Project Biologist determines that the construction area is of sufficient distance from natural areas to ensure the avoidance of potential impacts on wildlife.								Species and Other Native Plants Impact BIO#3: Direct Impacts on Special-Status Wildlife—Invertebrates Impact BIO#5: Direct Impacts on Special-Status Wildlife—Fish Impact BIO#7: Direct Impacts on Special-Status Wildlife—Amphibians Impact BIO#8: Indirect Impacts on Special-Status Wildlife—Amphibians Impact BIO#9: Direct Impacts on Special-Status Wildlife—Reptiles Impact BIO#10: Indirect Impacts on Special-Status Wildlife—Reptiles Impact BIO#11: Direct Impacts on Special-Status Wildlife—Birds Impact BIO#13: Direct Impacts on Special-Status Wildlife—Mammals Impact BIO#14: Indirect Impacts on Special-Status Wildlife—Mammals Impact BIO#15: Direct Impacts on Special-Status Plant Communities Impact BIO#16: Indirect Impacts on Special-Status Plant Communities

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
										Impact BIO#17: Direct Impacts on Jurisdictional Aquatic Resources Impact BIO#19: Direct Impacts on Critical Habitat Impact BIO#21: Direct Impacts on Essential Fish Habitat
BIO-IAMF#9	Prevent Entrapment in Construction Materials and Excavations	At the end of each work day during construction, the Authority will cover all excavated, steep-sided holes or trenches more than 8 inches deep and that have sidewalls steeper than 1:1 (45 degree) slope with plywood or similar materials, or provide a minimum of one escape ramp per 100 feet of trenching (with slopes no greater than 3:1) constructed of earth fill or wooden planks. The Project Biologist will thoroughly inspect holes and trenches for trapped animals at the start and end of each work day. The Authority will screen, cover, or elevate at least 1 foot above ground all construction pipe, culverts, or similar structures with a diameter of 3 inches or greater that are stored overnight within the project footprint. These pipes, culverts, and similar structures will be inspected by the Project Biologist for wildlife before such material is moved, buried, or capped.	Construction	Monitoring/ Compliance reporting	Daily monitoring/ Monthly reporting	Contractor	Contractor	Daily monitoring/ monthly reporting	Condition of design-build contract	Impact BIO#1: Direct Impacts on Special-Status Plant Species Impact BIO#2: Indirect Impacts on Special-Status Plant Species and Other Native Plants Impact BIO#3: Direct Impacts on Special-Status Wildlife—Invertebrates Impact BIO#4: Indirect Impacts on Special-Status Wildlife—Invertebrates Impact BIO#5: Direct Impacts on Special-Status Wildlife—Fish Impact BIO#7: Direct Impacts on Special-Status Wildlife—Amphibians Impact BIO#8: Indirect Impacts on Special-Status Wildlife—Amphibians Impact BIO#9: Direct Impacts on Special-Status Wildlife—Reptiles Impact BIO#11: Direct Impacts on Special-Status Wildlife—Birds

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
										Impact BIO#13: Direct Impacts on Special-Status Wildlife—Mammals Impact BIO#14: Indirect Impacts on Special-Status Wildlife—Mammals Impact BIO#15: Direct Impacts on Special-Status Plant Communities Impact BIO#16: Indirect Impacts on Special-Status Plant Communities Impact BIO#17: Direct Impacts on Jurisdictional Aquatic Resources Impact BIO#19: Direct Impacts on Critical Habitat Impact BIO#21: Direct Impacts on Essential Fish Habitat Impact BIO#23: Direct Impacts on Wildlife Movement Corridors Impact BIO#24: Indirect Impacts on Wildlife Movement Corridors
BIO-IAMF#10	Delineate Equipment Staging Areas and Traffic Routes	Prior to any ground-disturbing activity, the Authority will establish staging areas for construction equipment in areas that minimize effects on sensitive biological resources, including habitat for special-status species, seasonal wetlands, and wildlife movement corridors. Staging areas (including any temporary material storage areas) will be located in areas that would be occupied by permanent facilities, where practicable. Equipment staging areas will be identified on final project construction plans. The Authority will flag and mark access routes to ensure that vehicle traffic within the project footprint is restricted to established roads, construction areas, and other designated areas.	Pre-construction	Compliance reporting	Monthly	Contractor	Contractor	Monthly reporting	Condition of design-build contract	Impact BIO#1: Direct Impacts on Special-Status Plant Species Impact BIO#2: Indirect Impacts on Special-Status Plant Species and Other Native Plants Impact BIO#3: Direct Impacts on Special-Status Wildlife—Invertebrates

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
										Impact BIO#4: Indirect Impacts on Special-Status Wildlife—Invertebrates Impact BIO#5: Direct Impacts on Special-Status Wildlife—Fish Impact BIO#6: Indirect Impacts on Special-Status Wildlife—Fish Impact BIO#7: Direct Impacts on Special-Status Wildlife—Amphibians Impact BIO#8: Indirect Impacts on Special-Status Wildlife—Amphibians Impact BIO#9: Direct Impacts on Special-Status Wildlife—Reptiles Impact BIO#10: Indirect Impacts on Special-Status Wildlife—Reptiles Impact BIO#11: Direct Impacts on Special-Status Wildlife—Birds Impact BIO#12: Indirect Impacts on Special-Status Wildlife—Birds Impact BIO#13: Direct Impacts on Special-Status Wildlife—Mammals Impact BIO#14: Indirect Impacts on Special-Status Wildlife—Mammals

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
										Impact BIO#15: Direct Impacts on Special-Status Plant Communities Impact BIO#16: Indirect Impacts on Special-Status Plant Communities Impact BIO#17: Direct Impacts on Jurisdictional Aquatic Resources Impact BIO#18: Indirect Impacts on Jurisdictional Aquatic Resources Impact BIO#19: Direct Impacts on Critical Habitat Impact BIO#21: Direct Impacts on Essential Fish Habitat Impact BIO#22: Indirect Impacts on Essential Fish Habitat
BIO-IAMF#11	Dispose of Construction Spoils and Waste	During ground-disturbing activities, the Authority may temporarily store excavated materials produced by construction activities in areas at or near construction sites within the project footprint. Where practicable, the Authority will return excavated soil to its original location to be used as backfill. Any excavated waste materials unsuitable for treatment and reuse will be disposed at an off-site location, in conformance with applicable State and federal laws.	Construction	Compliance reporting	Monthly	Contractor	Contractor	Monthly reporting	Condition of design-build contract	Impact BIO#1: Direct Impacts on Special-Status Plant Species Impact BIO#2: Indirect Impacts on Special-Status Plant Species and Other Native Plants Impact BIO#3: Direct Impacts on Special-Status Wildlife—Invertebrates Impact BIO#4: Indirect Impacts on Special-Status Wildlife—Invertebrates Impact BIO#5: Direct Impacts on Special-Status Wildlife—Fish Impact BIO#6:

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
										Indirect Impacts on Special-Status Wildlife—Fish Impact BIO#7: Direct Impacts on Special-Status Wildlife—Amphibians Impact BIO#8: Indirect Impacts on Special-Status Wildlife—Amphibians Impact BIO#9: Direct Impacts on Special-Status Wildlife—Reptiles Impact BIO#10: Indirect Impacts on Special-Status Wildlife—Reptiles Impact BIO#11: Direct Impacts on Special-Status Wildlife—Birds Impact BIO#13: Direct Impacts on Special-Status Wildlife—Mammals Impact BIO#14: Indirect Impacts on Special-Status Wildlife—Mammals Impact BIO#15: Direct Impacts on Special-Status Plant Communities Impact BIO#16: Indirect Impacts on Special-Status Plant Communities Impact BIO#17: Direct Impacts on Jurisdictional Aquatic Resources Impact BIO#18: Indirect Impacts on Jurisdictional Aquatic

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
										Resources Impact BIO#19: Direct Impacts on Critical Habitat Impact BIO#21: Direct Impacts on Essential Fish Habitat Impact BIO#22: Indirect Impacts on Essential Fish Habitat
BIO-IAMF#12	Clean Construction Equipment	Prior to any ground-disturbing activity, the Authority will ensure that all equipment entering the Work Area is free of mud and plant materials. The Authority will establish vehicle cleaning locations designed to isolate and contain organic materials and minimize opportunities for weeds and invasive species to move in and out of the project footprint. Cleaning may be done by washing with water, blowing with compressed air, brushing, or other hand cleaning. The cleaning areas will be located so as to avoid impacts on surface waters and appropriate SWPPP BMPs will be implemented so as to further control any potential for the spread of weeds or other invasive species. Cleaning stations will be inspected regularly (at least monthly).	Pre-construction	Compliance reporting	Monthly	Contractor	Contractor	Monthly reporting	Condition of design-build contract	Impact BIO#1: Direct Impacts on Special-Status Plant Species Impact BIO#2: Indirect Impacts on Special-Status Plant Species and Other Native Plants Impact BIO#3: Direct Impacts on Special-Status Wildlife—Invertebrates Impact BIO#4: Indirect Impacts on Special-Status Wildlife—Invertebrates Impact BIO#5: Direct Impacts on Special-Status Wildlife—Fish Impact BIO#6: Indirect Impacts on Special-Status Wildlife—Fish Impact BIO#7: Direct Impacts on Special-Status Wildlife—Amphibians Impact BIO#8: Indirect Impacts on Special-Status Wildlife—Amphibians Impact BIO#9: Direct Impacts on Special-Status Wildlife—Reptiles

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
										Impact BIO#10: Indirect Impacts on Special-Status Wildlife—Reptiles Impact BIO#11: Direct Impacts on Special-Status Wildlife—Birds Impact BIO#13: Direct Impacts on Special-Status Wildlife—Mammals Impact BIO#14: Indirect Impacts on Special-Status Wildlife—Mammals Impact BIO#15: Direct Impacts on Special-Status Plant Communities Impact BIO#16: Indirect Impacts on Special-Status Plant Communities Impact BIO#17: Direct Impacts on Jurisdictional Aquatic Resources Impact BIO#18: Indirect Impacts on Jurisdictional Aquatic Resources Impact BIO#19: Direct Impacts on Critical Habitat Impact BIO#20: Indirect Impacts on Critical Habitat Impact BIO#21: Direct Impacts on Essential Fish Habitat Impact BIO#22: Indirect Impacts on Essential Fish Habitat

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
BIO-IAMF#13	Maintain Construction Sites	Prior to any ground-disturbing activity, the Authority will prepare a construction site BMP field manual. The manual will contain standard construction site housekeeping practices required to be implemented by construction personnel. The manual will identify BMPs for the following topics: temporary soil stabilization, temporary sediment control, wind erosion control, non-stormwater management, waste management and materials control, rodenticide use, and other general construction site cleanliness measures. All construction personnel will receive training on BMP field manual implementation prior to working within the project footprint. All personnel will acknowledge, in writing, their understanding of the BMP field manual implementation requirements. The BMP field manual will be updated by January 31 of each year. The Authority will provide, on an annual basis, training updates to all construction personnel.	Pre-construction	Reporting	Monthly	Contractor	Contractor	Monthly reporting	Condition of design-build contract	Impact BIO#1: Direct Impacts on Special-Status Plant Species Impact BIO#2: Indirect Impacts on Special-Status Plant Species and Other Native Plants Impact BIO#3: Direct Impacts on Special-Status Wildlife—Invertebrates Impact BIO#4: Indirect Impacts on Special-Status Wildlife—Invertebrates Impact BIO#5: Direct Impacts on Special-Status Wildlife—Fish Impact BIO#6: Indirect Impacts on Special-Status Wildlife—Fish Impact BIO#7: Direct Impacts on Special-Status Wildlife—Amphibians Impact BIO#8: Indirect Impacts on Special-Status Wildlife—Amphibians Impact BIO#9: Direct Impacts on Special-Status Wildlife—Reptiles Impact BIO#10: Indirect Impacts on Special-Status Wildlife—Reptiles Impact BIO#11: Direct Impacts on Special-Status Wildlife—Birds Impact BIO#13:

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
										Direct Impacts on Special-Status Wildlife—Mammals Impact BIO#14: Indirect Impacts on Special-Status Wildlife—Mammals Impact BIO#15: Direct Impacts on Special-Status Plant Communities Impact BIO#16: Indirect Impacts on Special-Status Plant Communities Impact BIO#17: Direct Impacts on Jurisdictional Aquatic Resources Impact BIO#18: Indirect Impacts on Jurisdictional Aquatic Resources Impact BIO#19: Direct Impacts on Critical Habitat Impact BIO#21: Direct Impacts on Essential Fish Habitat Impact BIO#22: Indirect Impacts on Essential Fish Habitat
BIO-IAMF#14	Dewatering and Water Diversion	Prior to any construction activities within open or flowing water, the Contractor will prepare a dewatering plan and submitted it for review and approval by the resource agencies (USACE, SWRCB, NMFS, and CDFW) prior to any work in that area. The plan will incorporate appropriate construction measures that minimize turbidity and siltation as determined through review and approval by the designated resource agencies. The Project Biologist and/or Biological Monitor will provide regular monitoring of dewatering and diversion sites and would collect water quality data (if applicable). Prior to dewatering or water diversion, pre-activity surveys will establish the presence or absence of special status wildlife species within the affected waterbody. In the event that special-status species are detected during pre-activity surveys, an agency approved Project Biologist will	Pre-construction/ Construction	Prepare a plan/ Monitoring	Daily	Contractor	Contractor	Daily monitoring during construction	Condition of design-build contract	Impact BIO#1: Direct Impacts on Special-Status Plant Species Impact BIO#2: Indirect Impacts on Special-Status Plant Species and Other Native Plants Impact BIO#3: Direct Impacts on Special-Status Wildlife—Invertebrates Impact BIO#5: Direct Impacts on Special-Status

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		relocate the species (if allowable) to an approved location off-site.								Wildlife—Fish Impact BIO#6: Indirect Impacts on Special-Status Wildlife—Fish Impact BIO#7: Direct Impacts on Special-Status Wildlife—Amphibians Impact BIO#9: Direct Impacts on Special-Status Wildlife—Reptiles Impact BIO#11: Direct Impacts on Special-Status Wildlife—Birds Impact BIO#13: Direct Impacts on Special-Status Wildlife—Mammals Impact BIO#14: Indirect Impacts on Special-Status Wildlife—Mammals Impact BIO#15: Direct Impacts on Special-Status Plant Communities Impact BIO#16: Indirect Impacts on Special-Status Plant Communities Impact BIO#17: Direct Impacts on Jurisdictional Aquatic Resources Impact BIO#18: Indirect Impacts on Jurisdictional Aquatic Resources Impact BIO#19: Direct Impacts on Critical Habitat

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
										Impact BIO#21: Direct Impacts on Essential Fish Habitat Impact BIO#22: Indirect Impacts on Essential Fish Habitat
BIO-IAMF#15	Vehicle Traffic and Construction Site Speed Limits	Prior to any ground-disturbing activities, the Contractor will obtain confirmation from the Project Biologist that appropriate BMPs are in place to restrict project vehicle traffic within the construction area to established roads, construction areas, and other designated areas. The Contractor will establish vehicle traffic in locations disturbed by previous activities to prevent further adverse ground-disturbing effects, require observance of a 15-mph speed limit for construction areas with potential special-status species habitat, clearly flag and mark access routes, and prohibit off-road traffic. The Project Biologist will submit a memorandum to the Mitigation Manager and Authority to document compliance with this measure on a monthly basis.	Pre-construction	Compliance reporting	Monthly	Contractor	Contractor	Monthly reporting	Condition of design-build contract	Impact BIO#1: Direct Impacts on Special-Status Plant Species Impact BIO#2: Indirect Impacts on Special-Status Plant Species and Other Native Plants Impact BIO#3: Direct Impacts on Special-Status Wildlife—Invertebrates Impact BIO#5: Direct Impacts on Special-Status Wildlife—Fish Impact BIO#7: Direct Impacts on Special-Status Wildlife—Amphibians Impact BIO#8: Indirect Impacts on Special-Status Wildlife—Amphibians Impact BIO#9: Direct Impacts on Special-Status Wildlife—Reptiles Impact BIO#10: Indirect Impacts on Special-Status Wildlife—Reptiles Impact BIO#11: Direct Impacts on Special-Status Wildlife—Birds Impact BIO#13: Direct Impacts on Special-Status Wildlife—Mammals

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
										Impact BIO#14: Indirect Impacts on Special-Status Wildlife—Mammals Impact BIO#15: Direct Impacts on Special-Status Plant Communities Impact BIO#16: Indirect Impacts on Special-Status Plant Communities Impact BIO#17: Direct Impacts on Jurisdictional Aquatic Resources Impact BIO#19: Direct Impacts on Critical Habitat Impact BIO#21: Direct Impacts on Essential Fish Habitat Impact BIO#23: Direct Impacts on Wildlife Movement Corridors Impact BIO#24: Indirect Impacts on Wildlife Movement Corridors
Hydrology and Water Resources										
HYD-IAMF#1	Stormwater Management	Prior to construction, the Contractor will prepare a stormwater management and treatment plan for review and approval by the Authority. During the detailed design phase, each receiving stormwater system's capacity to accommodate project runoff would be evaluated. As necessary, on-site stormwater management measures, such as detention or selected upgrades to the receiving system, would be designed to provide adequate capacity and to comply with the design standards in the latest version of Authority TM 2.6.5 Hydraulics and Hydrology Guidelines. On-site stormwater management facilities would be designed and constructed to capture runoff and provide treatment prior to discharge from pollutant-generating surfaces, including station parking areas, access roads, new road over- and underpasses, reconstructed interchanges, and new or relocated roads and highways. Low-impact development techniques would	Design/ Construction	Contractor	Monthly	Contractor	Contractor	At incorporation or completion of design/during monthly construction report	Condition of design-build contract	Impact HYD#1: Temporary Changes to Drainage Patterns and Stormwater Runoff Impact HYD#2: Permanent Changes to Drainage Patterns

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		be used to detain runoff on site and to reduce off site runoff, such as constructed wetland systems, biofiltration and bioretention systems, wet ponds, organic mulch layers, planting soil beds, and vegetated systems (biofilters), such as vegetated swales and grass filter strips, would be used where appropriate.								and Stormwater Runoff Impact HYD#3: Temporary Surface Water Quality Impacts Impact HYD#4: Permanent Surface Water Quality Impacts Impact HYD#5: Temporary Groundwater Quality and Volume Impacts Impact HYD#6: Permanent Groundwater Quality and Volume Impacts Impact BIO#5: Direct Impacts on Special-Status Wildlife–Fish Impact BIO#17: Direct Impacts on Jurisdictional Aquatic Resources Impact BIO#21: Direct Impacts on Essential Fish Habitat Impact BIO#29: Direct Impacts on Special-Status Wildlife–Fish Impact BIO#43: Direct Impacts on Essential Fish Habitat Impact PUE#7: Permanent Impacts on Wastewater or Stormwater Pipelines
HYD-IAMF#2	Flood Protection	Prior to construction, the Contractor will prepare a flood protection plan for Authority review and approval. The project would be designed both to remain operational during flood events and to minimize increases in 100-year or 200-year flood elevations, as applicable to locale. Design standards will include the following: ▪ Establish track elevation to prevent saturation and infiltration of stormwater into the sub-ballast.	Design/ Construction	Authority/ Contractor	Monthly	Contractor	Contractor	At incorporation or completion of design/during monthly construction report	Condition of design-build contract	Impact HYD#8: Permanent Changes to Floodplain Flows Impact HYD#9: Intermittent Permanent Changes in

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		▪ Minimize development within the floodplain, to such an extent that water surface elevation in the floodplain would not increase by more than 1 foot, or as required by state or local agencies, during the 100-year or 200-year flood flow (as applicable to locale). Avoid placement of facilities in the floodplain or raise the ground with fill above the base-flood elevation. ▪ Design the floodplain crossings to maintain a 100-year floodwater surface elevation of no greater than 1 foot above current levels, or as required by state or local agencies, and project features within the floodway itself would not increase existing 100-year floodwater surface elevations in FEMA-designated floodways, or as otherwise agreed upon with the county floodplains manager. The following design standards would minimize the effects of pier placement on floodplains and floodways: ▪ Design site crossings to be as nearly perpendicular to the channel as feasible to minimize bridge length. ▪ Orient piers to be parallel to the expected high-water flow direction to minimize flow disturbance. ▪ Elevate bridge crossings at least 3 feet above the high-water surface elevation to provide adequate clearance for floating debris, or as required by local agencies. ▪ Conduct engineering analyses of channel scour depths at each crossing to evaluate the depth for burying the bridge piers and abutments. Implement scour-control measures to reduce erosion potential. ▪ Use quarry stone, cobblestone, or their equivalent for erosion control along rivers and streams, complimented with native riparian plantings or other natural stabilization alternatives that would restore and maintain a natural riparian corridor. Place bedding materials under the stone protection at locations where the underlying soils require stabilization as a result of stream-flow velocity.							Hydraulic Capacity and Connectivity Impact HYD#13: Intermittent Permanent Floodplain Impacts Impact HYD#14: Continuous Permanent Exposure to Flood Hazards from Seismic Events Impact BIO#5: Direct Impacts on Special-Status Wildlife–Fish Impact BIO#17: Direct Impacts on Jurisdictional Aquatic Resources Impact BIO#21: Direct Impacts on Essential Fish Habitat Impact BIO#29: Direct Impacts on Special-Status Wildlife–Fish Impact BIO#43: Direct Impacts on Essential Fish Habitat Impact PUE#7: Permanent Impacts on Wastewater or Stormwater Pipelines
HYD-IAMF#3	Prepare and Implement a Construction Stormwater Pollution Prevention Plan	Prior to construction (any ground-disturbing activities), the Contractor will comply with the SWRCB Construction General Permit requiring preparation and implementation of a SWPPP. The Construction SWPPP will propose BMPs to minimize potential short-term increases in sediment transport caused by construction, including erosion control requirements, stormwater management, and channel dewatering for affected stream crossings. These BMPs would include measures to incorporate permeable surfaces into facility design plans where feasible, and describe how treated stormwater would be retained or detained on-site. Other BMPs shall include strategies to manage the amount and quality of overall stormwater runoff. The Construction SWPPP would	Design/ Construction	Authority/ Contractor	Monthly	Contractor	Contractor	At incorporation or completion of design/during monthly construction report	Condition of design-build contract	Impact HYD#1: Temporary Changes to Drainage Patterns

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		include, but are not limited to, measures to address the following: ▪ Hydromodification management to verify maintenance of pre-project hydrology by emphasizing on site retention of stormwater runoff using measures such as flow dispersion, infiltration, and evaporation (supplemented by detention where required). Additional flow control measures would be implemented where local regulations or drainage requirements dictate. ▪ Implementing practices to minimize the contact of construction materials, equipment, and maintenance supplies with stormwater. ▪ Limiting fueling and other activities using hazardous materials to areas distant from surface water, providing drip pans under equipment, and daily checks for vehicle condition. ▪ Implementing practices to reduce erosion of exposed soil, including soil stabilization, regular watering for dust control, perimeter siltation fences, and sediment catchment basins. ▪ Implementing practices to maintain current water quality, including siltation fencing, wattle barriers, stabilized construction entrances, grass buffer strips, ponding areas, organic mulch layers, inlet protection, storage tanks, and sediment traps to arrest and settle sediment. ▪ Where feasible, avoiding areas that may have substantial erosion risk, including areas with erosive soils and steep slopes. ▪ Using diversion ditches to intercept surface runoff from off-site. ▪ Where feasible, limiting construction to dry periods when flows in water bodies are low or absent. ▪ Implementing practices to capture and provide proper off-site disposal of concrete wash water, including isolation of runoff from fresh concrete during curing to prevent it from reaching the local drainage system, and possible treatments (e.g., dry ice). ▪ Developing and implementing a spill prevention and emergency response plan to handle potential fuel and/or hazardous material spills. Implementation of a SWPPP will be performed by the construction contractors as directed by the Contractor's Qualified SWPPP Practitioner or designee. As part of that responsibility, the effectiveness of construction BMPs must be monitored before, during and after storm events. Records of these inspections and monitoring results are submitted to the local regional water quality control board as part of the annual report required by the Statewide Construction General Permit. The reports are available to								and Stormwater Runoff Impact HYD#3: Temporary Surface Water Quality Impacts Impact HYD#4: Permanent Surface Water Quality Impacts Impact HYD#5: Temporary Groundwater Quality and Volume Impacts Impact HYD#6: Permanent Groundwater Quality and Volume Impacts Impact HYD#7: Temporary Changes to Floodplain Flows Impact HYD#8: Permanent Changes to Floodplain Flows Impact HYD#13: Intermittent Permanent Floodplain Impacts Impact BIO#5: Direct Impacts on Special-Status Wildlife–Fish Impact BIO#17: Direct Impacts on Jurisdictional Aquatic Resources Impact BIO#20: Indirect Impacts on Critical Habitat Impact BIO#21: Direct Impacts on Essential Fish Habitat Impact GEO#1:

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		the public online. The SWRCB and regional water quality control board would have the opportunity to review these documents.								Soil Erosion Impact PUE#7: Permanent Impacts on Wastewater or Stormwater Pipelines
HYD-IAMF#4	Prepare and Implement an Industrial Stormwater Pollution Prevention Plan	Prior to construction of any facility classified as an industrial facility, the Contractor will comply with existing water quality regulations. The stormwater general permit requires preparation of a SWPPP and a monitoring plan for industrial facilities that discharge stormwater from the site, including vehicle maintenance facilities associated with transportation operations. The permit includes performance standards for pollution control.	Design/ Construction	Authority/ Contractor	Monthly	Contractor	Contractor	At incorporation or completion of design/during monthly construction report	Condition of design-build contract	Impact HYD#3: Temporary Surface Water Quality Impacts Impact HYD#9: Intermittent Permanent Changes in Hydraulic Capacity and Connectivity Impact BIO#5: Direct Impacts on Special-Status Wildlife–Fish Impact BIO#17: Direct Impacts on Jurisdictional Aquatic Resources Impact BIO#21: Direct Impacts on Essential Fish Habitat Impact BIO#29: Direct Impacts on Special-Status Wildlife–Fish Impact BIO#43: Direct Impacts on Essential Fish Habitat Impact PUE#7: Permanent Impacts on Wastewater or Stormwater Pipelines
Geologic Resources										
GEO-IAMF#1	Geologic Hazards	Prior to construction, the Contractor will prepare a CMP addressing how the Contractor would address geologic constraints and minimize or avoid impacts on geologic hazards during construction. The plan would be submitted to the Authority for review and approval. At a minimum, the plan would address the following geological and geotechnical constraints/resources: a. Groundwater Withdrawal. Controlling the amount of groundwater withdrawal from the project, by re-inject groundwater at specific locations if necessary, or use alternate foundation designs to offset the potential for settlement. This control is important for locations with	Design/ Construction	Design/ Reporting	Annual	Contractor	Contractor	At incorporation or completion of design/during monthly construction report	Condition of design-build contract	Impact GEO#1: Soil Erosion Impact GEO#2: Moderate to High Shrink-Swell Potential Impact GEO#4: Unstable Soils Resulting in On-Site or Off-Site Slumps and Small Slope Failures

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		retained cuts in areas where high groundwater exists, and where existing buildings are located near the depressed track section. b. Unstable Soils. Employing various methods to mitigate for the risk of ground failure from unstable soils. If soft or loose soils are encountered at shallow depths, they can be excavated and replaced with competent soils. To limit the excavation depth, replacement materials can also be strengthened using geosynthetics. Where unsuitable soils are deeper, ground improvement methods, such as stone columns, cement deep-soil-mixing, or jet-grouting, can be used. Alternatively, if sufficient construction time is available, preloading—in combination with prefabricated vertical drains (wicks) and staged construction—can be used to gradually improve the strength of the soil without causing bearing-capacity failures. c. Subsidence. The Authority addresses subsidence in its design and construction processes. For the initial design, survey monuments were installed to establish a datum and set an initial track profile. In the construction phase, the design-build contractors for track bed preparation will conduct topographic surveys for preparation of final design. Because subsidence could have occurred since the original benchmarks (survey monuments) were established, the design-build contractor's topographic surveys would be used to help determine whether subsidence has occurred. The updated topographic surveys would also be used to establish the top of rail elevations for final design where the HSR system is outside established floodplain areas and above water surface elevations. Where the HSR system is in floodplain areas susceptible to flooding, consideration will be given to overbuild the height of the rail bed in anticipation of future subsidence. d. Water and Wind Erosion. The Contractor will implement erosion control methods as appropriate from the various erosion control methods documented in the Construction SWPPP (See HYD-IAMF#3), the Caltrans Construction Manuals, and the construction technical memorandum (see GEO-IAMF#6), and in coordination with other erosion, sediment, stormwater management and fugitive dust control efforts. Water and wind erosion control methods may include, but are not limited to, use of revegetation, stabilizers, mulches, and biodegradable geotextiles. e. Soils with Shrink-Swell Potential. In locations where shrink-swell potential is marginally unacceptable, soil additives will be mixed with existing soil to reduce the shrink-swell potential. Construction specifications								Impact GEO#5: Soil Settlement at Structures or along Trackway Impact GEO#6: Slope Failure Impact HYD#3: Temporary Surface Water Quality Impacts Impact HYD#5: Temporary Groundwater Quality and Volume Impacts Impact HMW#1: Temporary Effects from the Transport, Use, Storage, and Disposal of Hazardous Materials and Wastes Impact HMW#6 Temporary Effects Associated with Risks during Construction on or near Landfills and Oil and Gas Wells

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		would be based upon the decision whether to remove or treat the soil. This decision is based on the soils, specific shrink-swell characteristics, the additional costs for treatment versus excavation and replacement, as well as the long-term performance characteristics of the treated soil. f. Soils with Corrosive Potential. In locations where soils have a potential to be corrosive to steel and concrete, the soils will be removed and buried structures would be designed for corrosive conditions, and corrosion-protected materials would be used in infrastructure.								
GEO-IAMF#2	Slope Monitoring	During O&M, the Authority will incorporate slope monitoring by a Registered Engineering Geologist into the O&M procedures. The procedures will be implemented at sites identified in the CMP where a potential for long-term instability exists from gravity or seismic loading including but not limited to at-grade sections where slope failure could result in loss of track support or where slope failure could result in additional earth loading to foundations supporting elevated structures.	Operation	Contractor	Monthly	Contractor	Contractor	During operation	Condition of design-build contract	Impact GEO#4: Unstable Soils Resulting in On-Site or Off-Site Slumps and Small Slope Failures Impact GEO#6: Construction of the Central Valley Wye alternatives could result in slope failure.
GEO-IAMF#3	Evaluate and Design for Large Seismic Ground Shaking	Prior to construction, the Contractor will document through preparation of a technical memorandum how all HSR components were evaluated and designed for large seismic ground shaking. Prior to final design, the Contractor would conduct additional seismic studies to establish up-to-date estimation of levels of ground motion. The most current Caltrans seismic design criteria at the time of design will be used in the design of any structures supported in or on the ground. These design procedures and features reduce to the greatest practical extent for potential movements, shear forces, and displacements that result from inertial response of the structure. In critical locations, pendulum base isolators may be used to reduce the levels of inertial forces. New composite materials may also be used to enhance seismic performance.	Design/ Construction	Authority/ Contractor	Monthly	Authority/ Contractor	Authority/ Contractor	Monthly record keeping	Condition of design-build contract	Impact GEO#4: Unstable Soils Resulting in On-Site or Off-Site Slumps and Small Slope Failures Impact GEO#6: Construction of the Central Valley Wye alternatives could result in slope failure. Impact GEO#7: Seismic-Induced Ground Shaking and Secondary Seismic Hazards (Construction) Impact GEO#10: Seismic-Induced Ground Shaking and Secondary Seismic Hazards (Operations) Impact SS#13: Continuous Permanent Safety Hazard to Schools
GEO-IAMF#4	Suspension of Operations during an Earthquake	Prior to O&M activities, the Contractor will document in a technical memorandum how suspension of operations during or after an earthquake was addressed in project design. Motion-sensing instruments to provide ground-motion data and a control system to shut down HSR operations temporarily during or after a potentially damaging earthquake would be incorporated into final design. Monitoring equipment would be installed at select	Design/ Construction/ Operation	Reporting	As needed	Contractor/ Authority	Contractor/ Authority	At incorporation or completion of design/during monthly construction report	As needed based on an earthquake event	Impact GEO#10: Seismic-Induced Ground Shaking and Secondary Seismic Hazards (Operations) Impact SS#13: Continuous Permanent Safety Hazard to Schools

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		locations where high ground motions could occur. The system would then be inspected for damage due to ground motion and/or ground deformation, and then returned to service when appropriate.								
GEO-IAMF#5	Subsidence Monitoring	Prior to O&M, the Authority will develop a stringent track monitoring program. Once tracks are operational, a remote monitoring program would be implemented to monitor the effects of ongoing subsidence. Track inspection systems would provide early warning of reduced track integrity. HSR train sets would be equipped with autonomous equipment for daily track surveys. This specification would be added to HSR train bid packages. If monitoring indicates that track tolerances are not met, trains would operate at reduced speed until track tolerances are restored. In addition, the contractor responsible for wayside maintenance would be required to implement a stringent program for track maintenance.	Design/ Operation	Contractor	Monthly	Contractor	Contractor	During operation	Condition of design-build contract	Impact GEO#4: Unstable Soils Resulting in On-Site or Off-Site Slumps and Small Slope Failures
GEO-IAMF#6	Geology and Soils	Prior to construction, the Contractor will document through issuance of a technical memorandum how the following guidelines and standards have been incorporated into facility design and construction: ▪ 2015 AASHTO Load and Resistance Factor Bridge Design Specifications and the 2015 AASHTO Guide Specifications for Load and Resistance Factor Seismic Bridge Design, or their most recent versions. These documents provide guidance for characterization of soils, as well as methods to be used in the design of bridge foundations and structures, retaining walls, and buried structures. These design specifications would provide minimum specifications for evaluating the seismic response of the soil and structures. ▪ Federal Highway Administration Circulars and Reference Manuals: These documents provide detailed guidance on the characterization of geotechnical conditions at sites, methods for performing foundation design, and recommendations on foundation construction. These guidance documents include methods for designing retaining walls used for retained cuts and retained fills, foundations for elevated structures, and at-grade segments. Some of the documents include guidance on methods of mitigating geologic hazards that are encountered during design. ▪ American Railway Engineering and Maintenance-of-Way Association Manual: These guidelines deal with rail systems. Although they cover many of the same general topics as AASHTO, they are more focused on best practices for rail systems. The manual includes principles, data, specifications, plans, and economics pertaining to the engineering, design, and construction of railways.	Design/ Construction/ Operation	Design/ Reporting	Annual	Contractor	Contractor	At incorporation or completion of design/during monthly construction reporting	Implementation of guidelines during design, construction, and operation phases	Impact GEO#1: Soil Erosion Impact GEO#2: Moderate to High Shrink-Swell Potential Impact GEO#3: Moderately to Highly Corrosive Soils Impact GEO#4: Unstable Soils Resulting in On-Site or Off-Site Slumps and Small Slope Failures Impact GEO#5: Soil Settlement at Structures or along Trackway Impact GEO#6: Slope Failure Impact GEO#7: Seismic-Induced Ground Shaking and Secondary Seismic Hazards Impact GEO#8: Difficult Excavations due to Hardpan and Shallow Groundwater Impact GEO#9: Loss of Availability of Mineral or Energy Resources and Increase in Safety Risk

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		▪ California Building Code: The code is based on 2015 IBC. This code contains general building design and construction requirements relating to fire and life safety, structural safety, and access compliance. ▪ IBC and ASCE-7: These codes and standards provide minimum design loads for buildings and other structures. They would be used for the design of the maintenance facilities and stations. Sections in IBC and ASCE-7 provide minimum requirements for geotechnical investigations, levels of earthquake ground shaking, minimum standards for structural design, and inspection and testing requirements. ▪ Caltrans Design Standards: Caltrans has specific minimum design and construction standards for all aspects of transportation system design, ranging from geotechnical explorations to construction practices. These amendments provide specific guidance for the design of deep foundations that are used to support elevated structures, for design of mechanically stabilized earth (MSE) walls used for retained fills, and for design of various types of cantilever (e.g., soldier pile, secant pile, and tangent pile) and tie-back walls used for retained cuts. ▪ Caltrans Construction Manuals: Caltrans has a number of manuals including Field Guide to Construction Dewatering, Caltrans Construction Site BMPs Manual and Construction Site BMP Field Manual and Troubleshooting Guide. These provide guidance and best management practices for dewatering options and management, erosion control and soil stabilization, non-stormwater management, and waste management at construction sites. ▪ ASTM: ASTM has developed standards and guidelines for all types of material testing—from soil compaction testing to concrete-strength testing. The ASTM standards also include minimum performance requirements for materials.								due to Disruption of Subsurface Oil and Gas Resources Impact GEO#10: Seismic-Induced Ground Shaking and Secondary Seismic Hazards (Operations) Impact HYD#3: Temporary Surface Water Quality Impacts
GEO-IAMF#7	Engage a Qualified Paleontological Resources Specialist	Prior to the 90 percent design milestone for each construction package (CP) within the project section, the Contractor will retain a Paleontological Resources Specialist (PRS) responsible for: ▪ Reviewing the final design for the CP, and ▪ Developing a detailed Paleontological Resources Monitoring and Mitigation Plan (PRMMP) for the CP The PRS will be responsible for implementing the PRMMP, including development and delivery of WEAP training, supervision of Paleontological Resource Monitors (PRMs), and evaluation and treatment of finds, if any, and preparation o f a final paleontological mitigation report, per the PRMMP and for each CP. A Supervising Paleontologist, who is also a PRS, will be retained and act as Lead Paleontologist for the CP if there are multiple	Design	Contractor would retain paleontological resources specialist	Prior 90 percent design milestone for each CP	Contractor	Contractor	Prior to 90 percent design milestone for each CP	Condition of design-build contract	Impact PAL#1: Common Impacts on Paleontological Resources due to Construction

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		PRSs retained for a single CP. Retention of PRS staff will occur in a timely manner, in advance of the 90 percent design milestone for each CP, such that the PRS is on board and can review the 90 percent design submittal without delay when it becomes available. If feasible, the same PRS would be responsible for all CPs within a given project section. All PRS staff will meet or exceed the qualifications for a Principal Paleontologist as defined in the Caltrans current Standard Environmental Reference, Chapter 8 (Caltrans 2014). Appointment of PRS staff will be subject to review and approval by the Authority.								
GEO-IAMF#8	Perform Final Design Review and Triggers Evaluation	For each CP within the project section, the responsible PRS will evaluate the 90 percent design submittal to identify the portions of the CP that would involve work in paleontologically sensitive geologic units (either at the surface or in the subsurface), based on findings of the final Paleontological Resources Technical Report prepared for the project section. Evaluation would consider the location, areal extent, and anticipated depth of ground disturbance, the construction techniques that are planned/proposed, and the geology (i.e., location of geologic units with high paleontological resources) of the CP and vicinity. The evaluation and resulting recommendations would be consistent with guidance in the Society of Vertebrate Paleontology (SVP) Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources (SVP Impact Mitigation Guidelines Revision Committee 2010), the SVP Conditions of Receivership for Paleontologic Salvage Collections (SVP Conformable Impact Mitigation Guidelines Committee 1996), and relevant guidance from Chapter 8 of the current Caltrans Standard Environmental Reference (Caltrans 2014). The purpose of the Final Design Review and Triggers Evaluation IAMF would be to develop specific language detailing the location and duration of paleontological monitoring and other requirements for paleontological resources applicable to each CP within the Project Section. Paleontological protection requirements identified through the Final Design Review and Triggers Evaluation IAMF will be recorded in a concise technical memorandum (“Final Design Review Requirements for Paleontological Resources Protection”), which would then be incorporated in full detail into the PRMMP for each CP. Those portions of the CP requiring paleontological monitoring will also be clearly delineated in the project construction documents for each CP.	Design	Reporting	Each CP	Contractor	Contractor	CP reporting	Condition of design-build contract	Impact PAL#1: Common Impacts on Paleontological Resources due to Construction
GEO-IAMF#9	Prepare and Implement Paleontological Resources Monitoring	Following the Final Design Review and Triggers Evaluation for each CP, the PRS will develop a CP-specific PRMMP. For greater efficiency, PRMMPs may be written such that they cover more than one CP, as long as	Design	Reporting	Each CP	Contractor	Contractor	CP reporting	Condition of design-build contract	Impact PAL#1: Common Impacts on Paleontological Resources due to Construction.

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
	and Mitigation Plan (PRMMP)	the specific requirements of the IAMFs are satisfied explicitly and in detail for each CP included. The PRMMP for each CP will incorporate the findings of the Design Review and Triggers Evaluation for that CP and would be consistent with the SVP Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources (SVP Impact Mitigation Guidelines Revision Committee 2010), the SVP Conditions of Receivership for Paleontologic Salvage Collections (SVP Conformable Impact Mitigation Guidelines Committee 1996), and relevant guidance from Chapter 8 of the current Caltrans Standard Environmental Reference (Caltrans 2014). As such, the PRMMP would provide for at least the following: ▪ Implementation of the PRMMP by qualified personnel, including the following positions: – Paleontological Resource Specialist: The PRS will be required to meet or exceed Principal Paleontologist Qualifications per Chapter 8 of the current Caltrans Standard Environmental Reference (Caltrans 2014). The Supervising Paleontologist may, but not necessarily, be the PRS who prepares the PRMMP. – Paleontological Resources Monitors: The PRS would will be required to meet or exceed Paleontological Monitor qualifications per Chapter 8 of the current Caltrans Standard Environmental Reference (Caltrans 2014). ▪ Development of pre-construction and construction-period coordination procedures and communications protocols. ▪ Evaluation as to whether a pre-construction survey by qualified personnel is warranted for the CP. In general, pre-construction surveys are beneficial if there is a strong possibility that significant paleontological resources (e.g., concentrations of vertebrate fossils) are exposed at the ground surface and would be destroyed during the initial clearing and grubbing phase of earthwork. Such a determination can usually be made during preparation of the paleontological resources technical report. ▪ Requirements for paleontological monitoring by qualified PRMs of all ground-disturbing activities known to affect, or potentially affect, highly sensitive geologic units and for ground-disturbing activities affecting other geologic units in any areas where the PRS considers it warranted based on the findings of the paleontological resources technical report or any pre-construction surveys. In all areas of the CP subject to monitoring, monitoring would initially be conducted full-time for all ground-disturbing activities. However, the PRMMP may provide for monitoring							

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		frequency in any given location to be reduced once approximately 50 percent of the ground-disturbing activity in locations has been completed, if the reduction is appropriate based on the implementing PRS's professional judgment in consideration of actual site conditions. ▪ Provisions, if recommended by the PRS for paleontological monitoring of specific construction drilling operations. In general, small-diameter (i.e., less than 18 inches) drilling operations or drilling activities operations using bucket augers tend to pulverize impacted sediments and any contained fossils and are typically not monitored. The section in the PRMMP addressing monitoring program for drilling operations would rely, in part, on the information supplied by the CP design and geotechnical teams but would also take into consideration of the nature, depth, and location of drilling needed, and the anticipated equipment and staging configurations. ▪ Provisions for in-progress documentation of monitoring (and, if applicable, salvage/recovery operations) via "construction dailies" or a similar approved means. ▪ Provisions for a "stop work, evaluate, and treat appropriately" response in the event of a known or potential paleontological discovery, including finds in highly sensitive geologic units, as well as finds, if any, in geologic units identified as less sensitive, or nonsensitive, for paleontological resources. ▪ Provisions for sampling and recovery of unearthed fossils consistent with SVP Standard Procedures (SVP Impact Mitigation Guidelines Revision Committee 2010) and the SVP Conditions of Receivership (SVP Conformable Impact Mitigation Guidelines Committee 1996). Recovery procedures would provide for recovery of both macrofossils and microfossils. ▪ Provisions for acquiring a repository agreement from an approved regional repository for the curation, care, and storage of recovered materials, consistent with the SVP Conditions of Receivership (SVP Conformable Impact Mitigation Guidelines Committee 1996). If more than one repository institution is designated, separate repository agreements must be provided. ▪ Provisions for preparation of a final monitoring and mitigation report that meets the requirements of the Caltrans Standard Environmental Reference Chapter 8 provisions for the Paleontological Monitoring Report and Paleontological Stewardship Summary (Caltrans 2014).								

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		▪ Provisions for the preparation, identification, and analysis and curation of fossil specimens and data recovered, consistent with the SVP Conditions of Receivership (SVP Conformable Impact Mitigation Guidelines Committee 1996) and any specific requirements of the designated repository institution(s).								
GEO-IAMF#10	Provide Worker Environmental Awareness (WEAP) Training for Paleontological Resources	Prior to groundbreaking for each CP within the project section, the Contractor will provide paleontological resources WEAP training delivered by the PRS. All management and supervisory personnel and construction workers involved with ground-disturbing activities will be required to take this training before beginning work on the project. Refresher training would also be made available to management and supervisory personnel and workers as needed, based on the judgment of the PRS. At a minimum, paleontological resources WEAP training will include information on: ▪ The coordination between construction staff and paleontological staff, ▪ The construction and paleontological staff roles and responsibilities in implementing the PRMMP, ▪ The possibility of encountering fossils during construction, ▪ The types of fossils that may be seen and how to recognize them, and ▪ The proper procedures in the event fossils are encountered, including the requirement to halt work in the vicinity of the find and procedures for notifying responsible parties in the event of a find. Training materials and formats may include, but are not necessarily limited to, in-person training, prerecorded videos, posters, and informational brochures that provide contacts and summarize procedures in the event paleontological resources are encountered. WEAP training contents would be subject to review and approval by the Authority. Paleontological resources WEAP training may be provided concurrently with cultural resources WEAP training. Upon completion of any WEAP training, the Contractor will require workers to sign a form stating that they attended the training and understand and would comply with the information presented. Verification of paleontological resources WEAP training will be provided to the Authority by the Contractor.	Pre-construction	Training program/ Reporting	Annual (training)/ Monthly (reporting)	Contractor/ Authority	Contractor/ Authority	Annual (training)/ monthly (reporting)	Condition of design-build contract	Impact PAL#1: Common Impacts on Paleontological Resources due to Construction
GEO-IAMF#11	Halt Construction, Evaluate, and Treat if Paleontological Resources Are Found	Consistent with the PRMMP, if fossil materials are discovered during construction, regardless of the individual making the discovery, all activity in the immediate vicinity of the discovery will halt and the find would be protected from further disturbance. If the discovery is made by someone other than the PRS or	Construction	Reporting	Daily logs during active monitoring	Contractor	Contractor	Weekly reporting (if resource is identified during construction)	PRMMP, WEAP	Impact PAL#1: Common Impacts on Paleontological Resources due to Construction

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		PRM(s), the person who made the discovery would immediately notify construction supervisory personnel, who would in turn notify the PRS. Notification to the PRS would take place promptly (prior to the close of work the same day as the find), and the PRS would evaluate the find and prescribe appropriate treatment as soon as feasible. Work may continue on other portions of the CP while evaluation (and, if needed, treatment) takes place, as long as the find can be adequately protected in the judgment of the PRS. If the PRS determines that treatment (i.e., recovery and documentation) of unearthed fossil(s) is warranted, such treatment and any required reporting would proceed consistent with the PRMMP. The Contractor would be responsible for ensuring prompt and accurate implementation, subject to verification by the Authority. The stop work requirement does not apply to drilling operations because drilling typically cannot be suspended in mid-course. However, if finds are made during drilling, the same notification and other follow-up requirements would apply. The PRS would coordinate with construction supervisory and drilling staff regarding the handling of recovered fossils. The requirements of this IAMF will be detailed in the PRMMP and presented as part of the paleontological resources WEAP training.								
Hazardous Materials and Wastes										
HMW-IAMF#1	Transport of Materials	During construction, the Contractor will comply with applicable state and federal regulations, such as the Resource Conservation and Recovery Act (RCRA), Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Hazardous Materials Release Response Plans and Inventory Law, and the Hazardous Waste Control Act. Prior to construction, the Contractor will provide the Authority with a hazardous materials and waste plan describing responsible parties and procedures for hazardous waste and hazardous materials transport.	Pre-construction/ Construction	Reporting	Monthly	Contractor	Contractor	Weekly record keeping/monthly reporting	Condition of design-build contract	Impact HMW#1: Temporary Effects from the Transport, Use, Storage, and Disposal of Hazardous Materials and Wastes Impact HMW#2: Temporary Effects from Inadvertent Disturbance of Hazardous Materials and Wastes Impact HMW#3: Temporary Effects from Asbestos or Lead Exposure as a Result of Demolition Impact HMW#5: Temporary Effects from Hazardous Materials and Wastes Activities in Proximity to Schools and Recreational Areas Impact HMW#7: Intermittent Effects from the Transport,

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
										Use, Storage, and Disposal of Hazardous Materials and Wastes Impact HYD#3: Temporary Surface Water Quality Impacts Impact SO#7: Temporary Impacts on Children's Health and Safety
HMW-IAMF#2	Permit Conditions	During construction the Contractor will comply with the State Water Resources Control Board Construction Clean Water Act Section 402 General Permit conditions and requirements for transport, labeling, containment, cover, and other BMPs for storage of hazardous materials during construction. Prior to construction, the Contractor will provide the Authority with a hazardous materials and waste plan describing responsible parties and procedures for hazardous waste and hazardous materials transport, containment, and storage BMPs that would be implemented during construction.	Pre-construction/ Construction	Prepare a plan	Prior to construction	Contractor	Contractor	Provide a hazardous materials and waste plan	Condition of design-build contract	Impact HMW#1: Temporary Effects from the Transport, Use, Storage, and Disposal of Hazardous Materials and Wastes
HMW-IAMF#3	Environmental Management System	To the extent feasible, the Authority is committed to identifying, avoiding, and minimizing hazardous substances in the material selection process for construction, operation, and maintenance of the HSR system. The Authority would use an Environmental Management System to describe the process that would be used to evaluate the full inventory of hazardous materials as defined by federal and state law employed on an annual basis and would replace hazardous substances with nonhazardous materials. The Contractor will implement the material substitution recommendation contained in the annual inventory.will	Pre-construction/ Construction	Reporting	Annual	Contractor	Contractor	Annual reporting	Condition of design-build contract	Impact HMW#1: Temporary Effects from the Transport, Use, Storage, and Disposal of Hazardous Materials and Wastes Impact HMW#2: Temporary Effects from Inadvertent Disturbance of Hazardous Materials and Wastes Impact HMW#4: Temporary Effects from Construction on or near Potential Environmental Concern Sites Impact HYD#5: Temporary Groundwater Quality and Volume Impacts Impact HYD#10: Intermittent Permanent Surface Water Quality Impacts
HMW-IAMF#4	Spill Prevention	Prior to construction (any ground-disturbing activities), the Contractor will prepare a Construction Management Plan addressing spill prevention. A Spill Prevention, Control, and Countermeasure plan (or Soil Prevention and	Pre-construction/ Construction	Reporting	As needed	Contractor	Contractor	Reporting as needed	Condition of design-build contract	Impact HMW#1: Temporary Effects from the Transport, Use, Storage, and Disposal of Hazardous Materials and Wastes

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		Response Plan if the total above-ground oil storage capacity is less than 1,320 gallons in storage containers greater than or equal to 55 gallons) shall prescribe BMPs to follow to prevent hazardous material releases and clean-up of any hazardous material releases that may occur. The plans would be prepared and submitted to the Project Construction Manager on behalf of the Authority and will be implemented during construction.								Impact HMW#4: Temporary Effects from Construction on or near Potential Environmental Concern Sites Impact HMW#5: Temporary Effects from Hazardous Materials and Wastes Activities in Proximity to Schools and Recreational Areas Impact HMW#6 Temporary Effects Associated with Risks during Construction on or near Landfills and Oil and Gas Wells Impact HYD#3: Temporary Surface Water Quality Impacts Impact HYD#5: Temporary Groundwater Quality and Volume Impacts Impact HYD#10: Intermittent Permanent Surface Water Quality Impacts Impact SO#7: Temporary Impacts on Children's Health and Safety
HMW-IAMF#5	Undocumented Contamination	Prior to construction, the Contractor will prepare a CMP addressing provisions for the disturbance of undocumented contamination. The plan shall be submitted to the Authority for review and approval. Undocumented contamination could be encountered during construction activities and the Contractor will work closely with local agencies to resolve any such encounters and address necessary clean-up or disposal. Copies of all required hazardous material documentation will be provided within 30 days to the Authority.	Pre-construction/ Construction	Reporting	As needed	Contractor	Contractor	Reporting as needed	Condition of design-build contract	Impact HMW#2: Temporary Effects from Inadvertent Disturbance of Hazardous Materials and Wastes Impact HMW#4: Temporary Effects from Construction on or near Potential Environmental Concern Sites Impact HYD#5: Temporary Groundwater Quality and Volume Impacts

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
HMW-IAMF#6	Demolition Plans	Prior to construction that involves demolition, the Contractor will prepare demolition plans for the safe dismantling and removal of building components and debris. The demolition plans would include a plan for lead and asbestos abatement. The plans will be submitted to the Project Construction Manager on behalf of the Authority for verification that appropriate demolition practices have been followed consistent with federal and state regulations regarding asbestos and lead paint abatement.	Pre-construction/ Construction	Reporting	As needed	Contractor	Contractor	Reporting as needed	Condition of design-build contract	Impact HMW#2: Temporary Effects from Inadvertent Disturbance of Hazardous Materials and Wastes Impact HMW#3: Temporary Effects from Asbestos or Lead Exposure as a Result of Demolition Impact HMW#4: Temporary Effects from Construction on or near Potential Environmental Concern Sites
HMW-IAMF#7	Property Acquisition Phase 1 and Phase 2 Environmental Site Assessments	During the right-of-way acquisition phase, Phase 1 environmental site assessments (ESA) will be conducted in accordance with standard ASTM methodologies to characterize each parcel. The determination of parcels that require a Phase 2 ESA (e.g., soil, groundwater, soil vapor subsurface investigations) would be informed by a Phase 1 ESA and may require coordination with state and local agency officials. If the Phase 2 ESA concludes that the site is impacted, remediation or corrective action (e.g., removal of contamination, in-situ treatment, or soil capping) will be conducted with state and local agency officials (as necessary) and in full compliance with applicable state and federal laws and regulations.	Pre-construction/ Construction	Reporting	Monthly	Contractor	Contractor	Phase 1 report	Condition of design-build contract	Impact HMW#4: Temporary Effects from Construction on or near Potential Environmental Concern Sites
HMW-IAMF#8	Work Barriers	Prior to construction (any ground-disturbing activities), the Contractor will verify to the Authority through preparation of a technical memorandum the use of work barriers. Nominal design variances, such as the addition of a plastic barrier beneath the ballast material to limit the potential release of volatile subsurface contaminants, may be implemented in conjunction with site investigation and remediation.	Pre-construction/ Construction	Reporting	Monthly	Contractor	Contractor	Monthly record keeping	Condition of design-build contract	Impact HMW#4: Temporary Effects from Construction on or near Potential Environmental Concern Sites
HMW-IAMF#9	Landfill	Prior to construction (any ground-disturbing activities), the Contractor will verify to the Authority through preparation of a technical memorandum that methane protection measures would be implemented for all work within 1,000 feet of a landfill, including gas detection systems and personnel training. This would be undertaken pursuant to State of California Title 27, Environmental Protection – Division 2, Solid Waste, and the hazardous materials best management practices plan.	Pre-construction/ Construction	Reporting	Monthly	Contractor	Contractor	Monthly record keeping	Condition of design-build contract	Impact HMW#6 Temporary Effects Associated with Risks during Construction on or near Landfills and Oil and Gas Wells
HMW-IAMF#10	Hazardous Materials Plans	Prior to Operations and Maintenance activities, the Authority will prepare hazardous materials monitoring plans. These would use as a basis sources such as a hazardous materials business plan as defined in Title 19 California Code of Regulations and a Spill Prevention,	Post-construction	Prepare plans	Prior to operations	Authority	Authority	Prepare hazardous materials monitoring plans	Condition of design-build contract	Impact HMW#4: Temporary Effects from Construction on or near Potential Environmental Concern Sites

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		Control, and Countermeasure plan.								Impact HMW#7: Intermittent Effects from the Transport, Use, Storage, and Disposal of Hazardous Materials and Wastes
HMW-IAMF#11	Hazardous Minerals	Prior to construction, the Contractor will prepare a CMP addressing how the Contractor would minimize or avoid impacts related to hazardous minerals (i.e., radon, mercury, and naturally occurring asbestos) during construction. The CMP would be submitted to the Authority for review and approval. The CMP will include appropriate provisions for handling hazardous minerals including but not limited to dust control, control of soil erosion and water runoff, and testing and proper disposal of excavated material.	Pre-construction/ Construction	Reporting	As needed	Contractor	Contractor	Reporting as needed	Condition of design-build contract	Impact HMW#1: Temporary Effects from the Transport, Use, Storage, and Disposal of Hazardous Materials and Wastes
HMW-IAMF#12	Gas Monitoring	Prior to construction, the Contractor will prepare a CMP addressing how gas monitoring would be incorporated into construction BMPs. The CMP would be submitted to the Authority for review and approval. Hazards related to potential migration of hazardous gases due to the presence of known oil and gas fields, areas of active or historic landfills, or other subsurface sources can be reduced or eliminated by following strict federal and state Occupational Safety and Health Administration (OSHA/Cal-OSHA) regulatory requirements for excavations, and by consulting with other agencies as appropriate, such as the Department of Conservation (Division of Oil and Gas) and the California Environmental Protection Agency, Department of Toxic Substances Control, regarding known areas of concern. Practices would include using safe and explosion-proof equipment during construction and testing for gases regularly. Installation of passive or active gas venting systems, gas collection systems, as well as active monitoring systems and alarms would be required in underground construction areas and facilities where subsurface gases are present. Installing gas-detection systems allows for monitoring of the effectiveness of these systems.	Pre-construction/ Construction	Reporting	As needed	Contractor	Contractor	Reporting as needed	Condition of design-build contract	Impact HMW#6: Temporary Effects Associated with Risks during Construction on or near Landfills and Oil and Gas Wells
Safety and Security										
SS-IAMF#1	Construction Safety Transportation Management Plan	Prior to construction (any ground-disturbing activity), the Contractor will prepare for submittal to the Authority a Construction Safety Transportation Management Plan. The plan would describe the Contractor's coordination efforts with local jurisdictions for maintaining emergency vehicle access. The plan would also specify the Contractor's procedures for implementing temporary road closures, including access to residences and businesses during construction, lane closures, signage and flag persons, temporary detour provisions, alternative bus and delivery routes, emergency vehicle access, and alternative	Pre-construction/ Construction	Compliance reporting	Monthly	Contractor	Contractor	Monthly reporting	Condition of design-build contract	Impact SS#1: Temporary Interference with Emergency Response Times Impact SS#4: Temporary Motor Vehicle, Pedestrian, and Bicycle Safety Risks Impact SO#7:

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		access locations. The Contractor will prepare and submit monthly reports to the Authority documenting construction transportation plan implementation activities for compliance monitoring.								Temporary Impacts on Children's Health and Safety
SS-IAMF#2	Safety and Security Management Plan	Sixty days after receiving from the Authority a construction notice to proceed, the Contractor will provide the Authority with a technical memorandum documenting how the following requirements, plans, programs and guidelines were considered in design, construction, and eventual operation to protect the safety and security of construction workers and users of the HSR. The Contractor will be responsible for implementing all construction-related safety and security plans and the Authority will be responsible for implementing all safety and security plans related to HSR operation. ▪ Workplace worker safety is generally governed by the Occupational Health and Safety Act of 1970, which established the OSHA. OSHA establishes standards and oversees compliance with workplace safety and reporting of injuries and illnesses of employed workers. In California, OSHA enforcement of workplace requirements is performed by Cal OSHA. Under Cal OSHA regulations, as of July 1, 1991, every employer must establish, implement, and maintain an injury and illness prevention program. ▪ The Authority has adopted a Safety and Security Management Plan to guide the safety and security activities, processes, and responsibilities during design, construction and implementation phases of the project to protect the safety and security of construction workers and the public. A Systems Safety Program Plan and a System Security Plan would be implemented prior to the start of revenue service to guide the safety and security of the operation of the HSR system. ▪ Prior to construction, the Contractor will provide the Authority with a Safety and Security Management Plan documenting how they would implement the Authority's safety and security requirements within their project scope. ▪ Implement site-specific health and safety plans and site-specific security plans to establish minimum safety and security guidelines for contractors of, and visitors to, construction projects. Contractors would be required to develop and implement site-specific measures that address regulatory requirements to protect human health and property at construction sites. ▪ Preparation of a Valley fever action plan that includes: (1) information on causes, preventative measures, symptoms, and treatments for Valley fever to individuals who could potentially be exposed	Pre-construction/ Construction	Reporting	Sixty days after receiving a construction notice to proceed	Contractor/ Authority	Contractor/ Authority	Sixty days after receiving a construction notice to proceed	Condition of design-build contract	Impact SS#3: Temporary Exposure to Construction Site Hazards Impact SS#7: Temporary Exposure to Valley Fever Impact SS#8: Continuous Permanent Interference with Emergency Response Impact SS#9: Continuous Permanent Exposure to Wildfire Hazards Impact SS#11: Continuous Permanent Exposure to High-Risk Facilities. Impact SS#12: Continuous Permanent Criminal and Terrorist Activity Impact GEO#9: Loss of Availability of Mineral or Energy Resources and Increase in Safety Risk due to Disruption of Subsurface Oil and Gas Resources Impact HYD#14: Continuous Permanent Exposure to Flood Hazards from Seismic Events Impact SO#7: Temporary Impacts on Children's Health and Safety

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		through construction activities (i.e., construction workers, monitors, managers, and support personnel); (2) continued outreach and coordination with California Department of Public Health; (3) coordination with county departments of public health to ensure that the above-referenced information concerning Valley fever is readily available to nearby residents, schools, and businesses and to obtain area information about Valley fever outbreaks and hotspots; and (4) provide a qualified person dedicated to overseeing implementation of the Valley fever prevention measures to encourage a culture of safety of the contractors and subcontractors. The Valley Fever Health and Safety designee will coordinate with the county Public Health Officer and oversee and manage the implementation of Valley Fever control measures. The Valley Fever Health and Safety designee will be responsible for ensuring the implementation of measures in coordination with the county Public Health Officer. Medical information would be maintained following applicable and appropriate confidentiality protections. The Valley Fever Health and Safety designee, in coordination with the county Public Health Officer, would determine what measures would be added to the requirements for the Safety and Security Management Plan regarding preventive measures to avoid Valley fever exposure. Measures shall include, but are not limited to, the following: (1) train workers and supervisors on how to recognize symptoms of illness and ways to minimize exposure, such as washing hands at the end of shifts; (2) provide washing facilities nearby for washing at the end of shifts; (3) provide vehicles with enclosed, air conditioned cabs and make sure workers keep the windows closed; (4) equip heavy equipment cabs with high-efficiency particulate air (HEPA) filters; and (5) make NIOSH-approved respiratory protection with particulate filters as recommended by the California Department of Public Health available to workers who request them. ▪ System safety program plans incorporate FRA requirements and are implemented upon Authority approval. FRA's Systems Safety Program Plans requirements would be determined in FRA's new System Safety Regulation (49 C.F.R. 270). ▪ Rail systems must comply with FRA requirements for tracks, equipment, railroad operating rules and practices, passenger safety, emergency response, and passenger equipment safety standards found in 49 C.F.R. Parts 200-299. ▪ The *HSR Urban Design Guidelines* (Authority 2011) require implementing the principles of crime								

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		prevention through environmental design. The Contractor will consider four basic principles of crime prevention through environmental design during station design and site planning: (1) territoriality (design physical elements that express ownership of the station or site); (2) natural surveillance (arrange physical features to maximize visibility); (3) improved sightlines (provide clear views of surrounding areas); and (4) access control (provide physical guidance for people coming and going from a space). The HSR design includes emergency access to the rail right-of-way, and elevated HSR structure design includes emergency egress points. ▪ Implement fire/life safety and security programs that promote fire and life safety and security in system design, construction, and implementation. The fire and life safety program is coordinated with local emergency response organizations to provide them with an understanding of the rail system, facilities, and operations, and to obtain their input for modifications to emergency response operations and facilities, such as evacuation routes. The Authority would establish fire/life safety and security committees throughout the HSR section. ▪ Implement system security plans that address design features intended to maintain security at the stations within the track right-of-way, at stations, and onboard trains. A dedicated police force would ensure that the security needs of the HSR system are met. ▪ The design standards and guidelines require emergency walkways on both sides of the tracks for both elevated and at-grade sections and the provision of appropriate space as defined by fire and safety codes along at-grade sections of the alignment to allow for emergency response access. ▪ Implement standard operating procedures and emergency operating procedures, such as the FRA-mandated Roadway Worker Protection Program to address the day-to-day operation and emergency situations that would maintain the safety of employees, passengers, and the public.								
SS-IAMF#3	Hazard Analyses	The Authority's hazard management program includes the identification of hazards, assessment of associated risk, and application of control measures (mitigation) to reduce the risk to an acceptable level. Hazard assessment includes a preliminary hazard analysis and threat and vulnerability assessment. ▪ The Authority's programmatic preliminary hazard analyses are developed in conformance with the FRA's *Collison Hazard Analysis Guide: Commuter and Intercity Passenger Service* (FRA 2007) and the U.S. Department of Defense's *System Safety*	Pre-construction/ Construction	Reporting	Monthly	Authority	Authority	Monthly reporting	Condition of design-build contract	Impact SS#11: Continuous Permanent Exposure to High-Risk Facilities Impact SS#12: Continuous Permanent Criminal and Terrorist Activity Impact SS#13: Continuous Permanent Safety Hazard to

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		Program Plan (MIL-STD-882) to identify and determine the facility hazards and vulnerabilities so that they can be addressed—and either eliminated or minimized—by the design. ▪ Threat and vulnerability assessments establish provisions for the deterrence and detection of, as well as the response to, criminal and terrorist acts for rail facilities and system operations. Provisions include right-of-way fencing, intrusion detection, security lighting, security procedures and training, and closed-circuit televisions. Intrusion-detection technology could also alert to the presence of inert objects, such as toppled tall structures or derailed freight trains, and stop HSR operations to avoid collisions. ▪ During design and construction, the Contractor would conduct site-specific preliminary hazard analysis and threat and vulnerability assessments to apply the programmatic work to their specific project designs. The Authority's safety and security committees would be responsible for implementing the recommendations contained in the hazard analysis during HSR operation.								Schools Impact HYD#14: Continuous Permanent Exposure to Flood Hazards from Seismic Events
SS-IAMF#4	Oil and Gas Wells	Prior to ground-disturbing activities, the Contractor will identify and inspect all active and abandoned oil and gas wells within 200 feet of the HSR tracks. Any active wells would be abandoned and relocated by the Contractor in accordance with the California Department of Conservation, Division of Oil, and Gas and Geothermal Resources (DOGGR) standards in coordination with the well owners. In the event that relocated wells do not attain the current production rates of the now-abandoned active wells, the Authority would be responsible for compensating the well owner for lost production. All abandoned wells within 200 feet of the HSR tracks would be inspected and re-abandoned, as necessary, in accordance with DOGGR standards and in coordination with the well owner. The Contractor would provide the Authority with documentation that the identification and inspection of the wells has occurred prior to construction.	Pre-construction	Reporting	Monthly	Authority	Authority	Monthly reporting	Condition of design-build contract	Impact SS#3: Temporary Exposure to Construction Site Hazards Impact SS#11: Continuous Permanent Exposure to High-Risk Facilities Impact GEO#9: Loss of Availability of Mineral or Energy Resources and Increase in Safety Risk due to Disruption of Subsurface Oil and Gas Resources
Socioeconomics and Communities										
SO-IAMF#1	Construction Management Plan	Prior to construction, the Contractor will prepare a CMP providing measures that minimize impacts on low-income households and minority populations. The plan will be submitted to the Authority for review and approval. The plan would include actions pertaining to communications, visual protection, air quality, safety controls, noise controls, and traffic controls to minimize impacts on low-income households and minority populations. The plan would verify that property access is maintained for local businesses, residences, and emergency services. This plan would include maintaining customer and vendor access to local businesses throughout construction by using signs to instruct customers about access to	Design/ Construction	Reporting	Monthly	Contractor	Contractor	At incorporation or completion of design/monthly reporting (during construction)	Condition of design-build contract	Impact SO#1: Temporary Impacts on Communities—Community Cohesion Impact SO#2: Permanent Impacts on Communities—Community Cohesion Impact SO#14: Permanent Impacts on Agricultural Economy

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		businesses during construction. In addition, the plan would include efforts to consult with local transit providers to minimize impacts on local and regional bus routes in affected communities.								Impact LU#2: Temporary Indirect Impacts on Land Use Patterns Related to Areas Used for Construction
SO-IAMF#2	Compliance with Uniform Relocation Assistance and Real Property Acquisition Policies Act	The Authority must comply with the Uniform Act. The provisions of the Uniform Act, a federally mandated program, would apply to all acquisitions of real property or displacements of persons resulting from this federally assisted project. It was created to provide for fair and equitable treatment of all affected persons. Additionally, the Fifth Amendment of the U.S. Constitution provides that private property may not be taken for a public use without payment of "just compensation." The Uniform Act requires that the owning agency provide notification to all affected property owners of the agency's intent to acquire an interest in their property. This notification includes a written offer letter of just compensation. A right-of-way specialist is assigned to each property owner to assist him or her through the acquisition process. The Uniform Act also provides benefits to displaced individuals to assist them financially and with advisory services related to relocating their residence or business operation. Benefits are available to both owner occupants and tenants of either residential or business properties. The Uniform Act requires provision of relocation benefits to all eligible persons regardless of race, color, religion, sex, or national origin. Benefits to which eligible owners or tenants may be entitled are determined on an individual basis and explained in detail by an assigned right-of-way specialist. The California Relocation Assistance Act essentially mirrors the Uniform Act and also provides for consistent and fair treatment of property owners. However, because the Project would receive federal funding, the Uniform Act takes precedence. Owners of private property have federal and state constitutional guarantees that their property would not be acquired or damaged for public use unless owners first receive just compensation. Just compensation is measured by the "fair market value," where the property value is considered to be the highest price that would be negotiated on the date of valuation. The value must be agreed upon by a seller who is willing, not obliged to sell, but under no particular or urgent necessity and by a buyer who is ready, willing, and able to buy but under no particular necessity. Both the owner and the buyer must deal with the other with the full knowledge of all the uses and purposes for which the property is reasonably adaptable and available (Code of Civil Procedure Section 1263.320a). More detailed information about how the Authority plans to	Design/ Construction/ Operation	Reporting and meeting with interested parties	Monthly	Authority	Authority	Monthly reporting and record keeping	Compliance with acts, creation of ombudsman office and reporting	Impact SO#2: Permanent Impacts on Communities—Community Cohesion Impact SO#3: Displacements and Relocations of Residences Impact SO#4: Displacements and Relocations of Commercial and Industrial Businesses Impact SO#5: Displacements and Relocations of Agricultural Operations Impact SO#20: Permanent Impacts on Agricultural Economy

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		comply with the Uniform Act and the California Relocation Assistance Act is provided in the following three detailed relocation assistance documents modeled after Caltrans versions: ▪ Your Rights and Benefits as a Displacee under the Uniform Relocation Assistance Program (Residential) ▪ Your Rights and Benefits as a Displacee under the Uniform Relocation Assistance Program (Mobile Home) ▪ Your Rights and Benefits as a Displaced Business, Farm, or Nonprofit Organization under the Uniform Relocation Assistance Program								
SO-IAMF#3	Relocation Mitigation Plan	Before any acquisitions occur, the Authority will develop a Relocation Mitigation Plan, in consultation with affected cities and counties and property owners. In addition to establishing a program to minimize the economic disruption related to relocation, the Relocation Mitigation Plan will be written in a style that also enables it to be used as a public-information document. The Relocation Mitigation Plan would be designed to meet the following objectives: ▪ Provide affected property and business owners and tenants a high level of individualized assistance in situations when acquisition is necessary and the property owner desires to relocate the existing land use. ▪ Coordinate relocation activities with other agencies acquiring property resulting in displacements in the study area to provide for all displaced persons and businesses to receive fair and consistent relocation benefits. ▪ Make a best effort to minimize the permanent closure of businesses and nonprofit agencies as a result of property acquisition. ▪ Within the limits established by law and regulation, minimize the economic disruption caused to property owners by relocation. ▪ In individual situations, where warranted, consider the cost of obtaining the entitlement permits necessary to relocate to a suitable location and take those costs into account when establishing the fair market value of the property. ▪ Provide those business owners who require complex permitting with regulatory compliance assistance. The Relocation Mitigation Plan would include the following components: ▪ A description of the appraisal, acquisition, and relocation process as well as a description of the activities of the appraisal and relocation specialists.	Design/ Construction	Prepare plan	Prior to acquisitions	Authority	Authority	Prior to acquisitions	Condition of design-build contract	Impact SO#2: Permanent Impacts on Communities—Community Cohesion Impact SO#3: Displacements and Relocations of Residences

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		▪ A means of assigning appraisal and relocation staff to affected property owners, tenants, or other residents on an individual basis. ▪ Individualized assistance to affected property owners, tenants, or other residents in applying for funding, including research to summarize loans, grants, and federal aid available, and research areas for relocation. ▪ Creation of an ombudsman's position to act as a single point of contact for property owners, residents, and tenants with questions about the relocation process. The ombudsman would also act to address concerns about the relocation process as it applies to the individual situations of property owners, tenants, and other residents.								
Land Use and Development										
LU-IAMF#1	Station Area Planning and Local Agency Coordination	Prior to operations and maintenance activities, the Authority will prepare a technical memorandum for each station describing how multimodal connectivity was addressed. The Authority has a strategy for long-term coordination with local transit agencies and cities to develop transit connectivity plans for HSR station areas and for connectivity to neighboring communities where high HSR ridership is projected. The Authority expects HSR and connectivity to reduce the overall demand for parking at stations by facilitating alternative methods of station access. The strategy includes the following components: ▪ Design and construct stations to enhance pedestrian, bicycle and other shared ride access. Mobility features such as walking paths, bicycle lockers, and drop-off zones would be encouraged to enhance access. ▪ Work with local transit agencies around stations to provide easy transfer and fare payment options and install wayfinding signs, maps, and other techniques to identify local connections within HSR stations. ▪ In coordination with station cities, identify street enhancements for pedestrian and bicycle access such as improved sidewalks, multiuse pathways, trails, bike lanes, and shared parking sites. ▪ Provide station space for taxis, private buses, and shared rides.	Post-construction	Reporting	For each station	Authority	Authority	Authority would prepare a technical memorandum for each station	Condition of design-build contract	Impact LU#5: Permanent Conversion of Existing Land Uses to Transportation or Electrical Utility Resulting in Adjacent Incompatible Uses
Agricultural Farmland										
AG-IAMF#1	Restoration of Important Farmland Used for Temporary Staging Areas	Prior to any ground-disturbing activities at the site of a temporary construction staging area located on Important Farmland, the Contractor will prepare a restoration plan addressing specific actions, sequence of implementation, parties responsible for implementation, and successful achievement of restoration for temporary impacts. Actions shall include removing and stockpiling the top 18 inches of	Pre-construction	Reporting	Monthly	Contractor	Contractor	At incorporation or completion of design	Condition of design-build contract	Impact AG#1: Temporary Use of Important Farmland Impact LU#1: Temporary Direct Impacts on Land Use Patterns Related to Areas Used for

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		soil for replacement on-site during restoration activities. Before beginning construction use of sites on Important Farmland, the Contractor will submit the restoration plan to the Authority for review and obtain Authority (and if applicable, the landowner) approval. The restoration plan shall include time-stamped photo documentation of the pre-construction conditions of all temporary staging areas. All construction access, mobilization, material laydown, and staging areas on Important Farmlands would be returned to a condition equal to the pre-construction staging condition. This requirement is included in the design-build construction contract requirements.								Construction Impact LU#2: Temporary Indirect Impacts on Land Use Patterns Related to Areas Used for Construction
AG-IAMF#2	Permit Assistance	Prior to disturbance-causing activities affecting any segment of a confined animal facility, the Authority will assign a representative to act as a single point of contact to assist each confined animal facility owner during the process of obtaining new or amended permits or other regulatory compliance necessary to the continued operation or relocation of the facility. The Authority would consider and may provide compensation when acquisition of a confined animal site would require either relocation of the facility or amendment of its existing regulatory permits. The Authority would create a permit assistance center for landowners and operators whose operations would be out of compliance with permits because of the HSR. This permit center would focus on helping the permit holders modify or obtain any new permits that are required because of the HSR impacts.	Pre-construction	Reporting	Monthly	Authority	Authority representative	At incorporation or completion of design/monthly reporting during construction	Condition of design-build contract	Impact SO#2: Permanent Impacts on Communities—Community Cohesion Impact SO#5: Displacements and Relocations of Agricultural Operations Impact SO#14: Permanent Impacts on Agricultural Economy
AG-IAMF#3	Farmland Consolidation Program	The Authority will establish and administer a farmland consolidation program to sell remnant parcels to neighboring landowners for consolidation with adjacent farmland properties. In addition, the program would assist the owners of remnant parcels in selling those remnants to adjacent landowners, upon request. The goal of the program is to provide for continued agricultural use on the maximum feasible amount of remnant parcels that otherwise may not be economic to farm. The program would focus on severed remainder parcels, including those that were under Williamson Act or Farmland Security Act contract at the time of right-of-way acquisition and have become too small to remain in the local Williamson Act or Farmland Security Act program. The program would assist landowners in obtaining lot line adjustments where appropriate to incorporate remnant parcels into a larger parcel that is consistent with size requirements under the local government regulations. The program will operate for a minimum of 5 years after construction of the project section is completed. The Authority will document implementation of this measure through issuance of a compliance memorandum, after the minimum operation period of 5 years has elapsed. The document will be filed with EMMA.	Operation	Establish program	Program would operate for a minimum of 5 years after construction of the project section is completed	Authority	Authority	Program would operate for a minimum of 5 years after construction of the project section is completed	Condition of design-build contract	Impact AG#3: Creation of Remnant Parcels of Important Farmland

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Parks, Recreation and Open Space										
PK-IAMF#1	Parks, Recreation, and Open Space	Prior to construction, the Contractor will prepare and submit to the Authority a technical memorandum that identifies project design features to be implemented to minimize impacts on parks, recreation, and open space. Typical design measures to avoid or minimize impacts on parks and recreation may include: ▪ Provide safe and attractive access for present travel modes (e.g., motorists, bicyclists, pedestrians—as applicable) to existing park and recreation facilities. ▪ Design guideway, system, and station features in such a way as to enhance the surrounding local communities. Provide easy crossings of the guideway which allows for community use under the guideway or at station areas.	Pre-construction	Reporting	Monthly	Contractor	Contractor	At incorporation or completion of design/monthly reporting during construction	Condition of design-build contract	Impact PK#1: Permanent Impacts on Future Development of Recreational Trail Corridors in the Berenda Slough Open-Space Corridor Impact PK#2: Permanent Impacts on Future Development of Recreational Trail Corridors in the Ash Slough Open-Space Corridor
Aesthetics and Visual Quality										
AVR-IAMF#1	Aesthetic Options	Prior to construction, the Contractor will document, through issue of a technical memorandum, how the Authority's aesthetic guidelines have been employed to minimize visual impacts. The Authority seeks to balance providing a consistent, project-wide aesthetic with the local context for the numerous HSR non-station structures across the state. Examples of aesthetic options would be provided to local jurisdictions that can be applied to nonstandard structures in the HSR system. Refer to *Aesthetic Options for Non-Station Structures* (Authority 2017). will	Pre-construction	Reporting	Monthly	Contractor	Contractor	At incorporation or completion of design/monthly reporting during construction	Condition of design-build contract	Impact AVR#4: Decreased Visual Quality in the Robertson Boulevard Landscape Unit Impact AVR#5: Decreased Visual Quality in the Fairmead Landscape Unit
AVR-IAMF#2	Aesthetics Review Process	Prior to construction, the Contractor will document that the Authority's aesthetic review process has been followed to guide the development of non-station area structures. Documentation shall be through issuance of a technical memorandum to the Authority. The Authority will identify key non-station structures recommended for aesthetic treatment, consult with local jurisdictions on how best to involve the community in the process, solicit input from local jurisdictions on their aesthetic preferences, and evaluate aesthetic preferences for potential cost, schedule, and operational impacts. The Authority will also evaluate compatibility with project-wide aesthetic goals, include recommended aesthetic approaches in the construction procurement documents, and work with the Contractor and local jurisdictions to review designs and local aesthetic preferences and incorporate them into final design and construction. Refer to *Aesthetic Options for Non-Station Structures* (Authority 2017).will	Pre-construction	Reporting	Monthly	Contractor	Contractor	At incorporation or completion of design/monthly reporting during construction	Condition of design-build contract	Impact AVR#4: Decreased Visual Quality in the Robertson Boulevard Landscape Unit
Cultural Resources										
CUL-IAMF#1	Geospatial Data Layer and Archaeological Sensitivity Map	Prior to construction (any ground-disturbing activities) and staging of materials and equipment, the Contractor's archaeologist or geoarchaeologist will prepare a geospatial data layer identifying the locations of all known	Design/Pre-construction	Prepare geospatial data layer	Near full design	Contractor's archaeologist or geoarchaeologist	Authority	At incorporation or completion of design	Condition of design-build contract	Impact CUL#1: Permanent Disturbance of Unknown Archaeological Sites

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		archaeological resources and built historic resources that require avoidance or protection, and areas of archaeological sensitivity that require monitoring within the APE. The Contractor's archaeologist, who meets the Secretary of the Interior's Professional Qualifications Standards provided in 36 C.F.R. Part 61, is to use, as appropriate, a combination of the following: known locations of archaeological sites and built historic properties, tribal consultation, landforms, depositional processes, distance to water, mapping provided in the Archaeological Treatment Plan, or historic mapping. This mapping is to be updated as the design progresses if it results in an expansion of the area of ground disturbance/APE, including temporary construction easements and new laydown and access areas. This mapping would be used to develop an archaeological monitoring plan to be prepared by the Contractor's archaeologist, and upon approval by the Authority, implemented by the Contractor's archaeologist. When design is sufficiently advanced, a geospatial data layer would be produced by the Contractor overlaying the locations of all known archaeological resources and built historic resources within the APE, for which avoidance measures are necessary, and all archaeologically sensitive areas, for which monitoring is required.								
CUL-IAMF#2	Worker Environmental Awareness Program (WEAP) Training Session	Prior to construction (any ground-disturbing activity) construction contractor personnel who work on site will attend a WEAP training session provided by the Contractor. The WEAP will include cultural resources awareness training performed by the Contractor's archaeologist who meets the Secretary of the Interior's Professional Qualification Standards provided in 36 C.F.R. Part 61. The Contractor will develop instructional materials and a fact sheet for distribution to the construction crews, and submit the materials, as well as qualifications of the personnel providing the training, to the Authority for approval at least 15 days prior to being permitted on-site access. The training will address measures required to avoid or protect built historic resources, educate crews on artifacts and archaeological features they may encounter and the mandatory procedures to follow should potential cultural resources be exposed during construction. Translation services will be provided by the Contractor for non-English speaking participants. The training sessions will be given prior to the initiation of any ground-disturbing activities and repeated on an annual basis. Additionally, new construction crewmembers will attend an initial WEAP training session prior to working on site. On completion of the WEAP training, construction crews will sign a form stating that they attended the training, understood the information presented, and will comply with the WEAP requirements. The Contractor's archaeologist will submit the signed WEAP training forms	Pre-construction	Training program/ Reporting	Annual (training)/ Monthly (reporting)	Contractor	Contractor	Annual (training)/ monthly (reporting)	Condition of design-build contract	Impact CUL#1: Permanent Disturbance of Unknown Archaeological Sites

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		to the Mitigation Manager on a monthly basis. On an annual basis, the Contractor will provide the Authority with a letter indicating that regular WEAP training has been implemented and will provide at least one PowerPoint annually of the WEAP training. On a monthly basis, the Contractor's archaeologist will provide updates and synopsis of the training to workers during the daily safety ("tailgate") meeting. Construction crews will be informed during the WEAP training that, to the extent possible, travel within the marked project site would be restricted to established roadbeds.								
CUL-IAMF#3	Preconstruction Cultural Resource Surveys	Prior to construction (any ground-disturbing activities in areas not yet surveyed) and the staging of materials and equipment, the Contractor will conduct pre-construction cultural resource surveys. Resulting from lack of legal access, much of the construction footprint may not have been surveyed. Once parcels are accessible, the Contractor will have archaeologists or architectural historians, as appropriate, who meet the Secretary of the Interior professional qualification standards, survey and complete reporting in appropriate document for archaeology and/or built resources, in accordance with documentation requirements stipulated in the Programmatic Agreement. Identified resources will be evaluated for the National Register of Historic Places (NRHP) and the California Register of Historical Resources (CRHR). The qualified archaeologist or architectural historian, as appropriate, will assess the potential to affect to historic properties (NRHP) by applying the effects criteria in 36 C.F.R. Part 800.5(a)(1), and the potential of significant impacts on historical resources (CRHR) by applying the criteria in CEQA Guidelines 15064.5(b). Should the Authority determine, in consultation with the SHPO, that any newly identified historic properties or historical resources would be adversely affected, the BETP or Archeological Treatment Plan, as appropriate, would be amended, to document mitigation measures agreed upon by the MOA signatories. The schedule of these surveys would be dependent on the timing of obtaining legal access to the properties and may be driven by the need to complete construction-related activities (e.g., geotechnical borings, laydown yards). Prior to beginning surveys, updated records searches may be required by the Authority, depending on the length of the passage of time, to validate that accurate information was obtained regarding previous inventory and evaluation efforts. The Contractor's archaeologist, in consultation with the Authority, would determine if an updated records search is required. If an updated records search is necessary, the search will be performed by the Contractor's archaeologist.	Pre-construction	Conduct pre-construction surveys; Identify historic and/or cultural resources	Surveys conducted prior to ground disturbance	Contractor	Contractor	Surveys conducted prior to ground disturbance	Condition of design-build contract	Impact CUL#1: Permanent Disturbance of Unknown Archaeological Sites Impact CUL#3: Permanent Demolition, Destruction, Relocation, or Alteration of Historic Architectural Resources or Setting
CUL-IAMF#4	Relocation of Project Features when	Changing the rail alignment to avoid newly discovered sites is likely infeasible; however, access areas and	Construction	Relocation of access areas	As needed	Contractor	Contractor	As needed	Condition of design-build contract	Impact CUL#1: Permanent Disturbance of Unknown

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
	Possible	laydown sites may be relocated should their proposed location be found to be on archaeological sites or have the potential to affect historic built resources in the vicinity. The Contractor will delineate all avoidance and protection measures for identified archaeological and built resources on construction drawings.		and laydown sites						Archaeological Sites
CUL-IAMF#5	Archaeological Monitoring Plan and Implementation	Prior to construction the Contractor's professionally qualified archaeologist, as defined in the Programmatic Agreement, will prepare a monitoring plan based on the results of geospatial data layer and archaeological sensitivity map. The plan is to be reviewed and approved by the Authority prior to any ground-disturbing activities. During construction (any ground-disturbing activities) or staging of materials or equipment, the Contractor would be responsible for implementing the monitoring plan and providing archaeological and tribal monitoring of ground-disturbing construction activities with a potential to affect archaeological remains in areas identified as archaeologically sensitive in the Archaeological Treatment Plan. The Contractor will obtain Authority approval of all persons providing archaeological or tribal monitoring.	Pre-construction/ Construction	Prepare and implement monitoring plan	Prior to construction (prepare plan)/ During construction (implement plan)	Contractor	Contractor	Prior to construction (prepare plan)/ during construction (implement plan)	Condition of design-build contract	Impact CUL#1: Permanent Disturbance of Unknown Archaeological Sites
CUL-IAMF#6	Preconstruction Conditions Assessment, Plan for Protection of Historic Built Resources, and Repair of Inadvertent Damage	Prior to construction (any ground-disturbing activities that are within 1,000 feet of a historic built property) the Contractor may be required to assess the condition of construction-adjacent historic properties, and prepare a Plan for the Protection of Historic Built Resources and Repair of Inadvertent Damage. The MOA and BETP would stipulate for which properties the plan is to be prepared. MOA signatories and consulting parties may comment on the adequacy of the assessments. Protection measures would be developed in consultation with the landowner or land-owning agencies as well as the SHPO and the MOA signatories and consulting parties, as required by the Programmatic Agreement. As the design progresses, additional properties may be identified by the Authority as requiring this plan. The plan will record existing conditions in order to (1) establish a baseline against which to compare the property's post-project condition, (2) identify structural deficiencies that make the property vulnerable to project construction related damage, such as vibration, and (3) identify stabilization or other measures required to avoid or minimize inadvertent adverse effects. The plan would be further described in the BETP and be prepared by an interdisciplinary team, including (but not limited to) as appropriate, an architectural historian, architect, photographer, structural engineer, and acoustical engineer. Ambient conditions would be used to identify buildings that are sensitive receptors to construction-related vibration and require vibration monitoring during construction activities. Additional protective measures may be required if the property is vacant during construction. The plan content will be outlined in the BETP and is to be completed and approved by the Authority, with protective	Pre-construction	Conduct assessment and protection plan	Required if within 1,000 feet of historic built property	Contractor/ Authority	Contractor/ Authority	Required if within 1,000 feet of historic built property	MOA/PA/BETP	Impact CUL#3: Permanent Demolition, Destruction, Relocation, or Alteration of Historic Architectural Resources or Setting

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		measures implemented before construction begins within 1,000 feet of the subject building. The plan shall describe the protocols for documenting inadvertent damage (should it occur), as well as notification, coordination, and reporting to the SHPO, MOA signatories, and the owner of the historic property. The plan shall direct that inadvertent damage to historic properties shall be repaired in accordance with the Secretary of the Interior's *Standards for the Treatment of Historic Properties* (U.S. Department of the Interior, 1995). The plan shall be developed in coordination with the Authority and shall be submitted to the SHPO for review and approval. Protective plans would be required for buildings that would be moved as part of the project mitigation, including stabilization before, during, and after relocation; protection during temporary storage; and relocation to a new site, followed by rehabilitation.								
CUL-IAMF#7	Built Environment Monitoring Plan	Prior to construction (any ground-disturbing activities within 1,000 feet of a historic property or resource) the Contractor will prepare a Built Environment Monitoring Plan. Draft and final Built Environment Monitoring Plans will be prepared describing the properties that would require monitoring, the type of activities or resources that would require full-time monitoring or spot checks, the required number of monitors for each construction activity, and the parameters that would influence the level of effort for monitoring. Maximum vibration level thresholds may be established in the Plan for Protection of Historic Resources and Repair of Inadvertent Damage, the monitoring of which would be included in this monitoring plan. The BETP will outline the process for corrective action should the protection measures prove ineffective. Consultation procedures would also be defined in the BETP. The Contractor will develop both the draft and final plans in coordination with the Authority, and the plans shall be submitted to the SHPO for review and approval. The plan will be implemented prior to any ground-disturbing activities within 1,000 feet of properties identified as requiring monitoring, as specified in the BETP.	Pre-construction	Prepare monitoring plan	Required if within 1,000 feet of historic built property	Contractor/ Authority	Contractor/ Authority	Required if within 1,000 feet of historic built property	BETP	Impact CUL#3: Permanent Demolition, Destruction, Relocation, or Alteration of Historic Architectural Resources or Setting
CUL-IAMF#8	Implement Protection and/or Stabilization Measures	Implement the plan described in the Plan for Protection of Historic Resources and Repair of Inadvertent Damage and in the BETP. Such protection measures will include, but not be limited to, vibration monitoring of construction in the vicinity of historic properties; cordoning off of resources from construction activities (e.g., traffic, equipment storage, personnel); shielding of resources from dust or debris; and stabilization of buildings adjacent to construction. Temporary stabilization and protection measures would be removed after construction is complete, and the historic properties would be restored to their pre-construction condition. For buildings that would be moved, treatment would include stabilization before, during, and after relocation; protection during temporary	Pre-construction	Implement protection and/or stabilization measures	Per BETP	Contractor	Contractor	Per BETP	BETP	Impact CUL#3: Permanent Demolition, Destruction, Relocation, or Alteration of Historic Architectural Resources or Setting

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		storage; and relocation to a new site, followed by rehabilitation.								
Transportation										
TR-IAMF#1	Protection of Public Roadways during Construction	Prior to construction, the Contractor will provide a photographic survey documenting the condition of the public roadways along truck routes providing access to the proposed project site. The photographic survey shall be submitted for approval to the agency responsible for road maintenance and the Authority. The Contractor will be responsible for the repair of any structural damage to public roadways caused by HSR construction or construction access, returning any damaged sections to the equivalent of their original pre-HSR construction structural condition or better. The Contractor will survey the condition of the public roadways along truck routes providing access to the proposed project site after construction is complete. The Contractor will complete a before- and after-survey report and submit it to the Authority for review, indicating the location and extent of any damage.	Pre-construction/ Post-construction	Reporting	Immediately prior to and immediately following construction, and during construction as needed.	Contractor	Contractor	Implementation during construction	Condition of design-build contract	Impact TR#6: Temporary Impacts on Major Highway Operations Impact TR#8: Temporary Construction Impacts on Rural Roadway Operations Impact TR#16: Temporary Impacts on School Bus Routes Impact SO#1: Temporary Impacts on Communities—Community Cohesion Impact SO#7: Temporary Impacts on Children's Health and Safety Impact SO#14: Permanent Impacts on Agricultural Economy
TR-IAMF#2	Construction Transportation Plan	The design-build contractor will prepare a detailed CTP for the purpose of minimizing the impact of construction and construction traffic on adjoining and nearby roadways in close consultation with the local jurisdiction having authority over the site. The Authority must review and approve the CTP before the Contractor commences any construction activities. This plan will address, in detail, the activities to be carried out in each construction phase, with the requirement of maintaining traffic flow during peak travel periods. Such activities include, but are not limited to, the routing and scheduling of materials deliveries, materials staging and storage areas, construction employee arrival and departure schedules, employee parking locations, and temporary road closures, if any. The CTP will provide traffic controls pursuant to the *California Manual on Uniform Traffic Control Devices* sections on temporary traffic controls (Caltrans 2012) and will include a traffic control plan that includes, at a minimum, the following elements: ▪ Temporary signage to alert drivers and pedestrians to the construction zone. ▪ Flag persons or other methods of traffic control.	Design/ Construction	CTP to be prepared prior to construction, followed by reporting	Weekly during construction	Contractor	Contractor	At incorporation or completion of design/ implementation during construction	Condition of design-build contract	Impact TR#1: Temporary Impacts on Major Roadways from Temporary Road Closures and Relocations Impact TR#3: Temporary Impacts on Major Roadways and Truck Routes from Construction Vehicle Operations Impact TR#4: Temporary Impacts on Circulation and Emergency Access Impact TR#6: Temporary Impacts on Major Highway Operations Impact TR#8: Temporary Construction Impacts on Rural

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		▪ Traffic speed limitations in the construction zone. ▪ Temporary road closures and provisions for alternative access during the closure. ▪ Detour provisions for temporary road closures—alternating one-way traffic would be considered as an alternative to temporary closures where practicable and where it would result in better traffic flow than would a detour. ▪ Identified routes for construction traffic. ▪ Provisions for safe pedestrian and bicycle passage or convenient detour. ▪ Provisions to minimize access disruption to residents, businesses, customers, delivery vehicles, and buses to the extent practicable—where road closures are required during construction, limit to the hours that are least disruptive to access for the adjacent land uses. ▪ Provisions for farm equipment access. ▪ Provisions for 24-hour access by emergency vehicles. ▪ Safe vehicular and pedestrian access to local businesses and residences during construction. The plan would provide for scheduled transit access where construction would otherwise impede such access. Where an existing bus stop is within the work zone, the design-builder would provide a temporary bus stop at a safe and convenient location away from where construction is occurring in close coordination with the transit operator. Adequate measures would be taken to separate students and parents walking to and from the temporary bus stop from the construction zone. ▪ Advance notification to the local school district of construction activities and rigorously maintained traffic control at all school bus loading zones, to provide for the safety of schoolchildren. Review existing or planned Safe Routes to Schools with school districts and emergency responders to incorporate roadway modifications that maintain existing traffic patterns and fulfill response route and access needs during project construction and HSR operations. ▪ Identification and assessment of the potential safety risks of project construction to children, especially in areas where the project is located near homes, schools, daycare centers, and parks. ▪ Promotion of child safety within and near the project area. For example, crossing guards could be provided in areas where construction activities are located near schools, daycare centers, and parks. CTPs would consider and account for the potential for								Roadway Operations Impact TR#10: Temporary Loss of Property Access Impact TR#12: Temporary Impacts on Bus Transit Operations Impact TR#16: Temporary Impacts on School Bus Routes Impact TR#18: Temporary Impacts on Pedestrian and Bicycle Access Impact TR#20: Temporary Impacts on Major Roadway Operations Impact SO#1: Temporary Impacts on Communities—Community Cohesion Impact SO#7: Temporary Impacts on Children's Health and Safety Impact SO#14: Permanent Impacts on Agricultural Economy Impact LU#2: Temporary Indirect Impacts on Land Use Patterns Related to Areas Used for Construction Impact AG#4: Disruption of Agricultural Infrastructure Impact PK#4 Access to School Play Areas and Recreational Facilities

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
		overlapping construction projects.								
TR-IAMF#3	Off-Street Parking for Construction-Related Vehicles	The Contractor will identify adequate off-street parking for all construction-related vehicles throughout the construction period to minimize impacts on public on-street parking areas. If adequate parking cannot be provided on the construction sites, the Contractor will designate a remote parking area and arrange for the use a shuttle bus to transfer construction workers to/from the job site. This measure shall be addressed in the CTP.	Design/ Construction	CTP to be prepared prior to construction followed by reporting	Weekly	Contractor	Contractor	At incorporation or completion of design/monthly reporting during construction	Condition of design-build contract	Impact TR#3: Temporary Impacts on Major Roadways and Truck Routes from Construction Vehicle Operations Impact TR#8: Temporary Construction Impacts on Rural Roadway Operations Impact SO#1: Temporary Impacts on Communities—Community Cohesion
TR-IAMF#4	Maintenance of Pedestrian Access	The Contractor will prepare specific construction management plans to address maintenance of pedestrian access during the construction period. Actions that limit pedestrian access would include, but not be limited to, sidewalk closures, bridge closures, crosswalk closures or pedestrian rerouting at intersections, placement of construction-related material within pedestrian pathways or sidewalks, and other actions that may affect the mobility or safety of pedestrians during the construction period. If sidewalks are maintained along the construction site frontage, the Contractor will provide covered walkways and fencing. The plan objective shall be to maintain pedestrian access where feasible (i.e., meeting design, safety, and ADA requirements). This measure shall be addressed in the CTP.	Design/ Construction	CTP to be prepared prior to construction followed by reporting	Weekly	Contractor	Contractor	At incorporation or completion of design/monthly reporting during construction	Condition of design-build contract	Impact TR#18: Temporary Impacts on Pedestrian and Bicycle Access Impact SO#1: Temporary Impacts on Communities—Community Cohesion Impact SO#7: Temporary Impacts on Children's Health and Safety Impact PK#4 Access to School Play Areas and Recreational Facilities
TR-IAMF#5	Maintenance of Bicycle Access	The Contractor will prepare specific Construction Management Plans to address maintenance of bicycle access during the construction period. Actions that limit bicycle access would include, but not be limited to, bike lane closures or narrowing, closure or narrowing of streets that are designated bike routes, bridge closures, placement of construction-related materials within designated bike lanes or along bike routes, and other actions that may affect the mobility or safety of bicyclists during the construction period. The plan objective will be to maintain bicycle access where feasible (i.e., meeting design, safety, and ADA requirements). This measure shall be addressed in the CTP.	Design/ Construction	CTP to be prepared prior to construction followed by reporting	Weekly	Contractor	Contractor	At incorporation or completion of design/monthly reporting during construction	Condition of design-build contract	Impact TR#18: Temporary Impacts on Pedestrian and Bicycle Access Impact SO#1: Temporary Impacts on Communities—Community Cohesion Impact SO#7: Temporary Impacts on Children's Health and Safety Impact PK#4 Access to School Play Areas and Recreational Facilities

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
TR-IAMF#6	Restriction on Construction Hours	The Contractor will limit construction material deliveries between 7 a.m. and 9 a.m. and between 4 p.m. and 6 p.m. on weekdays to minimize impacts on traffic on roadways. The Contractor will limit the number of construction employees arriving or departing the site between the hours of 7 a.m. and 8:30 a.m. and 4:30 p.m. and 6 p.m. Areas where these restrictions would be implemented would be determined as part of the CTP. Based on Authority review of the CTP, the restricted hours may be altered due to local travel patterns.	Construction	CTP to be prepared prior to construction followed by reporting	Weekly	Contractor	Contractor	Implementation during construction	Condition of design-build contract	Impact TR#8: Temporary Construction Impacts on Rural Roadway Operations Impact SO#1: Temporary Impacts on Communities—Community Cohesion Impact SO#14: Permanent Impacts on Agricultural Economy
TR-IAMF#7	Construction Truck Routes	The Contractor will deliver all construction-related equipment and materials on the appropriate truck routes and shall prohibit heavy-construction vehicles from using alternative routes to get to the site. Truck routes will be established away from schools, daycare centers, and residences, or along routes with the least impact if the Authority determines those areas are unavoidable. This measure shall be addressed in the CTP.	Construction	CTP to be prepared prior to construction followed by reporting.	Weekly	Contractor	Contractor	Implementation during construction	Condition of design-build contract	Impact TR#3: Temporary Impacts on Major Roadways and Truck Routes from Construction Vehicle Operations Impact TR#8: Temporary Construction Impacts on Rural Roadway Operations Impact TR#14: Temporary Impacts on Passenger Rail Operations Impact SO#1: Temporary Impacts on Communities—Community Cohesion Impact SO#14: Permanent Impacts on Agricultural Economy Impact PK#4 Access to School Play Areas and Recreational Facilities
TR-IAMF#8	Construction during Special Events	The Contractor will provide a mechanism to prevent roadway construction activities from reducing roadway capacity during major athletic events or other special events that substantially (10 percent or more) increase traffic on roadways affected by project construction. Mechanisms include the presence of police officers directing traffic, special-event parking, use of within-the-curb parking, or shoulder lanes for through-traffic and traffic cones. This measure shall be addressed in the CTP.	Construction	CTP to be prepared prior to construction followed by reporting	Weekly	Contractor	Contractor	Implementation during construction	Condition of design-build contract	Impact TR#8: Temporary Construction Impacts on Rural Roadway Operations Impact SO#1: Temporary Impacts on Communities—Community Cohesion Impact PK#4

IAMF	Title	IAMF Text	Phase	Implementation Action	Reporting Schedule	Implementation Party	Reporting Party	Implementation Text	Implementation Mechanism	Impact # and Impact Title
										Access to School Play Areas and Recreational Facilities
TR-IAMF#9	Protection of Freight and Passenger Rail during Construction	The Contractor will repair any structural damage to freight or public railways that may occur during the construction period and return any damaged sections to their original structural condition. If necessary, during construction, a "shoofly" track would be constructed to allow existing train lines to bypass any areas closed for construction activities. Upon completion, tracks would be opened and repaired; or new mainline track would be constructed, and the "shoofly" would be removed. Contractor repair responsibility would be included in the design-build contract.	Construction	Design-build and CTP to be prepared prior to construction followed by reporting	Weekly	Contractor	Contractor	Implementation during construction	Condition of design-build contract	Impact TR#14: Temporary Impacts on Passenger Rail Operations Impact SO#1: Temporary Impacts on Communities—Community Cohesion
TR-IAMF#10	Maintenance of Transit Access	The Contractor will prepare specific Construction Management Plans to address maintenance of transit access during the construction period. Actions that limit transit access include, but are not limited to, roadway lane closures or narrowing, closure or narrowing of streets that are designated transit routes, bus stop closures, bridge closures, placement of construction-related materials within designated transit lanes, bus stop or layover zones or along transit routes, and other actions that may affect the mobility or safety of bus transit during the construction period. A plan objective shall be to maintain transit access where feasible (i.e., meeting design, safety, and ADA requirements). This measure shall be addressed in the CTP.	Construction	Design-build and CTP to be prepared prior to construction followed by reporting	Weekly	Contractor	Contractor	Implementation during construction	Condition of design-build contract	Impact TR#12: Temporary Impacts on Bus Transit Operations

AASHTO	American Association of State Highway and Transportation Officials
ADA	Americans with Disabilities Act
ASCE	American Society of Civil Engineers
ASTM	American Society for Testing and Materials
APE	area of potential effect
Authority	California High-Speed Rail Authority
BETP	built environment treatment plan
BMP	best management practice
BRMP	biological resources management plan
Cal OSHA	California Occupational Safety and Health Administration
Caltrans	California Department of Transportation
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
C.F.R.	Code of Federal Regulations
CMP	construction management plan
CP	construction package
CTP	construction transportation plan
DOGGR	California Department of Conservation, Division of Oil, and Gas and Geothermal Resources
DWR	California Department of Water Resources
EIR	environmental impact report
EIS	environmental impact statement
EMF	electromagnetic field
EMI	electromagnetic interference
EMMA	Environmental Mitigation Management and Assessment
ESA	Environmental Site Assessment
FESA	Endangered Species Act
FAST Act	Fixing America's Surface Transportation Act
FRA	Federal Railroad Administration
FEMA	Federal Emergency Management Agency
GIS	geographic information system
HSR	high-speed rail
IBC	International Building Code
ISEP	Implementation Stage Electromagnetic Compatibility Program Plan
IAMF	impact avoidance and minimization feature
MOA	Memorandum of Understanding
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NO_x	nitrogen oxide
O&M	operations and maintenance
OSHA	Occupational Safety & Health Administration
PM10	particulate matter smaller than or equal to 10 microns in diameter
PRM	Paleontological Resource Monitors
PRMMP	Paleontological Resources Monitoring and Mitigation Plan
SHPO	State Historic Preservation Office
SJVAPCD	San Joaquin Valley Unified Air Pollution Control District
SR	State Route
SVP	Society of Vertebrate Paleontology
SWPPP	Stormwater Pollution Prevention Plan
SWRCB	State Water Resources Control Board
Uniform Act	Uniform Relocation Assistance and Real Property Acquisition Policies Act, as amended
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
VOCs	volatile organic compounds
WEF	wildlife exclusion fence zones
WEAP	Worker Environmental Awareness Program

APPENDIX E: STATE HISTORIC PRESERVATION OFFICER SECTION 106 CONCURRENCE LETTER

State of California • Natural Resources Agency
Edmund G. Brown Jr., *Governor*

DEPARTMENT OF PARKS AND RECREATION
OFFICE OF HISTORIC PRESERVATION
Lisa Ann L. Mangat, *Director*

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April 6, 2018

Reply in Reference To: FRA100524A

Mr. Brett Rushing
Cultural Resources Program Manager
California High-Speed Rail Authority
770 L Street, Suite 620
Sacramento, CA 95814

Re: Supplemental Section 106 Finding of Effect Report, Central Valley Wye, Merced to Fresno Section of the High-Speed Train Project, Merced and Madera Counties, California

Dear Mr. Rushing:

The State Historic Preservation Officer (SHPO) received your letter on March 16, 2018, regarding the above-referenced finding of effect. The High Speed Rail Authority (Authority) is consulting, on behalf of the Federal Railroad Administration (FRA), pursuant to the *Programmatic Agreement Among the Federal Railroad Administration, the Advisory Council on Historic Preservation, the California State Historic Preservation Officer, and the California High-Speed Rail Authority regarding Compliance with Section 106 of the National Historic Preservation Act, as it Pertains to the California High-Speed Train Project* (PA) and the *Second Amended Memorandum of Agreement Among the Federal Railroad Administration, the California High-Speed Rail Authority, and the California State Historic Preservation Officer Regarding the Merced to Fresno Section of the California High-Speed Train System in Merced, Madera and Fresno Counties* (MOA).

Included with the consultation package were the following documents:

- *California High-Speed Rail Authority Merced to Fresno Section Supplemental Section 106 Findings of Effect Report, Central Valley Wye* (FOE), prepared by ICF in October 2017

The Central Valley Wye is the connection between the Merced to Fresno Section and the San Jose to Merced Section. The Authority previously consulted on the identification efforts for the Central Valley Wye, and has analyzed four potential alternatives. No new known historic properties would be adversely affected by any of the alternatives. The single, known property that would be adversely affected, the Robertson Boulevard Tree

FRA100524A

Row, was previously analyzed in the original FOE report for the Merced-Fresno segment. The FOE also concludes that the undertaking would cause adverse effects on unidentified or unknown built and archaeological historic properties; will not have an adverse effect on the Chowchilla Canal; and will not affect prehistoric site WW-01, the Delta-Mendota Canal, or the California Aqueduct.

The Authority, on behalf of FRA, has requested concurrence on the findings above in accordance with Stipulation IV of the MOA. After reviewing the information submitted with your letter, I offer the following comments:

- I agree that the undertaking will have an adverse effect on the Robertson Boulevard Tree Row and on unidentified or unknown built and archaeological historic properties, per 36 CFR § 800.5(d)(2)
- I agree that the undertaking will not have an adverse effect on the Chowchilla Canal; and will not affect prehistoric site WW-01, the Delta-Mendota Canal, or the California Aqueduct, per 36 CFR § 800.5(d)(1).
- I agree that amending the Built Environment Treatment Plan and Archaeological Treatment Plan in accordance with Stipulation V.D of the MOA is sufficient to address the adverse effects.

I look forward to continuing this consultation with you. If you have any questions, please contact Kathleen Forrest of my staff at (916) 445-7022 or email at Kathleen.Forrest@parks.ca.gov.

Sincerely,

Julianne Polanco
State Historic Preservation Officer