

California High-Speed Rail Authority

Merced to Fresno Section: Central Valley Wye

Supplemental Checkpoint C Summary Report

July 2018



TABLE OF CONTENTS

| | | |
|-------|-------------------------------------------------------------------------------------------------------------------------|------|
| 1 | AUTHORITY AND SCOPE OF ANALYSIS..... | 1-1 |
| 1.1 | Checkpoint C Purpose and Relationship to the Memorandum of Understanding | 1-1 |
| 1.1.1 | Definition of the Central Valley Wye Alternatives..... | 1-2 |
| 1.2 | Relationship between the Merced to Fresno Section and the Central Valley Wye Alternatives..... | 1-3 |
| 1.3 | Scope of Alternatives Analysis under Clean Water Act Section 404(b)(1) (33 C.F.R. § 320.4, 40 C.F.R. § 230.10(a)) | 1-4 |
| 1.4 | Scope of Section 408 Analysis | 1-4 |
| 1.5 | Scope of Analysis of the Preliminary Compensatory Mitigation Plan..... | 1-5 |
| 1.6 | Compliance with the Memorandum of Understanding Data Needs | 1-5 |
| 1.7 | Technical Updates since the Central Valley Wye Supplemental Checkpoint B and Addenda..... | 1-10 |
| 1.7.1 | SR 152 (North) to Road 13 Wye Alternative | 1-10 |
| 1.7.2 | SR 152 (North) to Road 19 Wye Alternative | 1-10 |
| 1.7.3 | Avenue 21 to Road 13 Wye Alternative | 1-10 |
| 1.7.4 | SR 152 (North) to Road 11 Wye Alternative | 1-11 |
| 2 | ALTERNATIVES | 2-1 |
| 2.1 | Project Purpose and Need | 2-1 |
| 2.1.1 | Purpose of the HSR System | 2-1 |
| 2.1.2 | Overall Project Purpose of the Merced to Fresno Section..... | 2-1 |
| 2.2 | Environmental Impact Assessment under the National Environmental Policy Act..... | 2-2 |
| 2.2.1 | California HSR System Programmatic Assessment: Tier 1 | 2-2 |
| 2.2.2 | Project-Level Assessment: Tier 2 | 2-3 |
| 2.3 | Section 404(b)(1) Guidelines Criteria for Consideration of Alternatives | 2-4 |
| 2.4 | Sequenced Search for Less Environmentally Damaging Alternatives | 2-4 |
| 2.5 | Description of the Alternatives | 2-5 |
| 2.5.1 | No-Fill Alternative..... | 2-5 |
| 2.5.2 | Common Features | 2-5 |
| 2.5.3 | Central Valley Wye Alternatives Descriptions..... | 2-6 |
| 3 | JURISDICTIONAL WATERS | 3-1 |
| 3.1 | Definitions of Study Areas | 3-1 |
| 3.2 | Delineated Jurisdictional Waters | 3-1 |
| 3.2.1 | Wetlands..... | 3-2 |
| 3.2.2 | Other Waters of the U.S..... | 3-3 |
| 3.3 | Summary of California Rapid Assessment Method Results | 3-6 |
| 4 | EFFECTS ON JURISDICTIONAL WATERS | 4-1 |
| 4.1 | Effect Determination Methodology and Definitions..... | 4-1 |
| 4.2 | Comparison of Effects on Jurisdictional Waters | 4-5 |
| 4.2.1 | Direct Effects | 4-5 |
| 4.2.2 | Indirect Effects | 4-5 |
| 4.2.3 | Cumulative Effects..... | 4-9 |
| 4.2.4 | Comparison of Alternatives..... | 4-9 |

| | | |
|-------|----------------------------------------------------------------------------------------------------------------------------|------|
| 4.3 | Avoidance and Minimization through the Development of Central Valley Wye Alternatives | 4-9 |
| 4.3.1 | Central Valley Wye Design Features for Jurisdictional Waters and Other Non-Wetland Waters | 4-10 |
| 4.3.2 | Central Valley Wye Design Features for Construction Stormwater Pollution Prevention Plan | 4-11 |
| 4.3.3 | Central Valley Wye Design Features for Stormwater Management and Treatment..... | 4-12 |
| 4.3.4 | Central Valley Wye Design Features for Flood Protection | 4-12 |
| 5 | OTHER ENVIRONMENTAL RESOURCES: EXISTING CONDITIONS | 5-1 |
| 5.1 | Biological Resources | 5-1 |
| 5.1.1 | Definition of the Study Areas for Biological Resources | 5-1 |
| 5.1.2 | Impact Avoidance and Minimization Features | 5-5 |
| 5.1.3 | Overview of Affected Environment: Plant Communities and Land Cover Types in the Resource Study Area of All Alignments..... | 5-6 |
| 5.1.4 | Biological Resources: Affected Environment | 5-10 |
| 5.2 | Other Environmental Resources | 5-20 |
| 5.2.1 | Transportation and Traffic..... | 5-20 |
| 5.2.2 | Noise and Vibration | 5-21 |
| 5.2.3 | Agricultural Lands..... | 5-23 |
| 5.2.4 | Parks, Recreation, and Open Space | 5-23 |
| 5.2.5 | Aesthetics and Visual Resources | 5-25 |
| 5.2.6 | Cultural Resources | 5-28 |
| 5.2.7 | Environmental Justice..... | 5-28 |
| 6 | COMPARATIVE ANALYSIS OF EFFECTS ON OTHER ENVIRONMENTAL RESOURCES FOR CENTRAL VALLEY WYE ALTERNATIVES | 6-1 |
| 6.1 | Biological Resources | 6-1 |
| 6.1.1 | Special-Status Plant Communities | 6-1 |
| 6.1.2 | Special-Status Plant Species..... | 6-4 |
| 6.1.3 | Special-Status Wildlife Species | 6-9 |
| 6.1.4 | Critical Habitat | 6-32 |
| 6.1.5 | Habitat Linkages and Wildlife Movement Corridors | 6-33 |
| 6.2 | Other Environmental Consequences..... | 6-36 |
| 6.2.1 | Environmental Factors Evaluated and Not Considered Further in this Summary Report | 6-36 |
| 6.2.2 | Transportation and Traffic..... | 6-36 |
| 6.2.3 | Noise and Vibration | 6-39 |
| 6.2.4 | Agricultural Lands..... | 6-41 |
| 6.2.5 | Parks, Water-Related Recreation, and Open Space | 6-43 |
| 6.2.6 | Aesthetics and Visual Resources | 6-44 |
| 6.2.7 | Cultural Resources | 6-47 |
| 6.2.8 | Environmental Justice Effects | 6-49 |
| 7 | PRACTICABILITY ANALYSIS | 7-1 |
| 7.1 | Consistency with Overall Project Purpose | 7-1 |
| 7.1.1 | Action Alternatives | 7-1 |
| 7.1.2 | No-Fill Alternative | 7-2 |
| 7.2 | Capability Factors Analysis | 7-2 |
| 7.2.1 | Cost Considerations | 7-2 |

| | | |
|-------|-------------------------------------------------------------------------------------------------------------------------|------|
| 7.2.2 | Existing Technology Considerations..... | 7-4 |
| 7.2.3 | Logistical Considerations..... | 7-4 |
| 8 | PRELIMINARY LEAST ENVIRONMENTALLY DAMAGING PRACTICABLE ALTERNATIVE AND THE PREFERRED ALTERNATIVE | 8-1 |
| 8.1 | Summary of Preliminary LEDPA Determination | 8-1 |
| 8.2 | Basis of Selection of Preliminary LEDPA | 8-1 |
| 8.2.1 | Summary of Jurisdictional Waters Effects | 8-4 |
| 8.2.2 | Summary of Other Adverse Environmental Consequences | 8-5 |
| 8.2.3 | Summary of Practicability Analysis | 8-9 |
| 8.3 | Conclusion..... | 8-9 |
| 9 | CONCEPTUAL MITIGATION OF EFFECTS ON JURSDICTIONAL WATERS..... | 9-1 |
| 9.1 | Watershed Approach..... | 9-1 |
| 9.2 | Mitigation Options..... | 9-2 |
| 10 | FACTUAL DETERMINATIONS REGARDING EFFECTS OF THE PRELIMINARY LEDPA (40 C.F.R. § 230.11 AND SUBPARTS C, D, E, AND F)..... | 10-1 |
| 11 | SECTION 4(F) RESOURCES | 11-1 |
| 11.1 | Planning Measures to Minimize Harm..... | 11-2 |
| 11.2 | Preliminary Section 4(f) Least Harm Analysis for the Central Valley Wye Alternatives..... | 11-2 |
| 12 | PUBLIC INVOLVEMENT..... | 12-1 |
| 12.1 | Summary of Outreach to Stakeholders | 12-1 |
| 13 | COMPLIANCE WITH FEDERAL AND STATE LAWS..... | 13-1 |
| 14 | REFERENCES..... | 14-1 |
| 15 | LIST OF PREPARERS AND REVIEWERS | 15-1 |
| 15.1 | California High-Speed Rail Authority and Federal Railroad Administration..... | 15-1 |
| 15.2 | List of Consultants | 15-2 |
| 16 | ATTACHMENTS | 16-1 |
| 16.1 | Impact Evaluation Schematics | 16-1 |

Tables

| | | |
|-----------|--------------------------------------------------------------------------------------------------------------------------------|------|
| Table 1-1 | U.S. Environmental Protection Agency/U.S. Army Corps of Engineers Data Needs for Checkpoint C..... | 1-6 |
| Table 2-1 | Design Features of the Central Valley Wye Alternatives | 2-25 |
| Table 4-1 | Direct Effects on Wetlands and Other Waters in the Central Valley Wye by Alternative ¹ (acres) | 4-7 |
| Table 5-1 | Definitions of Resource Study Areas | 5-2 |
| Table 5-2 | Land Cover Types in the Central Valley Wye Project Footprint (acres) ¹ | 5-6 |
| Table 5-3 | Special-Status Plant Communities Occurring in the Special-Status Plant Study Area of all Central Valley Wye Alternatives | 5-19 |

| | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| Table 5-4 Reference Community Demographic Characteristics (2014) | 5-29 |
| Table 6-1 Direct Impacts on Special-Status Plant Communities by Central Valley Wye Alternative (acres) ¹ | 6-3 |
| Table 6-2 Comparison of Direct Effects on Special-Status Plant Species by Wye Alternative (acres) | 6-7 |
| Table 6-3 Direct Effects on Special-Status Wildlife Species Habitats by Central Valley Wye Alternative (acres) | 6-23 |
| Table 6-4 Critical Habitat within the Core Habitat Study Area by Central Valley Wye Alternatives (acres; designated critical habitat/actual aquatic habitat in designated critical habitat) | 6-32 |
| Table 6-5 Wildlife Movement Corridors Crossed and Affected by the Wye Alternatives (miles)..... | 6-34 |
| Table 6-6 Noise Effects on Sensitive Receivers | 6-39 |
| Table 6-7 Operational Noise Effects for the Central Valley Wye Alternatives | 6-41 |
| Table 6-8 Important Farmland Temporarily Used for Construction of the Central Valley Wye Alternatives (acres) ¹ | 6-42 |
| Table 6-9 Maximum Amount of Important Farmland Permanently Converted by Central Valley Wye Alternative (acres) ¹ | 6-43 |
| Table 7-1 Central Valley Wye Alternative Cost Estimates | 7-3 |
| Table 8-1 404(b)(1) Comparison of Permanent Effects on Jurisdictional Waters (acres) Parameter | 8-3 |
| Table 13-1 Status of Permitting for Federal and State Environmental Laws and Regulations | 13-2 |

Figures

| | |
|----------------------------------------------------------------------------------------------------------------|------|
| Figure 2-1 SR 152 (North) to Road 13 Wye Alternative Alignment and Key Design Features..... | 2-7 |
| Figure 2-2 SR 152 (North) to Road 13 Wye Alternative Electrical Interconnections and Network Upgrades | 2-9 |
| Figure 2-3 SR 152 (North) to Road 19 Wye Alternative Alignment and Key Design Features..... | 2-11 |
| Figure 2-4 SR 152 (North) to Road 19 Wye Alternative Electrical Interconnections and Network Upgrades | 2-14 |
| Figure 2-5 Avenue 21 to Road 13 Wye Alternative Alignment and Key Design Features | 2-16 |
| Figure 2-6 Avenue 21 to Road 13 Wye Alternative Electrical Interconnections and Network Upgrades | 2-19 |
| Figure 2-7 SR 152 (North) to Road 11 Wye Alternative Alignment and Key Design Features..... | 2-22 |
| Figure 2-8 SR 152 (North) to Road 11 Wye Alternative Electrical Interconnections and Network Upgrades | 2-23 |
| Figure 4-1 Types of Effects on Jurisdictional Waters..... | 4-3 |
| Figure 4-2 Vernal Pools Effects Illustration | 4-4 |

Figure 5-1 Schematic of Biological Resource Study Areas..... 5-4

Figure 5-2 Wildlife Movement Corridors in the Wildlife Movement Study Area..... 5-13

Figure 5-3a Special-Status Plant Communities in the Special-Status Plant Study
Area..... 5-14

Figure 8-1 SR 152 (North) to Road 11 Wye Alternative Alignment and Key
Design Features 8-2

Figure 9-1 Vicinity Map of Potential Compensatory Mitigation Sites 9-3

Appendices

Appendix A: Merced to Fresno Section Watershed Evaluation Report

Appendix B: Merced to Fresno Section: Central Valley Wye Evaluation of
Wetland Condition Using the California Rapid Assessment Method Report

Appendix C: Sequenced Search for Less Environmentally Damaging Alternative

Appendix D: USACE Section 408 Preliminary Determination Hydraulics Analysis
Summary Report

Appendix E: Preliminary Compensatory Mitigation Plan

Appendix F: Clean Water Act 404(b)(1) Guidelines: Factual Determinations

Appendix G: Impact Avoidance and Minimization Features and Mitigation
Measures

Appendix H: Plant Communities and Land Cover Types within the Habitat Study
Area

ACRONYMS AND ABBREVIATIONS

| | |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| AADT | annual average daily traffic |
| APE | area of potential effects |
| Authority | California High-Speed Rail Authority |
| Bay Area | San Francisco Bay Area |
| BMP | best management practice |
| BNSF | BNSF Railway |
| C.F.R. | Code of Federal Regulations |
| Caltrans | California Department of Transportation |
| CDFW | California Department of Fish and Wildlife |
| CEQA | California Environmental Quality Act |
| CESA | California Endangered Species Act |
| CNDDDB | California Natural Diversity Database |
| CNPS | California Native Plant Society |
| CRAM | California Rapid Assessment Method |
| CRHR | California Register of Historical Resources |
| CTP | construction transportation plan |
| CVFPB | Central Valley Flood Protection Board |
| CWA | Clean Water Act |
| dB | decibel |
| dBA | A-weighted decibel |
| Draft Supplemental EIR/EIS | <i>Merced to Fresno Section: Central Valley Wye Draft Supplemental Environmental Impact Report /Supplemental Environmental Impact Statement</i> |
| ECA | essential connectivity area |
| EFH | essential fish habitat |
| EINU | electrical interconnection and network upgrades |
| EIR | environmental impact report |
| EIS | environmental impact statement |
| Fed. Reg. | <i>Federal Register</i> |
| FESA | Federal Endangered Species Act |
| FRA | Federal Railroad Administration |
| FSZ | Farmland Security Zone |
| GIS | geographic information system |
| HMF | Heavy Maintenance Facility |
| HSR | high-speed rail |
| HUC | Hydrologic Unit Codes |

| | |
|-----------------|--------------------------------------------------------|
| IAMF | Impact avoidance and minimization feature |
| ILF | in-lieu fee |
| kV | kilovolt |
| L _{dn} | day-night sound level |
| LEDPA | Least Environmentally Damaging Practicable Alternative |
| LOS | Level of Service |
| MM | mitigation measure |
| MOU | Memorandum of Understanding |
| NEPA | National Environmental Policy Act |
| NFWF | National Fish and Wildlife Foundation |
| NMFS | National Marine Fisheries Service |
| NRCS | Natural Resources Conservation Service |
| NRHP | National Register of Historic Places |
| pCMP | Preliminary Compensatory Mitigation Plan |
| PRM | permittee-responsible mitigation |
| RSA | resource study area |
| ROD | Record of Decision |
| Route 152 TCP | Route 152 Trade Corridor Project |
| SEL | sound exposure level |
| SHPO | State Historic Preservation Officer |
| SR | State Route |
| SWPPP | stormwater pollution prevention plan |
| SWRCB | State Water Resources Control Board |
| TCE | temporary construction easement |
| TPSS | traction power substation |
| UPRR | Union Pacific Railroad |
| U.S.C. | United States Code |
| USACE | U.S. Army Corps of Engineers |
| USBR | U.S. Bureau of Reclamation |
| USEPA | U.S. Environmental Protection Agency |
| USFWS | U.S. Fish and Wildlife Service |
| WEAP | Worker Environmental Awareness Program |
| WSA | wetland study area |

1 AUTHORITY AND SCOPE OF ANALYSIS

1.1 Checkpoint C Purpose and Relationship to the Memorandum of Understanding

This Draft Supplemental Checkpoint C Summary Report (Summary Report) for the Central Valley Wye of the proposed California High-Speed Rail (HSR) System Merced to Fresno Section was prepared pursuant to the National Environmental Policy Act (NEPA)/Section 404/408 Integration Process Memorandum of Understanding (MOU) between the California High-Speed Rail Authority (Authority), Federal Railroad Administration (FRA), U.S. Army Corps of Engineers (USACE), and U.S. Environmental Protection Agency (USEPA) (Authority and FRA 2010a). This report supplements the prior Checkpoint C report and 404(b)(1) analysis that was completed for the Merced to Fresno section on February 2012 (Authority and FRA 2012a).

Information to support this analysis is provided in this Summary Report and in the following Appendices:

- Appendix A: Merced to Fresno Section Watershed Evaluation Report
- Appendix B: Merced to Fresno Section: Central Valley Wye Evaluation of Wetland Condition Using the California Rapid Assessment Method Report
- Appendix C: Sequenced Search for Less Environmentally Damaging Alternative
- Appendix D: USACE Section 408 Preliminary Determination Hydraulics Analysis Summary Report
- Appendix E: Preliminary Compensatory Mitigation Plan
- Appendix F: Clean Water Act 404(b)(1) Guidelines: Factual Determinations
- Appendix G: Impact Avoidance and Minimization Features and Mitigation Measures
- Appendix H. Plant Communities and Land Cover Types within the Habitat Study Area

The alternatives evaluated in this Summary Report pursuant to Section 404(b)(1) were identified in the *Merced to Fresno Section: Wye Alternatives Supplemental Checkpoint B Summary Report* and Addenda, included in Appendix C, Sequenced Search for Less Environmentally Damaging Alternative (Authority and FRA 2013a; Authority and FRA 2014a and b; Authority and FRA 2016a). A draft supplemental environmental impact report/environmental impact statement (EIR/EIS) is being prepared to address the Central Valley Wye alternatives (the *Merced to Fresno Section: Central Valley Wye Draft Supplemental Environmental Impact Report/Supplemental Environmental Impact Statement* (Draft Supplemental EIR/EIS) (Authority and FRA 2018a). The FRA is the lead agency for NEPA compliance. The Authority is the lead agency for California Environmental Quality Act (CEQA) compliance. The evaluation of the alternatives in this Summary Report is based largely on the analyses conducted as part of the development of the Draft Supplemental EIR/EIS and on technical studies and other information, as listed in Table 1-1. Data requests included in Table 1-1 are based on MOU data needs and information necessary to support analyses required under the Clean Water Act (CWA) Section 404(b)(1) Guidelines (40 Code of Federal Regulations [C.F.R.] 230.10[a]) (Guidelines).

The Authority has carried forward the following alternatives from the Checkpoint B Report and Addenda for the purposes of the CWA Section 404(b)(1) alternatives analysis (Authority and FRA 2016a):

- State Route (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

The Central Valley Wye alternatives cross Merced and Madera Counties in the vicinity of the city of Chowchilla. The four Central Valley Wye alternatives present different routes and

characteristics; all four alternatives share common end points (logical termini) to allow for meaningful comparison of engineering and environmental considerations across all alternatives. The shared logical termini of the alternatives are at Henry Miller Road/Carlucci Road on the west, Ranch Road/SR 99 on the north, and Avenue 19 near Madera Acres on the south. Many features of the Central Valley Wye alternatives are common to all four alternative alignments. Project design components, travel times, safety and security procedures, roadway modifications, and railroad modifications are similar for all alternatives. The Central Valley Wye alternatives connect the San Jose to Merced and the north to south alignment of the Merced to Fresno section and consists of three legs: San Jose to Fresno (Carlucci Road to Avenue 19), Merced to Fresno (Ranch Road to Avenue 19), and San Jose to Merced (Carlucci Road to Ranch Road). Travel times for these legs would be similar across the Central Valley Wye alternatives.

The SR 152 (North) to Road 13 Wye Alternative would extend approximately 52 miles, following the Road 13, SR 99, and BNSF Railway (BNSF) rights-of-way in the north-south direction, while the SR 152 (North) to Road 19 Wye Alternative would extend approximately 55 miles, following the Road 19, SR 99, and BNSF rights-of-way in the north-south direction. The Avenue 21 to Road 13 Wye Alternative would extend approximately 53 miles, following 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 rights-of-way in the north-south direction. The SR152 (North) to Road 11 Wye Alternative, would extend approximately 51 miles, following 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.

Deviations from these existing transportation routes or 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 alternative alignments would be mostly at-grade on raised embankment, although they would also use aerial structures and a short segment of retained cut (depressed alignment). The alternative alignments would not follow existing transportation rights-of-way where they transition from following one transportation corridor to another.

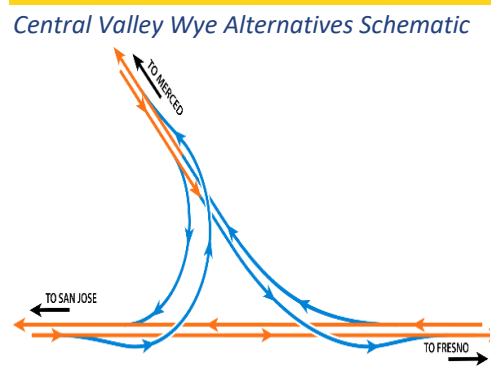
1.1.1 Definition of the Central Valley Wye Alternatives

The Central Valley Wye is part of the Merced to Fresno section of the HSR, and would create the east-west HSR connection between the San Jose to Merced Section to the west and the north-south Merced to Fresno Section to the east.¹

The four Central Valley Wye alternatives addressed in the Draft Supplemental EIR/EIS (Figures 2-1 to 2-4) are:

- 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

This section describes the common design features of the four alternatives, followed by descriptions of each alternative. Volume 2, Appendix 2-A, System Infrastructure, of the Draft Supplemental EIR/EIS provides further detail on



¹ The term *wye* refers to the Y-like formation created at the point where train tracks branch off the mainline to continue in different directions. The transition of mainline track to a wye requires splitting two tracks into four tracks that cross over one another before the wye “legs” (segments) can diverge in opposite directions to allow two-way travel. For the Merced to Fresno Section of the HSR system, the two tracks traveling east-west from the San Jose to Merced Section must become four tracks—a set of two tracks branching toward Merced to the north and a set of two tracks branching toward Fresno to the south.

performance criteria, infrastructure components and systems, and function of the Central Valley Wye alternatives and the HSR system as a whole.

1.2 Relationship between the Merced to Fresno Section and the Central Valley Wye Alternatives

This Supplemental Summary Report addresses changes to the Central Valley Wye alternatives since preparation of the *Merced to Fresno Section: Wye Alternatives Checkpoint B Summary Report* and Addenda (Authority and FRA 2013b, 2014a, 2014b, 2016a).

The Authority and FRA evaluated two wye design options (the Ave 24 Wye and the Ave 21 Wye) in the Merced to Fresno Draft and Final EIR/EISs (Authority and FRA 2012b: page 2-21). In May 2012, the Authority approved the Merced to Fresno Final EIR/EIS and identified the Hybrid Alternative along with stations in downtown Merced and downtown Fresno as the preferred alternative for the Merced to Fresno Section (Authority and FRA 2012b). In September 2012, the FRA issued the Record of Decision (ROD), selecting the same preferred alternative as the Authority. Although a preferred alternative was selected within the approved Merced to Fresno Final EIR/EIS, the decision on wye design option/connection was deferred until further study could be completed (Authority and FRA 2012b).

On September 10, 2013, the Authority and the FRA submitted two Checkpoint B Summary Reports to USACE and the EPA. The first was the San Jose to Merced Project Section Checkpoint B package and the second was the Merced to Fresno Project Section: Wye Alternatives Checkpoint B package (together, the Checkpoint B packages). The Authority and FRA prepared the Checkpoint B packages in accordance with the NEPA/CWA Section 404/Rivers and Harbors Act Section 14 Integration Process for the California High-Speed Train MOU dated November 2010 (NEPA/404/408 MOU). The September 2013 Checkpoint B packages identified four wye alternatives to carry forward for further environmental analysis: SR 152 (North) to Road 13 Wye, SR 152 (North) to Road 18 Wye, SR 152 (South) to Road 18 Wye, and Avenue 21 to Road 13 Wye.

Based on comments received from the USACE and EPA and additional stakeholder outreach, the Authority and FRA prepared and submitted an addendum to the Checkpoint B packages in May 2014. The May 2014 addendum included:

- A description of refinements to two alignments included in the Checkpoint B packages
- A qualitative analysis of the potential effects on the character of affected communities and environmental justice considerations
- Revisions to the SR 152 (North) to Road 18 and SR 152 (South) to Road 18 wye alternatives to reduce aquatic effects, address comments from the City of Chowchilla, and reduce effects on the community of Fairmead
- Responses to USACE and EPA comments
- A summary of agency and public input received
- A revised summary of conclusions

In August 2014, the Authority and FRA submitted a second addendum for the Merced to Fresno Project Section: Wye Alternatives to USACE and the EPA. In that addendum, the Authority and FRA proposed to carry forward the SR 152 (North) to Road 19 Wye Alternative for further consideration, replacing the SR 152 (North) to Road 18 Refined Wye and SR 152 (South) to Road 18 Refined Wye Alternatives previously identified in September 2013.

Together, the Checkpoint B packages and the addenda in May and August 2014 analyzed 17 potential wye alternatives. In summary, the Authority and FRA identified three alternatives to be carried forward for further analysis: the SR 152 (North) to Road 13 Wye, the Avenue 21 to Road 13 Wye, and the SR 152 (North) to Road 19 Wye. The Authority and FRA proposed withdrawing the remaining 14 wye alignments from consideration for reasons described in the Checkpoint B

packages and the May and August 2014 addenda. The USACE and EPA concurred with the range of alternatives on September 3, 2014, and August 29, 2014, respectively.

After completing the August 2014 addendum, the Authority and FRA continued to advance the design and environmental analysis of the wye alternatives while engaging in further public outreach. During this public engagement, stakeholder feedback raised concerns regarding the alignments east (Road 19) and west of Chowchilla (Road 13). In response to these concerns and as a result of further advances in project design, the project team revisited a previously considered alternative, namely the SR 152 (North) to Road 11 Wye. The SR 152 (North) to Road 11 Wye Alternative would satisfy the purpose of the project, meet the objective to reduce jurisdictional waters effects as it is among the alternatives with the least effects on jurisdictional waters, and would be responsive to local stakeholders' concerns. This alternative was withdrawn in 2013 because initial estimates indicated slightly greater effects on jurisdictional waters than the SR 152 (North) to Road 13 Wye Alternative. However, because it has the potential to result in lesser effects on other environmental and community resources, FRA and the Authority determined that this alternative warranted further consideration and detailed study in the Draft Supplemental EIR/EIS. Based on initial feedback, local stakeholders appear receptive to this alignment, which provided a further basis to carry it forward into the environmental review process.

In 2016, the Authority and FRA prepared a third addendum to the Supplemental Checkpoint B Summary Report—*Merced to Fresno Section: Third Report Addendum to the September 10, 2013 Supplemental Checkpoint B Summary Reports* (August 2016) (Authority and FRA 2016a). During preparation of this report, the Authority and FRA included the SR 152 (North) to Road 11 Wye Alternative, in addition to the three alternatives carried forward in the second report addendum.

This Summary Report addresses the effects of all four Central Valley Wye alternatives. Chapter 4, Effects on Jurisdictional Waters; Chapter 6, Comparative Analysis of Effects on Other Environmental Resources for Central Valley Wye Alternatives; and Chapter 7, Practicability Analysis, describe the reasons for the selection of the preliminary least environmentally damaging practicable alternative (LEDPA), including effects on jurisdictional waters, other environmental resources, and practicability factors.

1.3 Scope of Alternatives Analysis under Clean Water Act Section 404(b)(1) (33 C.F.R. § 320.4, 40 C.F.R. § 230.10(a))

The CWA Section 404(b)(1) Guidelines establish the requirements for consideration of alternatives when a Section 404 permit is sought. The Guidelines state that no fill of waters of the United States is permitted if there is a “practicable alternative” to the proposed project which would have a less adverse effect on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences (40 C.F.R. Section 230.10(a)). An alternative is “practicable” if it “is available and capable of being done after taking into consideration cost, existing technology, and logistics in light of the overall project purposes” (40 C.F.R. Section 230.10(a) and (a)(2)).

1.4 Scope of Section 408 Analysis

Pursuant to 33 United States Code (U.S.C.) section 408, USACE must evaluate any proposed modification involving a federal flood-control project. Section 408 permission is required if construction modifies a federal levee or if the project encroaches on a federal facility. Permission may be granted if an alteration or modification is not injurious to the public interest and will not impair the usefulness of the federal facility.

On July 31, 2014, USACE Headquarters issued Engineering Circular 1165-2-216 Policy and Procedural Guidance for Processing Requests to Alter USACE Civil Works Projects Pursuant to 33 U.S.C. section 408, which superseded previous policy memoranda on this topic dated October 23, 2006; November 17, 2008; and June 18, 2010. The purpose of this engineering circular is to provide policy and procedural guidance for processing requests for Section 408 permission

submitted by private, public, tribal, or other federal entities, to make alterations to, or temporarily or permanently occupy or use, any civil works projects pursuant to Section 408. Because proposed alterations vary in size, level of complexity, and potential effects, the procedures and required information to obtain Section 408 permission are intended to be scalable. The main body of EC 1165-2-216 contains policy applicable to all types of civil works projects and an overall step-by-step procedural guide to be tailored at the district level. The engineering circular appendices provide additional detail regarding procedures, data needs, and level of coordination according to the type of civil works project (i.e., dams, hydropower, levee systems, channels, and navigation).

Pursuant to the *National Environmental Policy Act/Clean Water Act Section 404/Rivers and Harbors Act Section 14 Integration Process Memorandum of Understanding for the California High-Speed Train Program* (MOU) (Authority et al. 2010) and the Checkpoint C agency review process, the Authority and FRA will provide sufficient materials to USACE in order to receive a Section 408 preliminary determination from USACE. A Section 408 preliminary determination provides substantive feedback to the FRA and Authority regarding the proposed Central Valley Wye design, the level of anticipated USACE review/approval, and additional analyses that would be required to obtain Section 408 permission. The proposed Central Valley Wye occurs entirely within the boundaries of the USACE Sacramento District; therefore, the Sacramento District is the primary point of contact for seeking Section 408 permission.

The Central Valley Wye alternatives are anticipated to have potential effects on federal and non-federal flood control facilities, which will require USACE Section 408 review and a Central Valley Flood Protection Board (CVFPB) encroachment permit (pursuant to Cal. Code Regs., tit. 23 and 33 C.F.R. § 208.10). See Appendix D, USACE Section 408 Preliminary Determination Hydraulics Analysis Summary Report, for a detailed description of Section 408 facilities within the Central Valley Wye, proposed crossings of Section 408 facilities for each Central Valley Wye alternative, and hydraulic modeling results. The Authority and FRA are currently preparing materials in support of early coordination with local maintaining authorities and the CVFPB, and in advance of submission of an application for an encroachment permit and submission of sufficient materials to receive USACE Section 408 permission (pursuant to the MOU and USACE Headquarters EC 1165-2-216, Step 1—Pre-Coordination).

1.5 Scope of Analysis of the Preliminary Compensatory Mitigation Plan

Appendix B of the MOU provides that the Preliminary Compensatory Mitigation Plan (pCMP) is a “[c]ompensatory mitigation plan to offset permanent losses of waters of the U.S.” It “should be based on the watershed approach and should comply with the final mitigation rule issued by the USEPA and the USACE on April 10, 2008, and USACE-issued Habitat Mitigation and Monitoring Guidelines (Authority et al. 2010).” The amount, type, and location of compensatory mitigation should be described if a mitigation bank or in-lieu fee program will not be used. If the mitigation proposal includes project activities to create, restore, or enhance waters of the U.S. and aquatic ecosystems, a prospectus of candidate mitigation sites should be provided.

This Summary Report provides the information needed for USACE concurrence with the pCMP, which is included as Appendix E, Preliminary Compensatory Mitigation Plan.

1.6 Compliance with the Memorandum of Understanding Data Needs

The information required by the MOU is included in the Draft Supplemental EIR/EIS and related technical documents. Table 1-1 describes the information required by the MOU and explains how and where the required information has been or will be provided.

Table 1-1 U.S. Environmental Protection Agency/U.S. Army Corps of Engineers Data Needs for Checkpoint C

| NEPA/404/408 MOU and USEPA/USACE Data Needs | Source of Data | Document Location | Request Status |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|----------------|
| Supplemental Checkpoint C: Preferred Alternative | | | |
| Data Request 1: Updated Project Activities Description | | | |
| Project description and/or plans for alternatives, including a draft operations and maintenance plan (if changed) | Draft Supplemental Checkpoint C Summary Report | This document | Complete |
| | Draft Supplemental EIR/EIS | To be submitted as Volume 1 | Complete |
| | Operations and Service Plan Summary | To be submitted as Chapter 6, Appendix 6-A in Volume 1 | Complete |
| Data Request 2: Functional/Condition Assessment of Jurisdictional Waters | | | |
| Report of findings and application of the results from the Functional/Condition Assessment of Jurisdictional Waters occurring within the Wetland Study Area | Merced to Fresno Section: Central Valley Wye Evaluation of Wetland Condition Using the CRAM Report | Appendix B of this document | Complete |
| Data Request 3: Draft 404(b)(1) Alternatives Analysis | | | |
| Draft 404(b)(1) alternatives analysis (compliance evaluation with 404(b)(1) Guidelines), if it is a separate and distinct document from the NEPA alternatives analysis | Draft Supplemental Checkpoint C Summary Report | This document | Complete |
| Data Request 4: Documentation of Avoidance/Minimization Features in Project Design | | | |
| Documentation of any Impact Avoidance and Minimization Features (IAMFs) and Mitigation Measures (MMs) incorporated into the Central Valley Wye alternatives design; documentation to consist of a quantification and qualification of the acres of effects on waters of the U.S. avoided for each alternative (as applicable) | Draft Supplemental Checkpoint C Summary Report | This document | Complete |
| Environmental Commitments –IAMFs ¹ and MMs ² | Draft Supplemental EIR/EIS, Appendix 2-B, California High-Speed Rail Environmental Commitments: Impact Avoidance and Minimization Features | Appendix G of this document | Complete |

| NEPA/404/408 MOU and USEPA/USACE Data Needs | Source of Data | Document Location | Request Status |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|----------------|
| Data Request 5: Waters of the U.S. Effects Summary (Permanent and Temporary) | | | |
| Based on engineering plans/drawings, a written description and quantification of the permanent effects (direct and indirect) on waters of the U.S., including special aquatic sites; the effects to be clearly depicted and accurately characterized by providing a quantification of the effects (acres and/or linear feet) and an assessment of the losses and gains in functions and services | Draft Supplemental Checkpoint C Summary Report | This document | Complete |
| | Draft Supplemental EIR/EIS | To be submitted as Volume I | Complete |
| | Merced to Fresno Section: Central Valley Wye: Evaluation of Wetland Condition Using the CRAM Report | Appendix B of this document | Complete |
| Data Request 6: Long-Term Operational Effects | | | |
| Based on the draft Wetlands Delineation Report and Operations and Service Plan Summary, a written description detailing long-term operations effects (direct and indirect) on waters of the U.S., including special aquatic sites | Second Supplemental Wetlands Delineation Report https://www.hsr.ca.gov/programs/statewide_rail_modernization/project_sections/central_valley_wye.html | Will be available on Authority's website | Complete |
| | Draft Supplemental EIR/EIS, Chapter 3.7, Biological Resources and Wetlands | To be submitted as Chapter 6, Appendix 6-A in Volume I | Complete |
| Data Request 7: Updated Environmental Summary Table/Maps | | | |
| Refinement and expansion of the environmental summary table and environmental constraints map(s) developed during Checkpoint B, incorporating data from the jurisdictional determination, functional/condition assessment, and other pertinent data stemming from the Draft Supplemental EIR/EIS | Supplemental Checkpoint C Summary Report | This document | Complete |
| Compliance with federal and state laws | Draft Supplemental EIR/EIS | To be submitted as Volume I | Complete |

| NEPA/404/408 MOU and USEPA/USACE Data Needs | Source of Data | Document Location | Request Status |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|---------------------------------------------|----------------|
| Data Request 10: Draft Biological Assessment Report | | | |
| Quantification of direct, indirect, and cumulative effects on biological resources, including federally listed, endangered, and threatened species and designated critical habitat, and other wildlife and habitat resource concerns | Draft Supplemental Biological Assessment | Will be available on Authority's website | Complete |
| | Merced to Fresno Section Draft Biological Assessment | Will be available on Authority's website | Complete |
| | Biological Resources and Wetlands Technical Report | Will be available on Authority's website | Complete |
| | Draft Supplemental EIR/EIS | To be submitted as Section 3.7 in Volume I | Complete |
| Data Request 11: Cultural Resources Effects | | | |
| Consideration of temporary, permanent, and cumulative effects on cultural resources, including sites listed on the National Register of Historic Places or National Historic Landmarks | Draft Supplemental EIR/EIS | To be submitted as Section 3.17 in Volume I | Complete |
| Data Request 12: Draft Mitigation Plan | | | |
| A description of FRA's and Authority's proposed compensatory mitigation for losses of jurisdictional waters that specifies the amount, type, and location of compensatory mitigation; the proposal to indicate whether the FRA and Authority intend to pursue permittee-responsible mitigation or use a USACE-approved mitigation bank or in-lieu fee program | Preliminary Compensatory Mitigation Plan | Appendix E of this document | Complete |
| | Merced to Fresno Section Draft Compensatory Mitigation Plan | Available on Authority's website | Complete |
| Data Request 13: 408 Preliminary Determination | | | |
| Process for obtaining the 408 Preliminary Determination | Section 408 Preliminary Determination Summary Report | Appendix D of this document | Complete |

| NEPA/404/408 MOU and USEPA/USACE Data Needs | Source of Data | Document Location | Request Status |
|---------------------------------------------|--------------------------------------------------------------------------------|-----------------------------|----------------|
| Additional Information | | | |
| Effects Illustrations | Preliminary Compensatory Mitigation Plan | Appendix E of this document | Complete |
| Impact Categories and Effects Definitions | Merced to Fresno Section Watershed Evaluation Report (Authority and FRA 2012c) | Appendix A of this document | Complete |
| Capital Cost Estimate Report | Draft Supplemental EIR/EIS | Draft Supplemental EIR/EIS | Complete |

Source: Author's compilation, 2017

¹ IAMFs are incorporated into the project design and construction that will avoid or minimize the environmental or community effects.

² MMs avoid or reduce effects that exist after application of all impact avoidance and minimization features through project construction and operation.

CRAM = California Rapid Assessment Method

FRA = Federal Rail Authority

HSR = high-speed rail

IAMF = impact avoidance and minimization features

LEDPA = least environmentally damaging practicable alternative

MOU = memorandum of understanding

MM = Mitigation Measures

NEPA = National Environmental Policy Act of 1969

USACE = U.S. Army Corps of Engineers

USEPA = U.S. Environmental Protection Agency

1.7 Technical Updates since the Central Valley Wye Supplemental Checkpoint B and Addenda

Following submittal of the Supplemental Checkpoint B materials in September 2013, the Checkpoint B Addendum in May 2014, Second Report Addendum in August 2014, and Third Report Addendum in August 2016, the Authority team has advanced the engineering designs at select locations across all Central Valley Wye alternative alignments. Specifically, the Regional Consultant has refined the design of the Central Valley Wye alternatives at all named water crossing locations (rivers, sloughs, creeks). Moreover, the Authority and Pacific Gas and Electric Company (PG&E) have more clearly defined the electrical components associated with each Central Valley Wye alternative.

The following refinements have been made to the alignments since submittal of the Checkpoint B materials.

1.7.1 SR 152 (North) to Road 13 Wye Alternative

- Updated limits of the alignment to only encompass the Central Valley Wye (the new limits include: western terminus at Henry Miller Road/Carlucci Road, northern terminus at Ranch Road/SR 99, and southern terminus at Avenue 19 near Madera Acres)
- Removed the tunnel crossing of Union Pacific Railroad (UPRR)/SR 99 by shifting the alignment north and placing the HSR on structure
- Refined the track profile
- Refined the roadway grade separations
- Refined the locations of traction power substations and access roads
- Globally reduced structure lengths by placing the HSR on higher embankments
- Increase separation between HSR right-of-way and BNSF/UPRR right-of-way

1.7.2 SR 152 (North) to Road 19 Wye Alternative

- Updated limits of the alignment to only encompass the Central Valley Wye (the new limits include: western terminus at Henry Miller Road/Carlucci Road, northern terminus at Ranch Road/SR 99, and southern terminus at Avenue 19 near Madera Acres)
- Refined alignment to reduce extended parallel track through the community of Fairmead
- Shifted alignment north at crossing of UPRR/SR 99 to reduce effect on the community of Fairmead
- Shifted east/west portion of the alignment north to reduce effects on local business and facilitate tunnel crossing under UPRR/SR 99
- Refined the track profile
- Refined the roadway grade separations
- Refined the locations of traction power substations and access roads
- Globally reduced structure lengths by placing the HSR on higher embankments
- Increase separation between HSR right-of-way and BNSF/UPRR right-of-way
- Added relocation of county road at intersection of SR 152 and Road 16

1.7.3 Avenue 21 to Road 13 Wye Alternative

- Updated limits of the alignment to only encompass the Central Valley Wye (the new limits include: western terminus at Henry Miller Road/Carlucci Road, northern terminus at Ranch Road/SR 99, and southern terminus at Avenue 19 near Madera Acres)

- Refined the track profile
- Refined the roadway grade separations
- Refined the locations of the traction power substations and access roads
- Globally reduced structure lengths by placing the HSR on higher embankments
- Increase separation between HSR right-of-way and BNSF/UPRR right-of-way
- Added relocation of county road at intersection of SR 152 and Road 16

1.7.4 SR 152 (North) to Road 11 Wye Alternative

- Updated limits of the alignment to only encompass the Central Valley Wye (the new limits include: western terminus at Henry Miller Road/Carlucci Road, northern terminus at Ranch Road/SR 99, and southern terminus at Avenue 19 near Madera Acres)
- Removed the tunnel crossing of the northbound San Jose to Merced track under HSR mainline
- Refined the track profile
- Refined the roadway grade separations
- Refined the locations of traction power substations and access roads
- Globally reduced structure lengths by placing the HSR on higher embankments
- Increase separation between HSR right-of-way and BNSF/UPRR right-of-way
- Added relocation of county road at intersection of SR 152 and Road 16

2 ALTERNATIVES

2.1 Project Purpose and Need

To comply with CWA Section 404(b)(1), the USACE must take into consideration the applicants’ needs in the context of the geographic area of the proposed action and the type of project being proposed. This section presents the Purpose and Need for the HSR System as a whole and the Merced to Fresno Section, focusing on the Central Valley Wye.

2.1.1 Purpose of the HSR System

The Program EIR/EIS documents² identified and evaluated alternative HSR corridor alignments and stations as part of a statewide HSR system. The stated purpose of the HSR system is as follows:

The purpose of the statewide HSR system is to provide a reliable high-speed electric-powered train system that links the major metropolitan areas of the state, and that delivers 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 (Authority and FRA 2005).

2.1.2 Overall Project Purpose of the Merced to Fresno Section

The overall project purpose of the Merced to Fresno Section is to construct a reliable, high-speed, lower emissions transit system within the Central Valley, while providing predictable and consistent travel times between major urban centers, and connectivity to airports, mass transit systems, and the highway network through the San Joaquin Valley. The Central Valley Wye portion of the Merced to Fresno Section is the critical connection between the San Francisco Bay Area (Bay Area) to the Central Valley HSR sections, specifically the San Jose to Merced (west to east) and the Merced to Fresno (north to south) sections, consistent with Proposition 1A, the Safe, Reliable High-Speed Passenger Train Bond Act for the 21st Century (California Streets & Highways Code § 2704 et seq.).

The Merced to Fresno Section’s Contribution to Meeting the Statewide and Regional Need for the HSR System

The need for an HSR system exists statewide, with regional areas contributing to this need. The Merced to Fresno Section is an essential component of the statewide HSR system. The Central Valley Wye refers to the Y-like formation that is created at the point where train tracks branch off the mainline to continue in different directions. This requires splitting two tracks into four tracks that cross over one another before the wye legs can diverge in opposite direction to allow for two-way travel. For the Merced to Fresno Section of the HSR system, the two tracks traveling east-west from the San Jose to Merced Section must become four tracks—a set of two tracks branching toward Merced to the north and a set of two tracks branching toward Fresno to the south.

The capacity of California’s intercity transportation system, including the central part of the San Joaquin Valley region, is insufficient to meet existing and future travel demand. The current and projected future system congestion will continue to result in deteriorating air quality, reduced

² The Program EIR/EIS documents are: *Final Program EIR/EIS for the Proposed California High-Speed Train System* (Authority and FRA 2005), *San Francisco Bay Area to Central Valley High-Speed Train Final Program EIR/EIS* (Authority and FRA 2008), and *2012 Bay Area to Central Valley High-Speed Train Partially Revised Final Program EIR* (Authority 2012a).

reliability, and increased travel times. The current transportation system has not kept pace with the increase in population, economic activity, and tourism within the state, including in the central part of the San Joaquin Valley region. The interstate highway system, commercial airports, and conventional passenger rail system serving the intercity travel market are operating at or near capacity. These transportation systems will require large public investments for maintenance and expansion to meet existing demand and future growth over the next 25 years and beyond. Moreover, the feasibility of expanding many major highways and key airports is uncertain; some needed expansions might be impractical or are constrained by physical, political, and other factors. The need for improvements to intercity travel in California, including intercity travel between the central part of the San Joaquin Valley, the Bay Area, Sacramento, and Southern California relates to the following issues:

- Future growth in demand for intercity travel, including the growth in demand within the central part of the San Joaquin Valley region
- Capacity constraints that will result in increasing congestion and travel delays, including those in the central part of the San Joaquin Valley region
- Unreliability of travel stemming from congestion and delays, weather conditions, accidents, and other factors that affect the quality of life and economic well-being of residents, businesses, and tourism in California, including the central part of the San Joaquin Valley region
- Reduced mobility as a result of increasing demand on limited modal connections between major airports, transit systems, and passenger rail in the state, including the central part of the San Joaquin Valley region
- Poor and deteriorating air quality and pressure on natural resources and agricultural lands as a result of expanded highways and airports and urban development pressures, including the development pressures within the central part of the San Joaquin Valley region

The Merced to Fresno Section, by virtue of its central location, is a critical link in the statewide plan for a new intercity transportation service connecting the San Joaquin Valley with the major population and economic centers on the coasts of Northern and Southern California and in the Sacramento Valley.

2.2 Environmental Impact Assessment under the National Environmental Policy Act

2.2.1 California HSR System Programmatic Assessment: Tier 1

The Authority and FRA prepared several Tier 1 environmental documents for the HSR system pursuant to NEPA and CEQA requirements. The Tier 1 *Final Program EIR/EIS for the Proposed California High-Speed Train System (Statewide Program EIR/EIS)* (Authority and FRA 2005) provided a programmatic analysis of implementing the HSR system across the state, from Sacramento in the north to San Diego in the south and the Bay Area in the west. The Authority approved the High Speed Train System Program on November 5, 2005 and the FRA issued its related ROD on November 11, 2005.

Following the Statewide Program EIR/EIS, the Authority and FRA prepared a second program EIR/EIS for the HSR system to identify a preferred alignment and stations for the connection between the Bay Area and the Central Valley. In 2008, after completing the *Bay Area to Central Valley High-Speed Train Final Program EIR/EIS* (Authority and FRA 2008), the Authority and FRA selected a Pacheco Pass connection, preferred general alignments, and stations for further second-tier evaluation. After litigation, the Authority rescinded its 2008 decision and prepared the *Bay Area to Central Valley High-Speed Train Revised Final Program EIR* (Authority 2010). The 2010 document was also litigated, after which the Authority prepared the *Bay Area to Central Valley High-Speed Train Partially Revised Final Program EIR* (Authority 2012a). With certification of the 2012 programmatic documents, the Authority again selected the Pacheco Pass Network Alternative for project-level study, with a corridor extending from the Bay Area over Pacheco Pass

to the Central Valley, then along Henry Miller Road to meet the Merced to Fresno corridor. The Authority and FRA are now preparing project-level environmental documents for several HSR sections, tiering from the programmatic documents.

2.2.2 Project-Level Assessment: Tier 2

Following completion of the Tier 1 documents, the Authority and FRA initiated Tier 2 project-level planning and environmental review efforts. Two Tier 2 project-level planning efforts are particularly relevant to this Summary Report:

1. Evaluation of alternatives between Merced and Fresno
2. Evaluation of alternatives between San Jose and Merced

Merced to Fresno Planning

The Central Valley Wye was included in and analyzed initially as part of the Merced to Fresno EIR/EIS. The Merced to Fresno EIR/EIS process commenced in 2009 and involved scoping and additional public discussions about the range of alternatives through 2010 and 2011. As a result of the public scoping and alternatives analysis process, the Merced to Fresno Draft EIR/EIS, released in August 2011, included detailed examinations of east-west alignments and wyes at Avenue 21 and Avenue 24, with the north-south alignments generally following the UPRR and BNSF.

In May 2012, the Authority approved the Merced to Fresno Final EIR/EIS and identified the Hybrid Alternative, the Merced Station, and the Fresno Mariposa Street Station as the preferred alternatives (Authority and FRA 2012b). As part of the project approval, the Authority directed staff to carry forward for further study and analysis all HSR elements in the wye area as part of the San Jose to Merced Section. This analysis was undertaken to determine whether any of the wye alternatives should be modified, augmented, or eliminated, or if additional wye alternatives should be considered.

This Summary Report does not contain any new information about heavy maintenance facilities (HMF) sites or impacts because the Authority has not proposed changes at this time. As described in the Draft Supplemental EIR/EIS, the statewide system only needs one HMF. Nine sites were evaluated and cleared in the 2012 Merced to Fresno Final EIR/EIS and in the 2014 Fresno to Bakersfield Final EIR/EIS. The Authority did not approve one at that time and presently has no proposed project modifications to any of the HMF sites in the Merced to Fresno Final EIR/EIS.

San Jose to Merced Planning

As a result of the Authority direction upon approval of the Merced to Fresno Final EIR/EIS, the environmental review of the San Jose to Merced Section was initially expanded to include a more comprehensive evaluation of wye alternatives connecting to the Hybrid Alternative (Authority and FRA 2012b). The analysis evaluated three primary east-west wye alternatives—Avenue 24, SR 152, and Avenue 21—along with a number of north-south options, all in the vicinity of Chowchilla.

Between May 2012 and October 2013, the Authority, Authority staff, and project team engaged in further public involvement and discussions with stakeholders to seek ways to refine the wye alternatives. These discussions generated multiple conceptual alignment ideas focused on addressing stakeholder concerns. Staff also worked closely with the California Department of Transportation (Caltrans) and Madera County to further develop and refine the SR 152 alignment. The range of potential alternatives under discussion expanded to 14 in order to evaluate the viability of several new scenarios generated through stakeholder input and agency discussions.

Advancing Evaluation of the Wye Alternatives

Analysis of the Central Valley Wye alternatives is included in the Merced to Fresno Draft Supplemental EIR/EIS. As described in Section 1.1, Checkpoint C Purpose and Relationship to the Memorandum of Understanding, the Draft Supplemental EIR/EIS supplements the Merced to Fresno Final EIR/EIS, focusing exclusively on the Central Valley Wye alternatives (Authority and

FRA 2012b). A preferred Central Valley Wye alternative is necessary to connect the San Francisco Bay Area to the Central Valley. The Draft Supplemental EIR/EIS identifies the preferred Central Valley Wye alternative as the SR 152 (North) to Road 11 Wye Alternative. The Authority and FRA are submitting this Summary Report to assist in identifying the Preliminary LEDPA.

2.3 Section 404(b)(1) Guidelines Criteria for Consideration of Alternatives

CWA Section 404(b)(1) Guidelines (Guidelines) (40 C.F.R. § 230.10(a)) establish the requirements for consideration of alternatives when an individual permit under Section 404 is sought. USACE's memorandum entitled "Appropriate Level of Analysis Required for Evaluating Compliance with the Section 404(b)(1) Guidelines Alternatives Requirements" describes these requirements as follows:

The fundamental precept of the Guidelines is that discharges of dredged or fill material into waters of the U.S., including wetlands, should not occur unless it can be demonstrated that such discharges, either individually or cumulatively, will not result in unacceptable adverse effects on the aquatic ecosystem. The Guidelines specifically require that 'no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences' (40 C.F.R. § 230.10(a)). Based on this provision, the applicant is required in every case (irrespective of whether the discharge site is a special aquatic site or whether the activity associated with the discharge is water dependent) to evaluate opportunities for use of non-aquatic areas and other aquatic sites that would result in less adverse impact on the aquatic ecosystem. A permit cannot be issued, therefore, in circumstances where a less environmentally damaging practicable alternative for the proposed discharge exists (except as provided for under Section 404(b)(2)).

The term *practicable* means available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes (30 C.F.R. § 230.2(q)). For further discussion of the practicability analysis, refer to Chapter 7, Practicability Analysis, of this Summary Report.

2.4 Sequenced Search for Less Environmentally Damaging Alternatives

The Statewide Program EIR/EIS (Authority and FRA 2005) provided a first-tier analysis of the general effects of implementing the HSR system across two-thirds of the state. That document provided the Authority and FRA with the environmental analysis necessary to evaluate the overall HSR system and to make broad decisions about general HSR alignments and station locations for further study in second-tier EIR/EIS documents. The conclusions of the Statewide Program EIR/EIS provided the basis for the initial range of alternatives to be considered in the project-level alternatives analysis process.

To define the project-level alternatives to be considered in the formal environmental process, the Authority and FRA prepared the Merced to Fresno Final EIR/EIS (Authority and FRA 2012b), the Supplemental Alternatives Analysis Report (April 2013), and the Supplemental Checkpoint B Summary Report (September 2013) and Checkpoint B Addenda (May and August 2014; August 2016). The Supplemental Alternatives Analysis Report summarized ongoing stakeholder engagement and public feedback and input from regulatory agencies and narrowed the recommended range of wye alternatives from 14 to 4. Continued agency coordination provided additional information about the wye alternatives that allowed for further definition of the wye alternatives proposed to be carried forward or withdrawn. With the recommendations contained in these documents, the Central Valley Wye description and the alternatives to be considered in the Draft Supplemental EIR/EIS were established.

Pursuant to the MOU, the Checkpoint B Summary Report identified the range of alternatives to be carried forward in the Draft Supplemental EIR/EIS. The MOU specifically stipulates that for each project EIR/EIS a range of alternatives is to be identified that will be carried forward for project-level analysis and consideration under the 404(b)(1) guidelines. In August and September 2014, USEPA and USACE concurred on the three wye alternatives to be evaluated in the Draft Supplemental EIR/EIS: the SR 152 (North) to Road 13 Wye Alternative, the SR 152 (North) to Road 19 Wye Alternative, and the Avenue 21 to Road 13 Wye Alternative. In August 2016, the Authority and FRA proposed to carry forward the SR 152 (North) to Road 11 Wye Alternative for consideration in addition to the previously agreed upon three alternatives. USEPA concurred with carrying forward the SR 152 (North) to Road 11 Wye Alternative in the Draft Supplemental EIR/EIS on December 15, 2016. USACE also concurred with this decision on December 16, 2016. Appendix C to this document contains the Supplemental Checkpoint B Summary Report (September 2013) and Checkpoint B Addenda (May 2014; August 2014; August 2016).

2.5 Description of the Alternatives

2.5.1 No-Fill Alternative

As the project is not water dependent, a No-Fill alternative was analyzed to determine whether such an alternative would be practicable in light of overall project purpose. The analysis concludes that the No-Fill alternative would not be practicable and, as such, would not be the LEDPA for the Central Valley Wye. The practicability analysis of the No-Fill Alternative is set out in Chapter 7, *Practicability Analysis*.

2.5.2 Common Features

The Central Valley Wye alternatives would cross rural areas in unincorporated Merced and Madera Counties, and would travel through the southern portion of Chowchilla and the rural-residential community of Fairmead. Volume 3 of the Draft Supplemental EIR/EIS provides detailed design drawings that support the descriptions of the Central Valley Wye alternatives.

The HSR alignment would be entirely grade-separated, meaning that crossings of roads, railroads, and other transport facilities would use overpasses or underpasses so that the HSR would operate independently of other modes of transport. The HSR right-of-way would also be fenced to prevent public or vehicle access. The Central Valley Wye alternatives project footprint would primarily consist of the train right-of-way, which would accommodate two sets of tracks in an area with a minimum width of 100 feet. Additional right-of-way would be required to accommodate grade separations, embankments, traction power facilities, and transitional portions of the Central Valley Wye alternatives that allow for bidirectional interface between north-south and east-west trending alignments.

The Central Valley Wye alternatives would include at-grade, below-grade, and above-grade (elevated) track segments. The at-grade track would be laid on an earthen railbed raised 6–10 feet (embankment heights are in excess of 35 feet) off the ground level, set on ties with rock ballast; fill and ballast for the railbed would be obtained from permitted borrow sites and quarries. Below-grade track would be laid in open cut, trench, or cut-and-cover tunnel at a depth that would allow roadway and other grade-level uses above the track. Elevated track segments would span some waterways, roadways, railroad, and other HSR tracks, and would consist of precast, prestressed concrete box girders, cast-in-place concrete box girders, or steel box girders. The height of elevated track sections would depend on the height of existing structures below, or clearances to existing roads or other HSR facilities, and would range from 35 to 90 feet above grade. Columns would be spaced approximately 100–120 feet apart on average.

To provide adequate capacity for train operators, the proposed electrical power supply system would interconnect into utility networks at 115 kilovolts (kV) or 230 kV, with approximately 30-mile intervals between the traction power substations (TPSS). Other electrical interconnection components, proposed to be designed and constructed by the Authority, would include switching and paralleling stations connected to TPSSs. A 2016 Transmission System Study completed by PG&E and reviewed by the Authority determined what network upgrades would be required to

existing PG&E infrastructure to meet the projected power demands of the HSR system. All network upgrades would be implemented pursuant to California Public Utilities Commission General Order 131-D. For purposes of analysis, each TPSS proposed for the HSR system has been assigned a site number. For the Central Valley Wye alternatives, there would be two TPSSs, designated Sites 6 and 7, that would require interconnection to PG&E's network.

2.5.3 Central Valley Wye Alternatives Descriptions

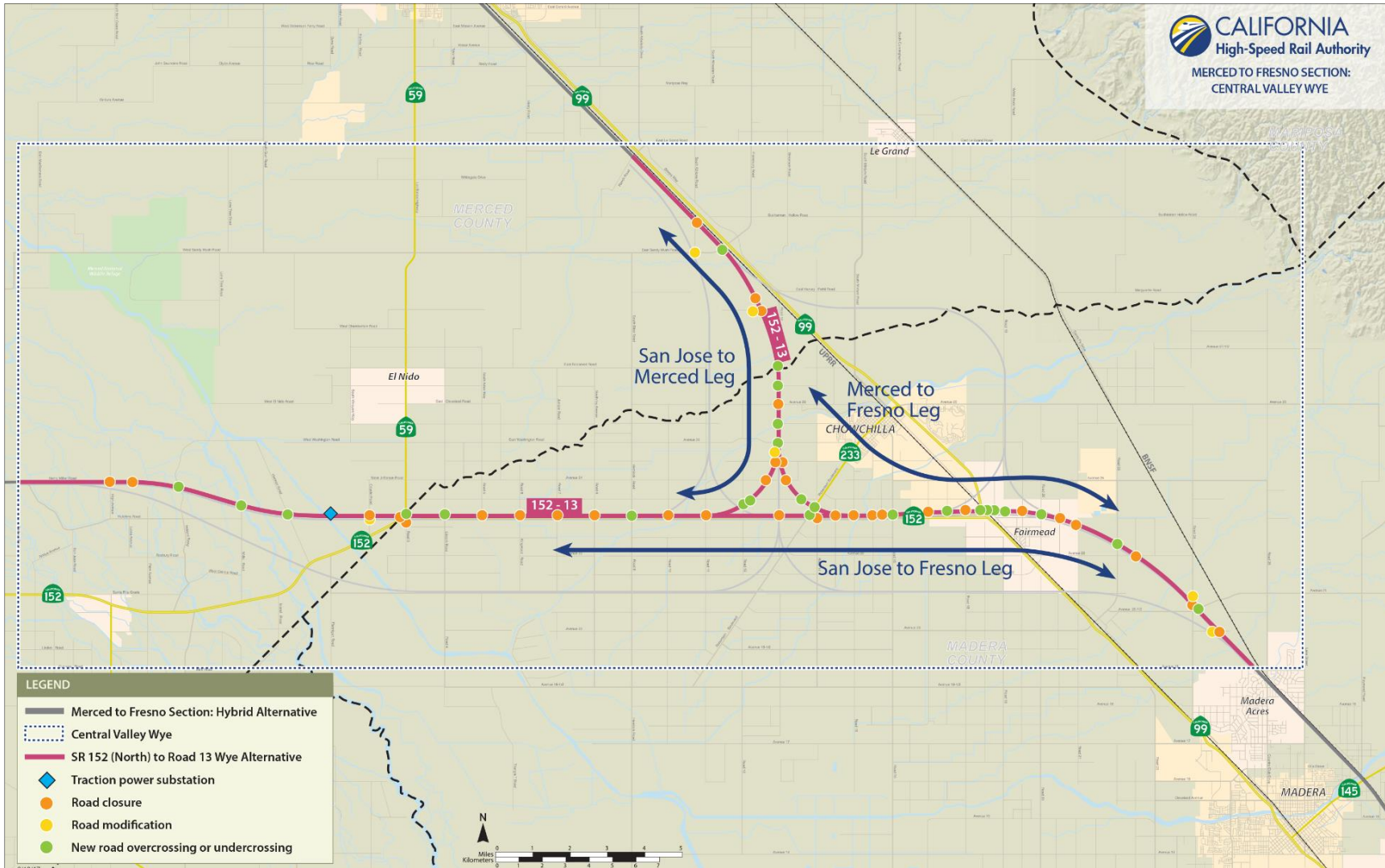
SR 152 (North) to Road 13 Wye Alternative

The SR 152 (North) to Road 13 Wye Alternative (Figure 2-1) follows 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, and BNSF rights-of-way in the north-south direction. Deviations from these existing transportation routes or 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 SR 152 (North) to Road 13 Wye Alternative would not follow existing transportation rights-of-way where it transitions from following one transportation corridor to another.

Alignment and Ancillary Features

The SR 152 (North) to Road 13 Wye Alternative 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). The wye configuration of this alternative would be located 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 13.

As shown on Figure 2-1, this alignment would begin in Merced County at the intersection of Henry Miller Road and Carlucci Road, and would continue at-grade on embankment due east toward Elgin Avenue, where it would curve southeast toward the San Joaquin River and Eastside Bypass. Approaching Willis Road, the alignment would cross the San Joaquin River on an aerial structure, then would return to embankment. It would then cross the Eastside Bypass on an aerial structure. After crossing the Eastside Bypass, the alignment would continue east and cross SR 59 at-grade just north of the existing SR 152/SR 59 interchange, entering Madera County. The SR 152/SR 59 interchange would be reconstructed a little to the south and SR 59 would be grade-separated to pass above the HSR on an aerial structure. The alignment would continue east at-grade along the north side of SR 152 toward Chowchilla, splitting into two legs (four tracks) near Road 11 to transition to the Merced to Fresno Section: Hybrid Alternative, and would cross Ash Slough on an aerial structure. All but the northbound track of the San Jose to Merced section of the alignment (leg) would then return to at-grade embankment. The northbound track would rise to cross over the tracks of the San Jose to Fresno leg on aerial structure as it curves north toward Merced. The SR 152 (North) to Road 13 Wye Alternative legs would be routed as described below and as shown on Figure 2-1.



Source: Authority and FRA 2018a; ESRI, 2013; CAL FIRE, 2004; ESRI/National Geographic, 2015

FINAL – JUNE 13, 2017

Figure 2-1 SR 152 (North) to Road 13 Wye Alternative Alignment and Key Design Features

- The southbound track of the San Jose to Merced leg³ would be at-grade. This split (where tracks separate) would be west of Chowchilla, at approximately Road 11. The two San Jose to Merced tracks would continue north on the eastern side of Road 13, crossing Ash Slough and the Chowchilla River, and then would cross over Road 13 to its west side. As the tracks return to grade, they would curve northwest, crossing Dutchman Creek on an aerial structure, and follow the west side of the UPRR/SR 99 corridor. At Sandy Mush Road, the alignment would descend into a shallow cut (depressed) section for approximately 0.5 mile, with a retained cut-and-cover undercrossing⁴ at Caltrans' Sandy Mush Road overhead. The alignment would return to grade and continue along the west side of the UPRR/SR 99 corridor, connecting to the Merced to Fresno Section: Hybrid Alternative at Ranch Road.
- The San Jose to Fresno leg of this alternative would continue east from the split near Road 11 and along the north side of SR 152 toward Chowchilla. It would be predominantly at-grade, crossing several roads and Berenda Slough on aerial structures. The alignment would pass south of Chowchilla at-grade then would rise to cross over the UPRR/SR 99 corridor and Fairmead Boulevard on an aerial structure. East of the UPRR/SR 99 corridor, the alternative would extend at-grade through Fairmead, north of Avenue 23. At approximately Road 20, the alignment would curve southeast toward the BNSF corridor and cross Dry Creek on a short aerial structure. The San Jose to Fresno leg would align parallel to the west side of the BNSF corridor as it meets the Merced to Fresno Section: Hybrid Alternative at Avenue 19.
- The Merced to Fresno leg of the alternative would split from the San Jose to Fresno leg near Road 14, where the southbound track of the Merced to Fresno leg would ascend on aerial structure, crossing over the tracks of the San Jose to Fresno leg. The northbound track would curve northwest, rise on a high embankment crossing over several roads, and continue on an at-grade embankment until joining the San Jose to Merced leg near Avenue 25.

Wildlife undercrossing structures would be installed in at-grade embankments along this alternative where the alignment intersects wildlife corridors.

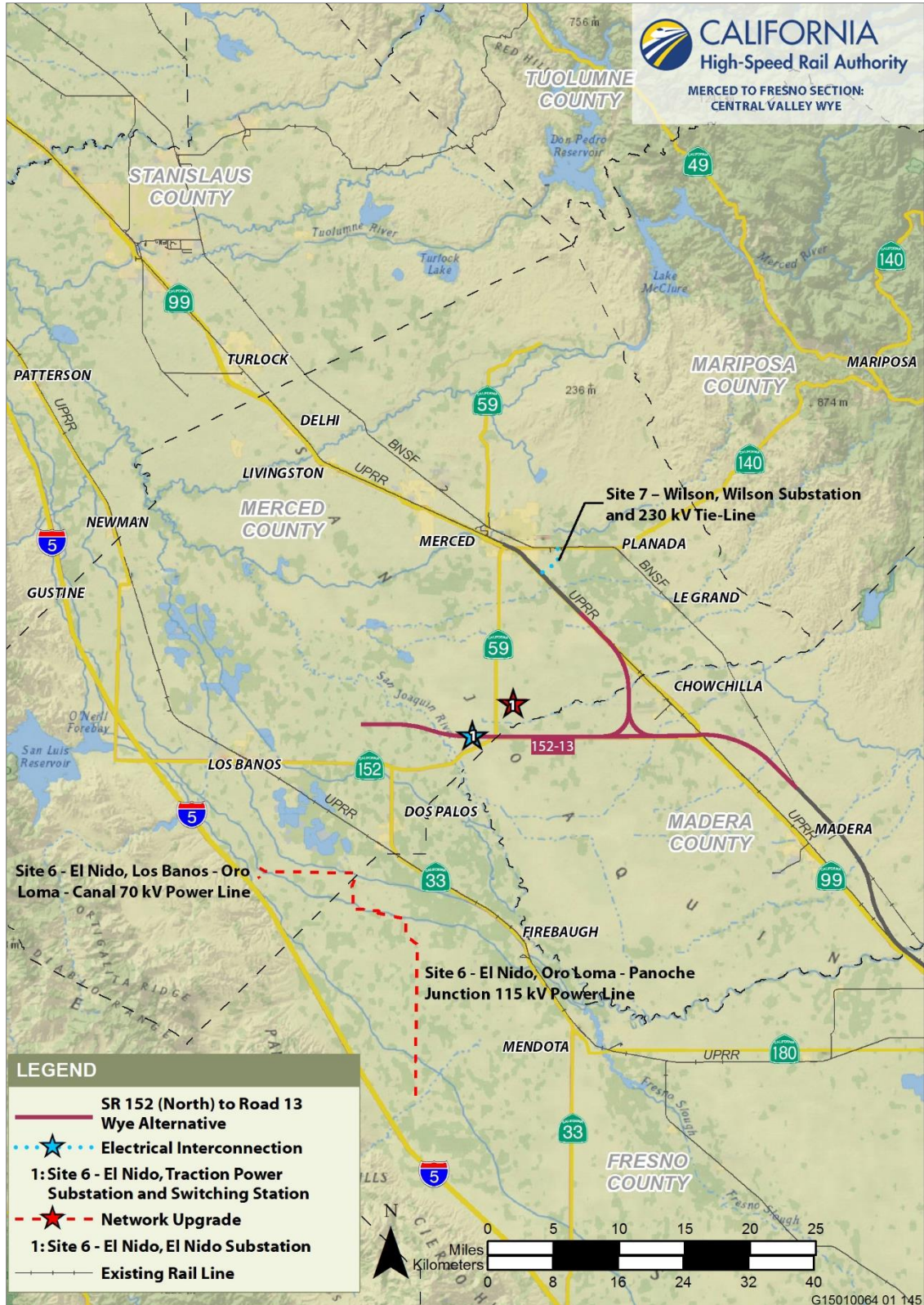
Electrical Interconnections and Network Upgrades

For Site 6—El Nido, interconnection facilities would include a 115 kV TPSS and switching station located immediately east of where the SR 152 (North) to Road 13 Wye Alternative crosses the Eastside Bypass. This new switching station would connect to the Wilson—Oro Loma 115 kV power line. Network upgrades would include expanding the El Nido Substation and reconductoring (i.e., replacing existing conductor with more efficient conductor and replacing or modify existing poles/towers) 16.9 miles of the single-circuit Panoche—Oro Loma 115 kV Power Line and 13.3 miles of the single-circuit Los Banos—Oro Loma—Canal 70 kV Power Line.

For Site 7—Wilson, interconnection facilities would include a 230 kV TPSS and an approximately 2.3-mile double-circuit 230 kV transmission line (230 kV Tie-Line) to the Wilson Substation. The TPSS and approximately 0.5 mile of the 230 kV Tie-Line were previously analyzed in the Merced to Fresno Final EIR/EIS. To support this interconnection, PG&E would need to rebuild the existing Wilson 230 kV Substation to a 4-Bay Breaker-And-A-Half within the existing fence line. Figure 2-2 illustrates the electrical interconnections and network upgrades associated with the SR 152 (North) to Road 13 Wye Alternative.

³ A track is included within a leg; e.g., southbound track of the San Jose to Merced leg.

⁴ An undercrossing is a road or track crossing under an existing road or track.



Source: Authority and FRA, 2018a; PG&E, 2016; ESRI/National Geographic, 2015

FINAL – JUNE 14, 2017

Figure 2-2 SR 152 (North) to Road 13 Wye Alternative Electrical Interconnections and Network Upgrades

Backup electrical power would be supplied by an emergency standby generator for select electrical loads, including fire protection systems, ventilation systems, emergency lights and signage, communication systems, train controls systems, and low-voltage direct-current battery supply systems to support emergency lighting and communications.

State Highway or Local Roadway Modifications

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.⁵ Figure 2-1 illustrates the anticipated state highway and local roadway closures and modifications. Fourteen of these permanent road closures would be located at SR 152, where roads currently cross at-grade but need to be closed to convert SR 152 to a fully access-controlled corridor. The 14 proposed closures are Road 5, Road 6, Road 7, Road 8, Road 10, Road 11, Road 13, Road 14, Road 14 1/2, Road 15, Road 15 1/2, Road 15 3/4, Road 17, and Road 18. Planned new grade separations along SR 152 at the SR 59/SR 152 Interchange, Road 4/Lincoln Road, Road 12, and Road 17 1/2 would maintain access to, and across, SR 152. These roadways would be reconfigured to two 12-foot lanes with two 8-foot shoulders. Each of the new interchanges would require realigning SR 152. Three new interchanges are proposed between SR 59 and SR 99 to provide access to SR 152: at Road 9/Hemlock Road, SR 233/Robertson Boulevard, and Road 16.

The distance between over- or undercrossings would vary from less than 2 miles to approximately 5 miles where other roads are perpendicular to the proposed HSR. All of the 24 roads that would not be grade-separated between these over- or undercrossings, roads would need to be closed, as illustrated on Figure 2-1. Local roads paralleling the proposed 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 HSR.

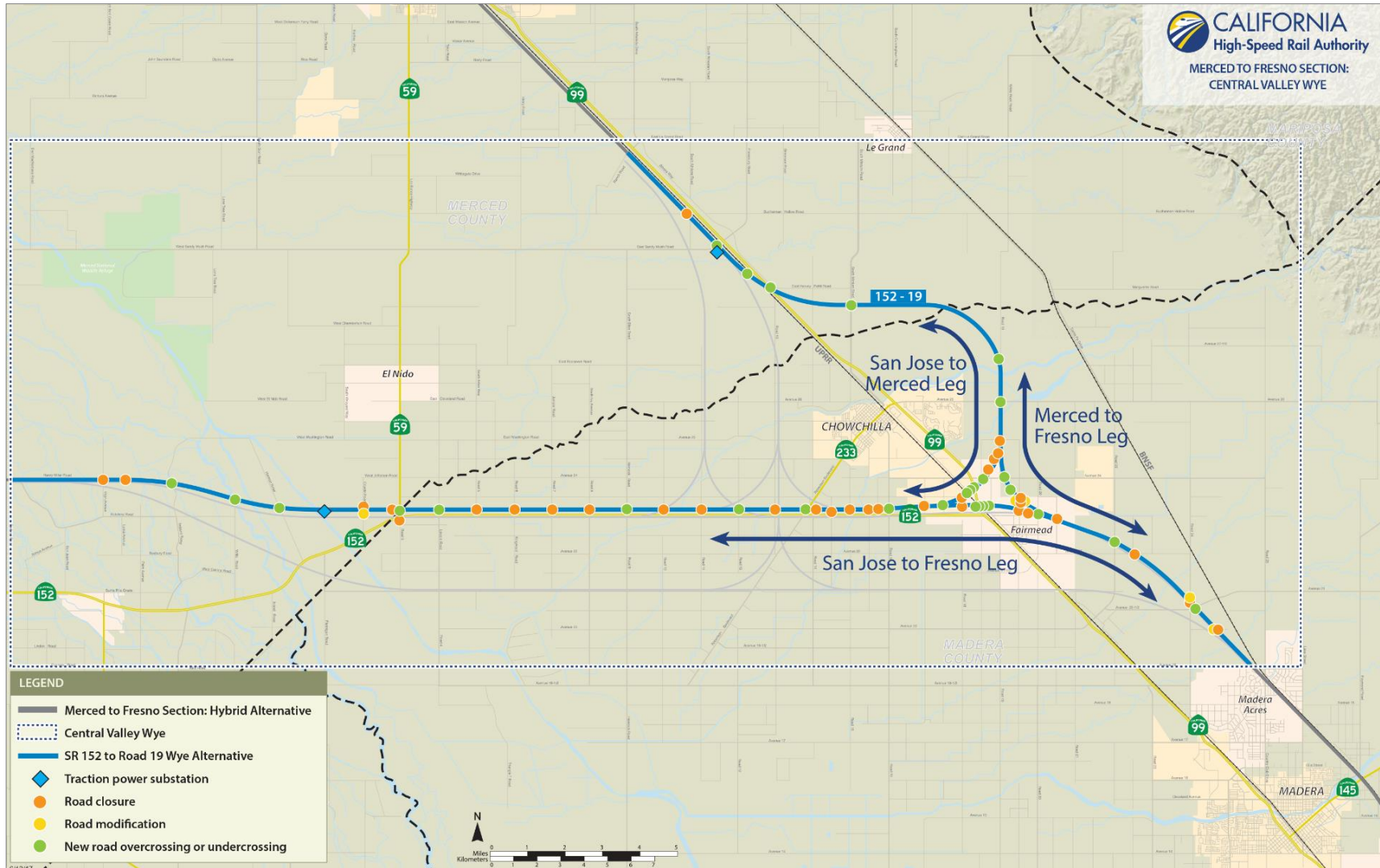
Freight or Passenger Railroad Modifications

The SR 152 (North) to Road 13 Wye Alternative would cross over the UPRR right-of-way south of Chowchilla. This alternative would maintain required vertical (at least 23.3 feet) clearance over UPRR operational right-of-way to avoid or minimize effects on UPRR rights-of-way, spurs, and facilities (BNSF and UPRR 2016). Where the SR 152 (North) to Road 13 Wye Alternative would parallel UPRR operational right-of-way, a horizontal clearance of 102 feet would be maintained from the centerline to the UPRR right-of-way.

SR 152 (North) to Road 19 Wye Alternative

The SR 152 (North) to Road 19 Wye Alternative (Figure 2-3) is designed to 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 rights-of-way in the north-south direction. Deviations from these existing transportation corridors would be necessary to accommodate design requirements; specifically, larger curves would be necessary to accommodate the high speed of the HSR compared to lower-speed roadway alignments. The SR 152 (North) to Road 19 Wye Alternative would not follow existing transportation rights-of-way as it transitions from following one transportation corridor to another.

⁵ An overcrossing is a road or track crossing over an existing road or track. An undercrossing is a road or track crossing under an existing road or track.



FINAL – JUNE 13, 2017

Figure 2-3 SR 152 (North) to Road 19 Wye Alternative Alignment and Key Design Features

Alignment and Ancillary Features

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), this alternative would continue east toward Elgin Avenue, where it would curve southeast toward the San Joaquin River. It would cross the river on an aerial structure, returning to an at-grade embankment, then onto another aerial structure to cross the Eastside Bypass. After crossing the Eastside Bypass, the alignment would continue east and cross SR 59 at-grade just north of the existing SR 152/SR 59 interchange, where it would enter Madera County. It would continue east at-grade along the north side of SR 152 toward Chowchilla, crossing Ash Slough and Berenda Slough on aerial structures. As it crosses Road 16, the alignment would split into two legs (four tracks) to transition to the Merced to Fresno Section: Hybrid Alternative. East of Road 17, the San Jose to Merced leg would curve northeast, rising to cross the UPRR/SR 99 corridor on an aerial structure, and then would continue north along the east side of Road 19.

As the alignment approaches Avenue 25, the San Jose to Merced and Merced to Fresno legs would converge, 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 SR 152 (North) to Road 19 Wye Alternative legs would be routed as follows.

- The San Jose to Merced leg would continue north to just south of Ash Slough, where it would curve west, cross Ash Slough and the Chowchilla River on aerial structures, and continue west approximately 0.5 mile south of Harvey Pettit Road. West of South Minturn Road, the leg would curve northwest and descend below-grade into a series of three tunnels crossing under the SR 99 and UPRR corridors and the Caltrans Sandy Mush Road overhead. The UPRR tracks would be reconstructed on the roof of the HSR cut-and-cover tunnels, while maintaining the same horizontal and vertical alignment. Construction of this type of below-grade crossing would require temporarily realigning the UPRR tracks. Approximately 0.6 mile north of Sandy Mush Road, the alternative would ascend to grade and continue along the UPRR/SR 99 corridor to connect with the Merced to Fresno Section: Hybrid Alternative at Ranch Road.
- The San Jose to Fresno leg would continue east from Road 16 and, east of Road 18, ascend on an aerial structure to cross SR 99 north of the SR 99/SR 152 interchange. East of the UPRR/SR 99 corridor, the leg would continue north of Avenue 23 through Fairmead, descending to grade east of Road 18 3/4. The alternative would then curve southeast toward the BNSF corridor, crossing Dry Creek on a short aerial structure, and continuing along the west side of the BNSF corridor to join the Merced to Fresno Section: Hybrid Alternative at Avenue 19.
- The Merced to Fresno leg would split from the San Jose to Fresno leg near Road 20 1/2. The southbound track of the Merced to Fresno leg would ascend on an aerial structure and cross over the tracks of the San Jose to Fresno leg. The Merced to Fresno leg would curve northwest, rise on aerial structures over several road crossings, and then continue at-grade to join the San Jose to Merced leg near Avenue 25.

Wildlife undercrossing structures would be provided in at-grade embankments where the alignment intersects wildlife corridors.

Electrical Interconnections and Network Upgrades

For Site 6—El Nido, interconnection facilities would include a 115 kV TPSS and switching station located immediately east of where the SR 152 (North) to Road 19 Wye Alternative crosses the Eastside Bypass. This new switching station would connect to the existing Wilson—Oro Loma 115 kV power line. Network upgrades would include expanding the El Nido Substation and reconductoring 16.9 miles of the single-circuit Panoche—Oro Loma 115 kV Power Line and 13.3 miles of the single-circuit Los Banos—Oro Loma—Canal 70 kV Power Line.

For Site 7—Le Grand Junction/Sandy Mush Road, interconnection facilities would include a 115 kV TPSS connected to a new switching station located on the east side of the UPRR/SR 99

corridor at the corner of East Sandy Mush Road and South Bliss Road via a new approximately 2.6-mile double-circuit 115 kV power line (115 kV Tie-Line). The new switching station would connect to the Wilson–Oro Loma, Wilson–Le Grand, and Wilson–Dairyland (idle) 115 kV power lines. Network upgrades would include reconductoring 38.4 miles of the single-circuit Warnerville–Wilson 230 kV Transmission Line and 11.3 miles of the existing single-circuit Wilson–Dairyland (idle) 115 kV Power Line. Figure 2-4 illustrates the electrical interconnections and network upgrades associated with the SR 152 (North) to Road 19 Wye Alternative.

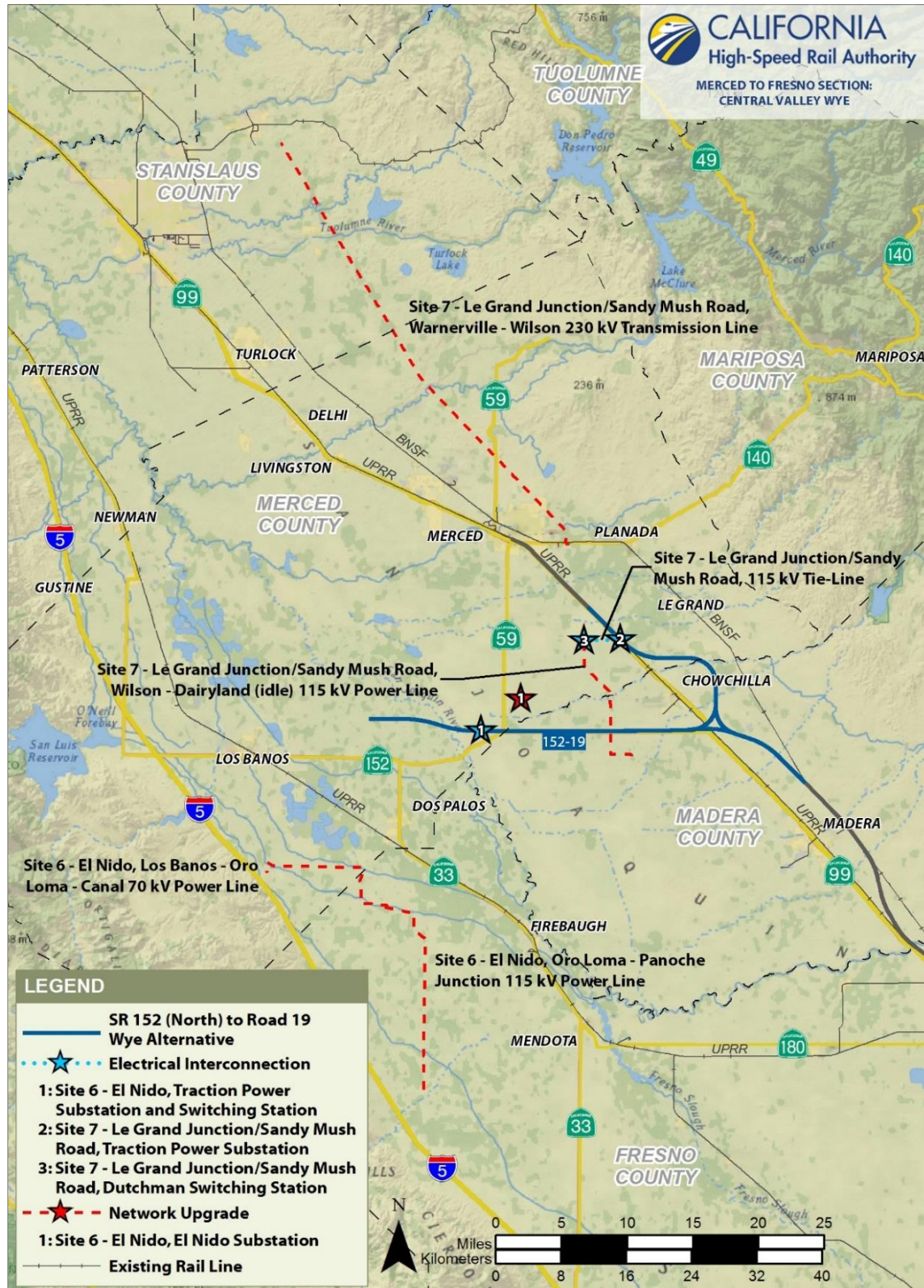
Backup electrical power would be supplied by an emergency standby generator for select electrical loads, including fire protection systems, ventilation systems, emergency lights and signage, communication systems, train controls systems, and low-voltage direct-current battery supply systems to support emergency lighting and communications.

State Highway or Local Roadway Modifications

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. Table 2-1 and Figure 2-3 show the anticipated state highway and local roadway closures and modifications. Fourteen of these permanent road closures would be located at SR 152 where roads currently cross at-grade but must be closed to convert SR 152 to a fully access-controlled corridor. The proposed 14 closures are Road 5, Road 6, Road 7, Road 8, Road 10, Road 11, Road 13, Road 14, Road 14 1/2, Road 15, Road 15 1/2, Road 15 3/4, Road 17, and Road 18. New grade separations are planned along SR 152 at the SR 59/SR 152 interchange, Road 4/Lincoln Road, Road 12, SR and Road 17 1/2. These roadways would be reconfigured to two 12-foot lanes with two 8-foot shoulders, and several of these interchanges would require realigning SR 152. Interchanges between SR 59 and SR 99 that would provide access to SR 152 are Road 9/Hemlock Road, SR 233/Robertson Boulevard, and Road 16.

The distance between over- or undercrossings would vary from less than 2 miles to approximately 5 miles where roads would be perpendicular to the proposed HSR. Of the 29 total over- or undercrossings that would be constructed, 22 over- or undercrossings would require road closures. These are included in the 36 public roadway closures described above (Figure 2-3). Local roads paralleling the proposed 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 HSR.

The SR 152 (North) to Road 19 Wye Alternative would cross over SR 99 at three locations. South of Chowchilla, both the San Jose to Merced and the San Jose to Fresno legs would rise on aerial structures to cross SR 99. Another crossing of SR 99 would be at the northern end of the alternative, where it descends below-grade into an undercrossing tunnel segment. SR 99 would be temporarily realigned during construction, and would be reconstructed on the roof of the undercrossing tunnel.



FINAL - JUNE 13, 2017

Figure 2-4 SR 152 (North) to Road 19 Wye Alternative Electrical Interconnections and Network Upgrades

Freight or Passenger Railroad Modifications

The SR 152 (North) to Road 19 Wye Alternative would cross over the UPRR corridor at three separate locations. South of Chowchilla, both the San Jose to Merced and the San Jose to Fresno legs would rise on aerial structures to cross the UPRR operational right-of-way. In these instances, the alternative would maintain required vertical (at least 23.3 feet) clearance over UPRR operational right-of-way to avoid or minimize effects on UPRR rights-of-way, spurs, and facilities (BNSF and UPRR 2016). The third crossing of the UPRR corridor would be at the northern end of the alternative, where the alignment would descend into an undercrossing tunnel. The UPRR tracks would be reconstructed on the roof of the HSR tunnel, maintaining the same vertical alignment. Construction of this crossing would require the temporary detour (shoofly)⁶ of the UPRR tracks. Where the SR 152 (North) to Road 19 Wye Alternative would parallel UPRR operational right-of-way, a horizontal clearance of 102 feet would be maintained from the centerline to the UPRR right-of-way.

Avenue 21 to Road 13 Wye Alternative

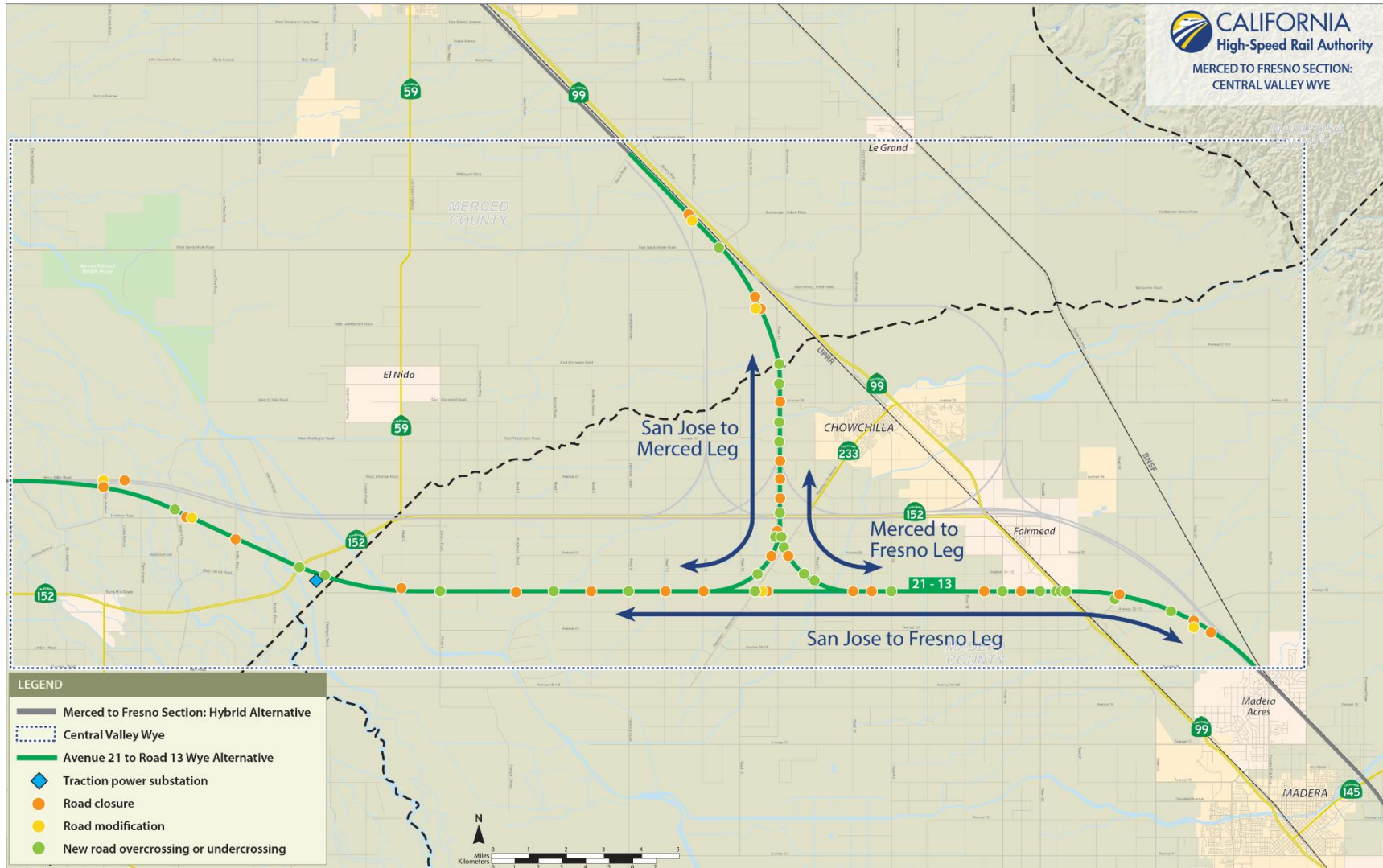
The Avenue 21 to Road 13 Wye Alternative (Figure 2-5) is designed to follow the existing Henry Miller Road and Avenue 21 rights-of-way as closely as practicable in the east-west direction and the Road 13, SR 99, and BNSF rights-of-way in the north-south direction. Deviations from these existing transportation corridors would be necessary to accommodate design requirements; specifically, larger curves would be necessary to accommodate the high speeds of the HSR compared to lower-speed roadway alignments. The Avenue 21 to Road 13 Wye Alternative would not follow existing transportation rights-of-way as it transitions from following one transportation corridor to another.

Alignment and Ancillary Features

The Avenue 21 to Road 13 Wye Alternative would extend approximately 53 miles, mostly at-grade on 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. East of Willis Road, the alignment would rise to an aerial structure to cross the river, SR 152, and the Eastside Bypass. The alignment would continue east along the north side of Avenue 21, crossing Ash Slough on an aerial structure. Southwest of Chowchilla, near Road 11, the alignment would split into two legs (four tracks) for transition to the Merced to Fresno Section: Hybrid Alternative. The San Jose to Merced leg would curve northeast, cross Road 13, and continue north along the east side of Road 13. At the beginning of the San Jose to Merced leg, the northbound track alternative would rise onto an aerial structure to cross over the tracks of the San Jose to Fresno leg. The Avenue 21 to Road 13 Wye Alternative legs would be routed as described below and shown on Figure 2-5.

⁶ A shoofly is a temporary track alignment that detours trains around a construction site.



Source: Authority and FRA 2018a; ESRI, 2013; CAL FIRE, 2004; ESRI/National Geographic, 2015

FINAL – JUNE 13, 2017

Figure 2-5 Avenue 21 to Road 13 Wye Alternative Alignment and Key Design Features

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.

- The San Jose to Fresno leg would continue east from the split near Road 11 along the north side of Avenue 21 toward Chowchilla. It would be predominantly at-grade on embankment, ascending to cross Berenda Slough on an aerial structure. East of the wye configuration, the alignment would extend south of Chowchilla, ascend on an aerial structure east of Road 19 1/2, and cross the UPRR/SR 99 corridor. The alternative would extend south of Fairmead and curve southeast toward the BNSF corridor, cross Dry Creek on an aerial structure, and run adjacent to the west side of the BNSF corridor to its meeting with the Merced to Fresno Section: Hybrid Alternative at Avenue 19.
- The Merced to Fresno leg would split from the San Jose to Fresno leg near Road 15. The southbound track of the Merced to Fresno leg would ascend on an aerial structure and cross over the tracks of the San Jose to Fresno leg. The Merced to Fresno leg would curve northwest, rise on aerial structures over several road crossings, and then continue on an at-grade embankment to join the San Jose to Merced leg near SR 152.

Wildlife undercrossing structures would be provided along this alternative in at-grade embankment portions of the HSR corridor where the alignment intersects wildlife corridors.

Electrical Interconnections and Network Upgrades

For Site 6—El Nido, interconnection facilities would include a 115 kV TPSS and switching station located on the west side of Flanagan Road. This new switching station would connect to the Wilson—Oro Loma 115 kV power line. The discussion of electrical interconnections and network upgrades provided for the SR 152 (North) to Road 13 Wye Alternative provides a more detailed description of the network upgrades associated with Site 6—El Nido as well as the interconnection facilities associated with Site 7—Wilson. Figure 2-6 shows the electrical interconnections and network upgrades associated with the Avenue 21 to Road 13 Wye Alternative.

In addition, the Avenue 21 to Road 13 Wye Alternative would require the Authority to relocate the existing PG&E Dairyland Substation. It is estimated that relocation would take approximately 18 months to complete and specific construction related activities would include the following:

- **Below-Grade Components**—Foundations, a stormwater detention and Spill Prevention Control and Countermeasure basin, raceways, and underground conduit would be constructed. Reinforced concrete subsurface footings and concrete slabs would be installed along with the ground grid. Substation equipment foundations would be approximately 5–16 feet deep.
- **Aboveground Structures**—These would include steel structures, circuit breakers, transformers, switchgears, buses, and other electrical equipment. These elements would be installed once the below-grade construction is complete. Equipment would be bolted or welded to slabs and footings and connected to the ground grid. The maximum height of substation equipment would be approximately 35 feet for the dead-end structures supporting the 115-kV power line interconnection. The transformers, switches, and buswork would be approximately 15 feet tall. Substation structures and equipment would be neutral gray.

- **Perimeter Fencing**—A perimeter enclosure with two access gates would be constructed around the substation perimeter for security. An 8- to 10-foot-high chain-link fence with barbed wire would be installed around the substation.
- **Security Lighting**—Security lighting would consist of sodium vapor lamps, and all exterior lighting would use non-glare light bulbs, designed and positioned to minimize casting light or glare to off-site locations. Light poles placed at each corner of the substation would be approximately 10 feet high and constructed of galvanized steel. The lights would be controlled by a photocell that automatically turns the lights off during the day and on at night.
- **Access Roads**—Access roads leading to the substation would be dirt, and roads within the substation would be paved. Generally, access roads would be 20 feet wide.

Backup electrical power would be supplied by an emergency standby generator for select electrical loads including fire protection systems, ventilation systems, emergency lights and signage, communication systems; train controls systems, and low-voltage direct-current battery supply systems to support emergency lighting and communications.

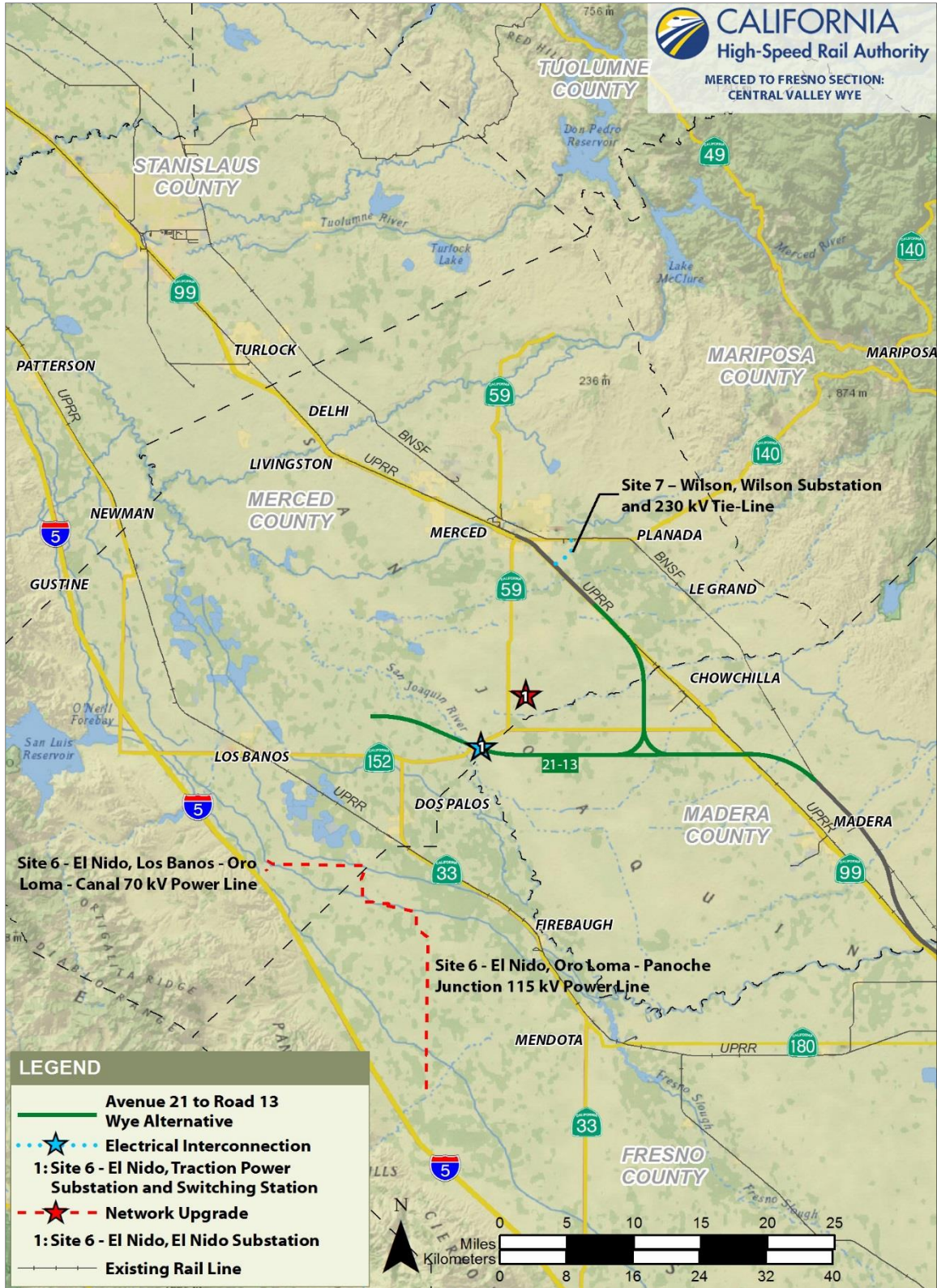
State Highway or Local Roadway Modifications

The Avenue 21 to Road 13 Wye Alternative would require the permanent closure of 30 public roadways at selected locations and the construction of 28 overcrossings or undercrossings. Table 2-1 and Figure 2-5 show the anticipated state highway and local roadway closures. This alternative would require the fewest roadway and state highway modifications.

The Avenue 21 to Road 13 Wye Alternative would rise on aerial structures and cross over state highway facilities in three locations: SR 59 at Harmon Road, SR 152 at Road 13, and SR 99 at Avenue 21. Where other roads would be perpendicular to the proposed HSR, over- or undercrossings are planned at distances from less than 2 miles to 5 miles. Between these over- and undercrossings, some roads may 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 would be provided to maintain access to properties severed by HSR.

Freight or Passenger Railroad Modifications

The Avenue 21 to Road 13 Wye Alternative would cross the UPRR operational right-of-way on an aerial structure south of Fairmead and maintain a vertical (at least 23.3 feet) clearance over UPRR operational right-of-way to avoid or minimize effects on other UPRR rights-of-way, spurs, and facilities. Where the Avenue 21 to Road 13 Wye Alternative would parallel UPRR operational right-of-way, a horizontal clearance of 102 feet would be maintained from the centerline to the UPRR right-of-way.



FINAL – JUNE 13, 2017

Figure 2-6 Avenue 21 to Road 13 Wye Alternative Electrical Interconnections and Network Upgrades

SR 152 (North) to Road 11 Wye Alternative

The SR 152 (North) to Road 11 Wye Alternative (Figure 2-7) follows 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. 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 SR 152 (North) to Road 11 Wye Alternative would not follow existing transportation rights-of-way where it transitions from following one transportation corridor to another.

Alignment and Ancillary Features

The SR 152 (North) to Road 11 Wye Alternative would extend approximately 51 miles, mostly at-grade on raised embankment, although it would also have aerial structures. The wye configuration of this alternative would 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.

Like the other three alternatives, this alternative would begin in Merced County at the intersection of Henry Miller Road and Carlucci Road, and would continue at-grade on embankment east toward Elgin Avenue, where it would curve southeast toward the San Joaquin River and Eastside Bypass. Approaching Willis Road, the alignment would rise to cross the San Joaquin River on an aerial structure, return to embankment, then cross the Eastside Bypass on an aerial structure. After crossing the Eastside Bypass, this alternative would continue east, crossing SR 59 at-grade just north of the existing SR 152/SR 59 interchange, entering Madera County. To accommodate the SR 152 (North) to Road 11 Wye Alternative, the SR 152/SR 59 interchange would be reconstructed slightly to the south, and SR 59 would be grade-separated to pass above the HSR on an aerial structure. The alignment would continue east at-grade along the north side of SR 152 toward Chowchilla, splitting into two legs (four tracks) near Road 10 to transition to the Merced to Fresno Section: Hybrid Alternative, and would cross Ash Slough on an aerial structure. All but the northbound track of the San Jose to Merced leg of the alternative would then return to at-grade embankment; the northbound track would rise to cross over the tracks of the San Jose to Fresno leg on an aerial structure as it curves north toward Merced. The SR 152 (North) to Road 11 Wye Alternative legs would be routed as described below and illustrated on Figure 2-7:

- The southbound track of the San Jose to Merced leg would turn north at-grade. This split would be west of Chowchilla, at approximately Road 10. The two San Jose to Merced tracks would continue north on the eastern side of Road 11, crossing the Chowchilla River, and then would cross over Road 11 to follow its west side. As the tracks return to grade, they would curve northwest, crossing Dutchman Creek on an aerial structure, following the west side of the UPRR/SR 99 corridor. The alignment would continue north, crossing over Sandy Mush Road on an aerial structure. The alignment would return to grade and continue along the west side of the UPRR/SR 99 corridor, connecting to the Merced to Fresno Section: Hybrid Alternative at Ranch Road.
- The San Jose to Fresno leg would continue east from the wye split near Road 10, along the north side of SR 152 toward Chowchilla. It would be predominantly at-grade, ascending on aerial structures at several road crossings and Berenda Slough. The leg would 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 would extend at-grade through Fairmead, north of Avenue 23. At approximately Road 20, the leg would curve southeast toward the BNSF corridor and cross Dry Creek on a short aerial structure. The SR 152 (North) to Road 11 Wye Alternative would align parallel to the west side of the BNSF corridor as it meets the Merced to Fresno Section: Hybrid Alternative at Avenue 19.
- The Merced to Fresno leg would split from the San Jose to Fresno leg near Road 13. The southbound track of the Merced to Fresno leg would ascend on an aerial structure and cross

over the tracks of the San Jose to Fresno leg. The Merced to Fresno leg would 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.

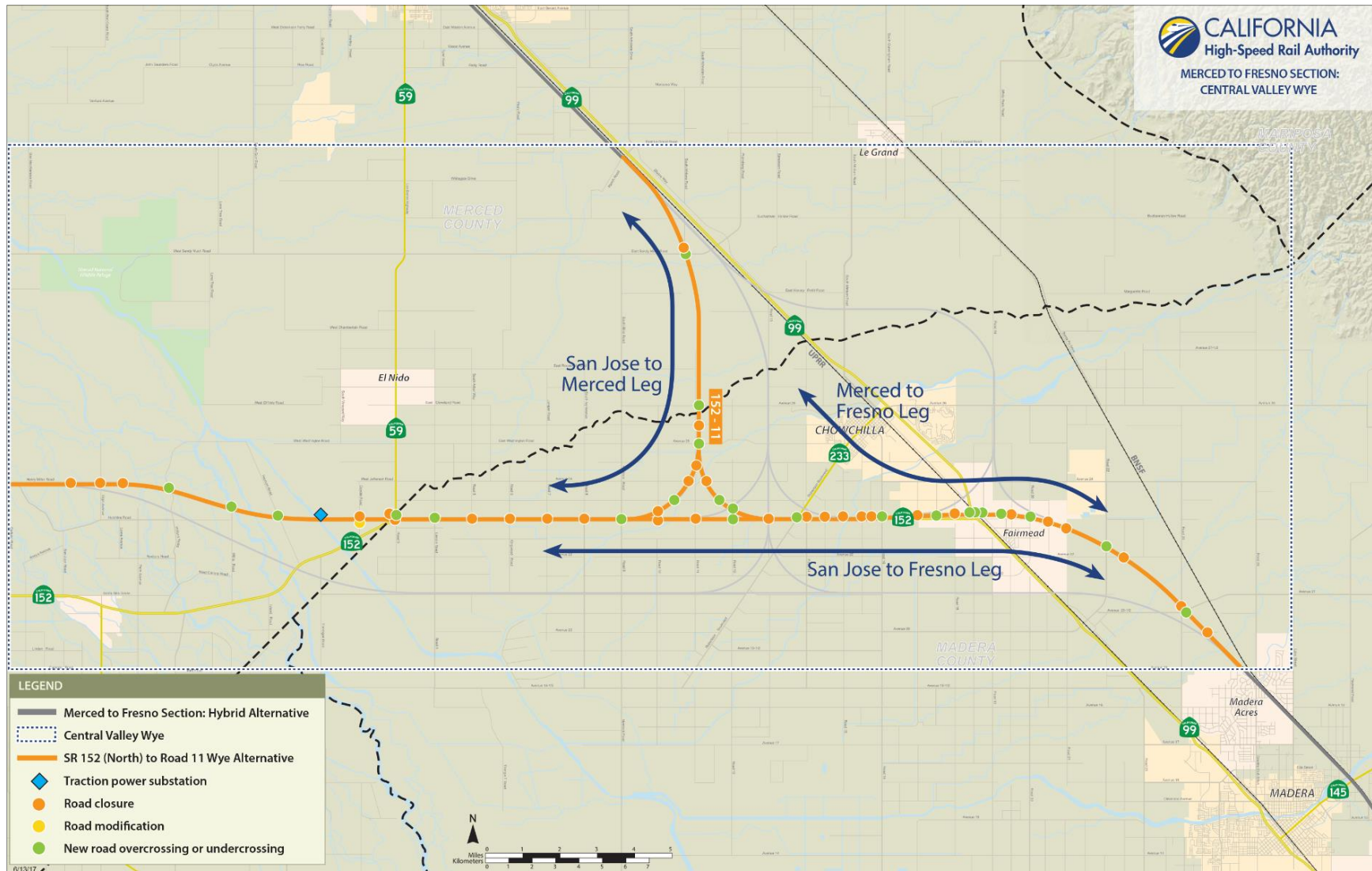
Wildlife undercrossing structures would be installed in at-grade embankments along this alternative where the alignment intersects wildlife corridors.

Electrical Interconnections and Network Upgrades

The electrical interconnections and network upgrades for the SR 152 (North) to Road 11 Wye Alternative would be the same as those described for the SR 152 (North) to Road 13 Wye Alternative. Figure 2-8 illustrates the electrical interconnections and network upgrades associated with the SR 152 (North) to Road 11 Wye Alternative.

State Highway or Local Roadway Modifications

The SR 152 (North) to Road 11 Wye Alternative would require the permanent closure of 33 public roadways at selected locations and the construction of 24 overcrossings or undercrossings in lieu of closure. Table 2-1 and Figure 2-7 show the anticipated state highway and local roadway closures and modifications. Fourteen of these permanent road closures would be located at SR 152 where roads currently cross at-grade but need to be closed in order to convert SR 152 to a fully access-controlled corridor. The 14 proposed closures are Road 5, Road 6, Road 7, Road 8, Road 10, Road 11, Road 13, Road 14, Road 14 1/2, Road 15, Road 15 1/2, Road 15 3/4, Road 17, and Road 18. Planned new grade separations along SR 152 at the SR 59/SR 152 Interchange, Road 4/Lincoln Road, Road 12, and Road 17 1/2 would maintain access to SR 152. These roadways would be reconfigured to two 12-foot lanes with two 8-foot shoulders. Several of these new interchanges would require realigning SR 152. Three new interchanges are proposed between SR 59 and SR 99 to provide access to SR 152: at Road 9/Hemlock Road, SR 233/Robertson Boulevard, and Road 16.



Source: Authority and FRA 2018a; ESRI, 2013; CAL FIRE, 2004; ESRI/National Geographic, 2015

FINAL – JUNE 13, 2017

Figure 2-7 SR 152 (North) to Road 11 Wye Alternative Alignment and Key Design Features



Source: Authority and FRA, 2018a; PG&E, 2016; ESRI/National Geographic, 2015

FINAL - JUNE 13, 2017

Figure 2-8 SR 152 (North) to Road 11 Wye Alternative Electrical Interconnections and Network Upgrades

The distance between over- or undercrossings would vary from less than 2 miles to approximately 5 miles where other roads are perpendicular to the proposed HSR. Between these over- or undercrossings, 19 of the 24 over- or undercrossings would require closure. Local roads paralleling the proposed 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 HSR.

Freight or Passenger Railroad Modifications

The SR 152 (North) to Road 11 Wye Alternative would cross over the UPRR right-of-way as it passes south of Chowchilla. This alternative would maintain required vertical (at least 23.3 feet) clearance over UPRR operational right-of-way to avoid or minimize effects on UPRR rights-of-way, spurs, and facilities (BNSF and UPRR 2016). Where the SR 152 (North) to Road 11 Wye Alternative would parallel UPRR operational right-of-way, a horizontal clearance of 102 feet would be maintained from the centerline to the UPRR right-of-way.

Summary of Design Features

Table 2-1 shows the design features of the Central Valley Wye alternatives.

Table 2-1 Design Features of the Central Valley Wye Alternatives

| Feature | SR 152 (North) to Road 13 Wye | SR 152 (North) to Road 19 Wye | Avenue 21 to Road 13 Wye | SR 152 (North) to Road 11 Wye |
|----------------------------------------------------|-------------------------------|-------------------------------|--------------------------|-------------------------------|
| Alignment Features | | | | |
| Total length (linear miles) ¹ | 52 | 55 | 53 | 51 |
| At-grade profile (linear miles) ¹ | 48.5 | 48.5 | 48.5 | 46.5 |
| Elevated profile (linear miles) ¹ | 3 | 3.5 | 4 | 4.5 |
| Below-grade profile (linear miles) ¹ | 0.5 | 3 | 0.5 | 0 |
| Number of straddle bents | 32 | 31 | 32 | 27 |
| Number of railroad crossings | 1 | 3 | 1 | 1 |
| Number of named water crossings | 12 | 13 | 11 | 13 |
| Number of road crossings | 62 | 65 | 58 | 57 |
| Approximate number of public roadway closures | 38 | 36 | 30 | 33 |
| Number of roadway overcrossings and undercrossings | 24 | 29 | 28 | 24 |
| Wildlife crossing structures | 39 | 41 | 44 | 37 |
| Electrical Features | | | | |
| Traction power substation sites | 1 | 2 | 1 | 1 |
| Switching stations | 1 | 2 | 1 | 1 |
| Paralleling stations | 8 | 7 | 7 | 7 |
| Signaling and train-control elements | 18 | 21 | 15 | 19 |
| Communication towers | 9 | 6 | 6 | 9 |

Source: Authority, 2015, 2016; BNSF & UPRR, 2016

¹ Lengths shown are based on equivalent dual-track alignments and are one-way mileages. For example, the length of single-track elevated structure will be divided by a factor of 2 to convert to dual-track equivalent.

3 JURISDICTIONAL WATERS

3.1 Definitions of Study Areas

This Summary Report describes each alternative's likely effects on waters of the U.S., including wetlands (collectively, waters of the U.S. or jurisdictional waters) located within the wetland study area (WSA). The WSA encompasses the project footprint, as well as a 250-foot buffer surrounding the project footprint to capture potential indirect effects. The project footprint is defined as the proposed HSR right-of-way and associated facilities (TPSSs, switching and paralleling stations, tie-lines and areas associated with modifying or relocating roadways for those facilities—including overcrossings and interchanges), station alternatives, maintenance of infrastructure facilities and construction areas (including laydown, storage, and similar areas). For purposes of this discussion, network upgrades are not included. They will be permitted at a later date, as construction would not be required until 2031 based on current operational assumptions.

The *Merced to Fresno Section: Central Valley Wye Biological Resources and Wetlands Technical Report* (Biological Resources and Wetlands Technical Report) (Authority and FRA 2016b) and the *Merced to Fresno Section: Central Valley Wye Second Supplemental Wetland Delineation Report* (Second Supplemental Wetlands Delineation Report) (Authority and FRA 2018b) address regulatory requirements and assess potential effects on jurisdictional waters.

The following definitions support the analysis of effects for the affected resources:

- Project Footprint:** Includes the proposed HSR right-of-way and associated facilities (traction power substations, switching and paralleling stations, and areas associated with modifying or relocating roadways for those facilities—including undercrossings/overcrossings and interchanges), station alternatives, maintenance of infrastructure facilities, electrical interconnection components, and construction areas (including laydown, storage, and similar areas).
- Wetland Study Area**—Project footprint plus a 250-foot buffer to evaluate indirect effects on vernal pools. With respect to determining effects on vernal pools, the following methodology is used: If a portion of a vernal pool or swale is directly affected, the effect would be assumed to extend to the entire feature for the purpose of quantifying and establishing mitigation requirements. This type of effect is referred to as *indirect bisected*.

3.2 Delineated Jurisdictional Waters

Discharge of dredge or fill material into jurisdictional waters is regulated by the USACE under CWA Section 404. Wetlands and other waters as identified in the Wetlands Delineation Reports (see the *Merced to Fresno Preliminary Jurisdictional Waters and Wetlands Delineation Report* [Authority and FRA 2012d] and the *Second Supplemental Wetlands Delineation Report* [Authority and FRA 2018b]) are presumed to fall under the jurisdiction of USACE for purposes of this discussion. Verification of these waters as potentially federally jurisdictional was obtained from USACE on April 27, 2018.

Wetland ecologists conducted wetland surveys on June 17–21 and August 26–28, 2013; December 22–23, 2014; and April 28–30, 2015 to identify the locations, types, and characteristics of features that may be subject to state and federal regulation in the Central Valley Wye WSA. In addition, where access was granted, qualified delineators walked meandering transects to visually assess the WSA for the presence of additional wetland features. Additional information about wetland surveys is provided in the *Second Supplemental Wetlands Delineation Report* (Authority and FRA 2018b). Field verification of the jurisdictional waters and wetlands delineation was also conducted by the USACE and wetland ecologists on December 6, 2017.

Jurisdictional water types present in the WSA include vernal pool, seasonal wetland, palustrine forested wetland, natural watercourse, constructed watercourse, and constructed basin. These resources have been grouped into two categories: (1) palustrine wetlands, and (2) other waters of the U.S. Palustrine wetlands include vernal pool, seasonal wetland, and palustrine forested wetlands. Other waters of the U.S. include constructed basin, constructed watercourse, and

natural watercourse. Jurisdictional water types have been broadly classified following the Hydrogeomorphic Wetland Classification System (USACE 2008) and the Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al. 1979).

Jurisdictional waters occur in the Upper Chowchilla-Upper Fresno Watershed (Hydrologic Unit Code [HUC]-8: 18040007), and the Middle San Joaquin-Lower Chowchilla (HUC-8: 18040001).

3.2.1 Wetlands

Wetlands considered potentially jurisdictional under Section 404 of the CWA, and verified by the USACE within the Central Valley Wye alternatives wetland study area include depressional and palustrine emergent wetlands such as vernal pool, seasonal wetland, and palustrine forested wetland.

The palustrine system is a broad class of nontidal wetlands that was developed to include vegetated wetlands. The palustrine system was classified by the Classification of Wetlands and Deepwater Habitats of the United States and also includes small, shallow permanent or intermittent waterbodies such as ponds. Palustrine wetlands may be situated shoreward of lakes, river channels, or estuaries; on river floodplains; in isolated catchments; or on slopes. They may also occur as islands in lakes or rivers (Cowardin et al. 1979).

Several of the palustrine wetlands are also classified as depressional wetlands. Depressional wetlands were classified using the Hydrogeomorphic Wetland Classification System and occur in topographic depressions where the dominant water sources are precipitation, groundwater discharge, and both inflow and overland flow from the adjacent uplands (USACE 2008). Depressional wetlands include (1) vernal pool, (2) seasonal wetland, and (3) palustrine forested wetlands.

Vernal Pools

Vernal pools are a type of seasonal wetland characterized by a low amphibious, herbaceous community dominated by annual forbs and grasses. Vernal pools are isolated, unstable ecosystems that respond markedly to seasonal precipitation patterns. These pools are associated with certain types of soils. Hardpan soil layers frequently form in the horizons of clay soils, leading to the formation of vernal pools. California annual grasslands can occur on similar soils but are not exclusively associated with vernal pools. Once formed, vernal pools have specific flora and fauna associated with their seasonal water cycle. The standing water that forms in vernal pools is breeding habitat for several special-status species such as vernal pool fairy shrimp (*Branchinecta lynchi*), Conservancy fairy shrimp (*Branchinecta conservatio*), vernal pool tadpole shrimp (*Lepidurus packardii*), California tiger salamander (*Ambystoma californiense*), and western spadefoot (*Spea hammondi*). This plant community type is classified as a California Department of Fish and Wildlife (CDFW) special-status plant community (CDFW 2014a) which is a subclass of depressional wetlands (USACE 2008). As described above, vernal pools are classified as depressional wetlands as well as palustrine wetlands.

Common plant species observed in vernal pools include woolly marbles (*Psilocarphus brevisissimus*), popcorn flower (*Plagiobothrys* spp.), water pigmy-stonecrop (*Crassula aquatica*), annual hairgrass (*Deschampsia danthonioides*), purslane speedwell (*Veronica peregrina*), and toad rush (*Juncus bufonius*). Shallow vernal pools are often characterized by an abundance of nonnative grasses and forbs such as Mediterranean barley (*Hordeum marinum*) and hyssop-loosestrife (*Lythrum hyssopifolium*), but these areas also typically contain relatively high cover of native vernal pool plants such as coyote thistle (*Eryngium* spp.). Deeper parts of vernal pools are often characterized by creeping spikerush (*Eleocharis macrostachya*).

The quality of vernal pools identified within the wetland study area ranges from low quality where they occur in areas of inactive farmland to moderate quality where they occur in grazed California annual grassland.

Seasonal Wetlands

Seasonal wetlands are a class of wetland characterized by seasonal inundation and are nontidal, flooded, depressionnal wetlands classified as palustrine emergent seasonally flooded by Cowardin et al. (1979). Seasonal wetlands support a variety of both native and nonnative wetland plant species and may occur in a variety of landforms where there is seasonal saturation or inundation. Although sharing a similar hydrologic regime, seasonal wetlands are distinguished from vernal pool wetlands by their lack of distinctive floristic components (i.e., vernal pool indicator species) and by the absence of a distinctive claypan or hardpan soil.

In the wetland study area, seasonal wetlands may be considered somewhat degraded based on nonnative plant community assemblages and land management modifications (e.g., cultivation, grading, etc.). Example species include cattail (*Typha* spp.), horsetail (*Equisetum* spp.), barley (*Hordeum* spp.), saltgrass (*Distichlis spicata*), meadow barley (*Hordeum brachyantherum*), *Chenopodium* sp., summer Cyprus (*Kochia scoparia*), fivehook bassia (*Bassia hyssopifolia*), knotweed (*Polygonum* spp.), rush (*Juncus* spp.), sedge (*Carex* spp.), nutsedge (*Cyperus* spp.), bulrush (*Scirpus* spp. or *Schoenoplectus* spp.), and plantain (*Plantago* spp.). The stable water column in seasonal wetlands (although not as ephemeral as vernal pools) provides suitable conditions for California tiger salamanders, vernal pool branchiopods, and western spadefoot to complete their lifecycles.

In the most manipulated areas, inundation is hydrologically controlled by pumps, weirs, and storm drain systems. In less manipulated systems, natural inundation or saturation occurs during the winter and spring seasons, and the seasonal wetlands are dry during the summer and fall. For the Central Valley Wye alternatives, these wetland type are similar to the vernal marsh designation in Holland (1986). The quality of seasonal wetlands in the WSA ranges from low to moderate quality as all seasonal wetlands occur in disturbed areas.

Palustrine Forested Wetland

Palustrine forested wetlands are nontidal, flooded, depressionnal wetlands classified as palustrine forested wetlands by Cowardin et al. (1979). These wetlands occur on soils intermittently or seasonally flooded or saturated by freshwater systems. Frequently, these community types are found along riparian corridors, floodplains subject to high-intensity flooding, or on low-gradient depositions along rivers and streams. These communities are described as typically containing an overstory dominated by Fremont cottonwood or mixed with other tree species including box elder (*Acer negundo*), Oregon ash (*Fraxinus latifolia*), California walnut (*Juglans californica*), or California sycamore (*Platanus racemosa*). The shrub layer within this community type is typically dominated by willow species (*Salix* spp.) and California wild grape (*Vitis californica*). The understory of Fremont cottonwood forested wetlands may support emergent perennial vegetation such as cattails, sedges, and rushes. Freshwater forested wetlands are nontidal, flooded, depressionnal wetlands; and are categorized as Cowardin class: palustrine forested wetland. The *Populus fremontii* Forest Alliance, Fremont cottonwood forested wetland, is described by Sawyer et al. (2009) and is similar to the Great Valley cottonwood riparian forest described by Holland (1986).

3.2.2 Other Waters of the U.S.

Other waters of the U.S. identified in the wetland study area include constructed basins, constructed watercourses, and natural watercourses.

Constructed Basins

Constructed basins in the wetland study area are highly disturbed and may be routinely managed through vegetation removal and dredging. Depending on substrate and management regimes, vegetation type and presence varies. Hydrology is variable based on precipitation events, irrigation inputs/removal, and other management objectives. Stormwater retention basins and agricultural tailwater ponds are the management features that make up the constructed basin wetland type.

Stormwater retention basins are generally excavated earthen basins that have been constructed to hold urban stormwater runoff. Most of the stormwater retention basins in the wetland study area are associated with urban communities as well as commercial and industrial areas. Most of these basins are devoid of vegetation or support ruderal species that become established when the water levels are low or the basins are dry.

Agricultural tailwater ponds are generally small, relatively shallow basins that are excavated in the low corners or along the side of an agricultural field or orchard for the purpose of capturing excess irrigation water. Excess water is then either allowed to gradually seep into the soil or is pumped into a nearby canal feature. Vegetation within these basins is often composed of ruderal wetland plant species such as Bermuda grass (*Cynodon dactylon*), tall flat sedge (*Cyperus eragrostis*), sprangletop (*Leptochloa* spp.), and fireweed (*Epilobium* spp.).

Constructed Watercourses

Constructed watercourses include irrigation canals and drainage ditches. The constructed watercourses have the potential to support emergent vegetation, as well as ruderal wetland species. A number of constructed watercourses convey water diverted from or discharged into natural watercourses. Constructed watercourses potentially support special-status species such as Sanford's arrowhead (*Sagittaria sanfordii*) and western pond turtle (*Actinemys marmorata*), but these watercourses usually do not provide native fishes with the aquatic habitat necessary to survive and grow, and are typically dominated by predatory or competitive nonnative fishes. Constructed watercourses are routinely maintained by removing vegetation (e.g., by clearing or spraying), which greatly limits their potential as aquatic habitat.

Natural Watercourses

Most natural watercourses in the WSA have intermittent or ephemeral flow regimes, either because of their small watershed size or because they have been impounded or diverted upstream for agricultural purposes. Natural watercourses located within the wetland study area include riverine areas of the perennial San Joaquin River and several intermittent to ephemeral sloughs and creeks. The different natural watercourses are described further below. Natural watercourses have intermittent to ephemeral hydrology either because of their small watershed size or because they have been impounded or diverted upstream into other watercourses for agricultural purposes. All are low-gradient systems with emergent vegetation along margins of pool-run habitat units with bottom substrates dominated by fine sediments (i.e., sand, silt, or clay). Riffle and other fast-water habitats are uncommon. The named natural watercourses within the wetland study area are the San Joaquin River, Fresno River, Chowchilla River, Ash Slough, Berenda Slough, Berenda Creek, Eastside Bypass, Deadman Creek, Dutchman Creek, and Dry Creek.

San Joaquin River

The San Joaquin River is the largest and most substantial water feature in the wetland study area. Sections of the river are characterized by a single large flow channel with an average width of 150 feet. In several locations, the river splits into multiple braided channels, including some larger backwater ponded areas. A detailed investigation of the adjacent riparian habitat was not conducted during the field survey because of property access limitations; however, observations of the area were made from Willis Road on the southeast side of the river. The riparian community within the wetland study area is an open mixed woodland composed of valley oak, California sycamore, and eucalyptus trees (*Eucalyptus* spp.). The open understory consists of typical California annual grassland species with occasional patches of narrowleaf willow (*Salix exigua*) and elderberry. The San Joaquin River is normally dry within the wetland study area, at least during the summer/fall months. The wetland study area crosses the San Joaquin River downstream of the Sand Slough Control Structure, which diverts all flow into the flood bypass system via the Sand Slough Bypass (except during flood flows).

Fresno River

The Fresno River in the wetland study area contains sections of low, broad, routinely maintained channel crossing SR 152. The sandy channel in this area is highly disturbed as a result of vegetation clearing and grading, presumably done for flood control maintenance and giant reed removal. Trash and debris are also common and widespread throughout the channel. Although there were patches cleared of vegetation, some portions of the channel were vegetated with narrowleaf willow, scattered patches of cattail, hardstem bulrush (*Schoenoplectus acutus*), sprangletop, tall flat sedge, Bermuda grass, and fireweed (*Chamerion angustifolium*). The adjacent riparian area included some large cottonwood and red willow (*Salix laevigata*) trees. The Fresno River is normally dry within the wetland study area, at least during the summer/fall months.

Chowchilla River

Within the wetland study area, the Chowchilla River is a low, broad sandy channel that supports a mosaic of emergent vegetation, active flow channels, and riparian woodland. There was no flowing water present at the time of the surveys, but shallow pockets of ponding water (less than 6 inches deep) were present along the channel bottom. The active flow channel in this area is variable, ranging from 30 to 60 feet wide with an estimated ordinary high-water depth of 3 feet. Vegetation within the channel includes patches of cattail as well as scattered tall flat sedge, cocklebur (*Xanthium strumarium*), dallisgrass (*Paspalum dilatatum*), rabbitsfoot grass (*Polypogon monspeliensis*), and a number of other herbaceous species. Water primrose (*Ludwigia peploides*) was observed in a few areas where standing water was present within the channel. The open riparian woodland adjacent to the river includes a number of large cottonwood trees and several smaller arroyo willows.

Ash Slough

The section of Ash Slough in the wetland study area is a broad, open sandy-gravel channel that was dry at the time of the survey. The average active flow channel is 70 feet wide with an ordinary high-water depth of 3 feet. The channel is largely devoid of emergent vegetation with the exception of a few small patches of cattail and hardstem bulrush in scattered locations. Riparian vegetation along the edges of the channel includes a mixture of dense patches of giant reed intermixed with cottonwood and willow trees and open areas characterized by ruderal grassland habitat. Other riparian vegetation includes Himalayan blackberry, Mexican rush (*Juncus mexicanus*), and narrowleaf willow. In some areas along the slough, giant reed had been cut, treated, and burned with herbicides in an apparent effort to manage this highly invasive species.

Berenda Slough

Berenda Slough is an open sandy channel that was dry at the time of the surveys. The active flow channel has an average width of 40 feet with an ordinary high-water depth around 3 feet. The active flow channel is generally devoid of vegetation, with the exception of small areas of Bermuda grass, cocklebur, bird's-foot trefoil (*Lotus corniculatus*), and giant reed. The broad, low terrace adjacent to the channel supports open riparian woodland characterized by cottonwood, black walnut, arroyo willow, and black locust trees (*Robinia pseudoacacia*), with an understory of mule fat (*Baccharis salicifolia*), narrowleaf willow, beardless wild rye (*Elymus triticoides* [*Leymus triticoides*]), ripgut brome (*Bromus diandrus*), and mustard (*Brassica* sp.). The outer banks support dense giant reed with scattered eucalyptus and cottonwood trees. Other areas of the slough are characterized by dense growth of cattail, with some hardstem bulrush likely the result of impounded water in this section of the slough.

Berenda Creek

Berenda Creek is a small, intermittent stream. The channel in this area has a sandy substrate with some cobbles and woody debris. At the time of the survey, water was not flowing in the creek, but shallow ponded water (less than 6 inches deep) was present in some areas along the channel bed. Within the wetland study area, the channel is characterized by patches of dense cattail and open unvegetated areas. Riparian vegetation along the edges of the channel consists

of a patches of arroyo, and narrowleaf and red willow. Downstream, Berenda Creek has been channelized into a drainage ditch that flows to the west and then runs to the north along Avenue 18. The channel is characterized by steep vertical banks approximately 15 feet apart. The ordinary high-water depth was estimated to be between 2 and 3 feet. Scattered emergent vegetation, including cattails and hardstem bulrushes, occurs throughout much of the channel in this area. Vegetation along the upper banks is characterized by Himalayan blackberry, small black walnut trees, giant reed, and scattered cottonwood trees.

Eastside Bypass of the San Joaquin River

The section of Eastside Bypass in the wetland study area is a broad, open silty-clay channel that was dry at the time of the survey. Several active flow channels were evident, with the channels being devoid of vegetation. Vegetation along the low terrace of the bypass includes a mixture of nonnative grasses in the brome and oat variety (*Bromus* spp., *Avena* spp.) characterized by grassland habitat. The portion of the Eastside Bypass crossing under SR 152 was reinforced with riprap bottom and sides. Trash and debris were evident within the channel.

Deadman Creek

Within the wetland study area, Deadman Creek has gravelly silty clay substrate that was dry at the time of the survey. The active flow channel ranges from 14 to 20 feet wide with an ordinary high-water depth ranging from 18 to 24 inches above the channel bottom. The narrow riparian community along most of the channel consists of cottonwoods, including numerous saplings as well as large mature trees. This section of the channel is devoid of emergent and aquatic vegetation, but does contain some woody debris. Immediately west of the wetland study area, Deadman Creek has been diverted from its natural channel into a constructed canal.

Dutchman Creek

The northeastern portion of Dutchman Creek within the wetland study area is highly disturbed with no riparian vegetation. The sandy substrate in this area has been disturbed by several unimproved roads, both parallel to the railroad tracks as well as crossing under the highway. To the southwest, the channel and adjacent riparian habitat are much less disturbed. In this area, the channel has a silty clay substrate with scattered patches of common rush (*Juncus* sp.), tall flat sedge, and curly dock (*Rumex crispus*) scattered throughout. Small patches of cattail are also present in some sections of the channel, towards the southwestern end of the wetland study area. The channel was dry at the time of the survey with an active flow channel ranging from 20 to 30 feet wide. The depth of the ordinary high water appears to be between 2 and 3.5 feet. The narrow riparian community comprises large cottonwood and black walnut trees with scattered arroyo willow. Some trash and debris is present within the channel in this area.

Dry Creek

Dry Creek is characterized by an open water channel lined with dense growth of cattail and hardstem bulrush on both sides. The channel has a sandy substrate and an active flow channel between 35 and 38 feet wide with an ordinary high-water depth of 3 feet. The adjacent riparian community is characterized by scattered large arroyo willow and cottonwood trees, localized dense thickets of narrowleaf willow, and open areas with beardless wild rye, ripgut brome, saltgrass, mustard, and common rush. Further downstream, Dry Creek has been channelized and converted into a routinely maintained agricultural irrigation canal. The constructed earthen channel is 25 feet wide and approximately 5 feet deep with riprap along the edges. The channel supports small patches of cattail and hardstem bulrush with some tall flat sedge, sprangletop, common rush, and horseweed (*Erigeron canadensis*) growing along the upper edges. Farm and canal maintenance roads are present along both sides of the channel and the area has no adjacent riparian vegetation.

3.3 Summary of California Rapid Assessment Method Results

Constructed basins, seasonal wetlands, constructed and natural watercourses, and vernal pools, were analyzed using the California Rapid Assessment Method (CRAM). Possible CRAM scores

range from 25 to 100 with 100 representing the maximum reference conditions within a given wetland type and 25 representing the lowest possible.

CRAM evaluates wetlands by scoring four key attributes: buffer and landscape context, hydrology, physical structure, and biotic structure. In all modules, the CRAM “Index Score,” or overall score, is calculated as the average of the four attribute scores. The conditions attributed to wetland areas in a site or region are based on the conditions sampled in Assessment Areas, which are chosen to represent the wetlands within the site or region. Field assessments were conducted during May 16 through 24, 2016 for the HSR alignments associated with the SR 152 (North) to Road 13 Wye Alternative, SR 152 (North) to Road 19 Wye Alternative, and Avenue 21 to Road 13 Wye Alternative.

As access to properties and impact areas was limited at the time of field work for all alternatives, the CRAM analysis included an extrapolation of field collected CRAM scores to the larger study area. Data from the 28 surveyed sites were used to extrapolate the evaluations to all wetlands that fell within affected areas of the four Central Valley Wye alternatives. CRAM Index scores for the nine depressional features and 18 riverine features (both natural and constructed) assessed in the Central Valley Wye study area were averaged, ordered, and plotted from low to high. CRAM scores for depressional and riverine features displayed an intuitive division between natural and constructed features, with natural watercourses consistently scoring higher than constructed watercourses and seasonal wetlands consistently scoring higher than constructed basins. Data was further reviewed within each wetland type to note any distinct breaks that would justify multiple condition classes (i.e., low, medium, and high). Whether a result of the low sample size or the small geographic area, no unique condition classes were identified. The CRAM Index scores were averaged for each wetland type and the average score was then applied to the remaining un-surveyed wetland features of each wetland type.

Due to the limited sample size of one for vernal pools in the Central Valley Wye study area, fifteen vernal pools, assessed in a previous CRAM assessment of the Merced to Fresno section, were used to extrapolate to the Central Valley Wye alternatives vernal pool features. The Merced to Fresno section overlaps geographically with the Central Valley Wye and the scores are expected to be representative of the Central Valley Wye alternatives vernal pools. Scores in the Merced to Fresno section ranged from a low of 33 to a high of 72. A simple average was not recommended as the range in scores was so large, there was concern that the resource would be undervalued and subsequently under mitigated. Through discussions with the USACE, two pools thought to be uncharacteristic for the Merced to Fresno section were removed from consideration and then the average of the remaining two highest scoring vernal pool Assessment Areas (65) were used to extrapolate across vernal pool features (Authority 2013). Therefore, the highest observed CRAM score of 72 points was recommended as this approach limits the likelihood that any vernal pool would be undervalued and as such under mitigated.

Constructed basins exhibited much lower CRAM scores (44–45) because these features are constructed (i.e., unnatural) and work in conjunction with other unnatural, built watercourses such as canals and ditches. Most are vegetated, but have little topographic complexity.

Seasonal wetlands are common throughout the Central Valley Wye alternatives, occurring as low points in un-used agricultural fields or fragments of past natural riverine features. These natural features provide much better condition indicators, exhibited by their higher CRAM attribute scores than those of constructed features (52–53).

The constructed watercourses assessed throughout the Central Valley Wye alternatives yielded scores only somewhat lower (approximately six points lower) than scores for the natural watercourses (51 versus 58–59). The low condition scores for constructed waterways are primarily because they are constructed, artificial features set in an already modified watershed. Similarly, the modified watershed and surrounding agriculture is responsible for lowering the condition of the natural watercourses in the study area and resulted in lower overall CRAM scores. Overall, both of these wetland types do not provide the same aquatic benefits as riverine systems in a natural, less-altered setting.

Only one vernal pool was surveyed within the WSA as a result of limited property access (CRAM score of 65). Based on qualitative observations during the field effort for the Wye, most of the vernal pools were dominated by nonnative grasses, with minimal vernal pool dependent species present. This is likely an indication of disturbance but also strongly related to historical drought conditions and the timing of the field visit.

The average overall CRAM score is 51 for the SR 152 (North) to Road 13 and SR 152 (North) to Road 11 Wye alternatives, and is 52 for the SR 152 (North) to Road 19 and Avenue 21 to Road 13 Wye alternatives. This is reasonable given the homogenous landscape, the low sample size, and the level of extrapolation that was necessary. The apparent lack of difference in overall CRAM scores indicates little differentiation between the overall condition of waters in the locations of the alternative alignments. With an increased sample size, the ability to distinguish may be improved. Another way to compare the alternatives considers the number of times the alternative intersects with wetland features. Using this approach, differences across the alternatives can be discerned. The Avenue 21 to Road 13 and SR 152 (North) to Road 11 Wye alternatives have the lowest number of total intersections (162 and 156 respectively) when compared to the SR 152 (North) to Road 13 Wye Alternative, which crosses 187 features. The SR 152 (North) to Road 19 Wye Alternative has a moderate amount of intersections (166). In addition, the Avenue 21 to Road 13 and SR 152 (North) to Road 11 Wye alternatives have the lowest number of intersections with higher scoring, natural wetland features, such as natural watercourses (18 and 21 respectively) compared to 29 natural features crossing the SR 152 (North) to Road 13 Wye Alternative. The SR 152 (North) to Road 19 Wye Alternative has a moderate amount of intersections with natural watercourses (25).

4 EFFECTS ON JURISDICTIONAL WATERS

Direct and indirect effects on jurisdictional waters would result from construction and operation of any of the four Central Valley Wye alternatives, although they would occur at varying levels. This chapter provides a comparative analysis of effects on jurisdictional waters for the Central Valley Wye.

The impact analysis provided in this chapter is based primarily on the analysis presented in the Biological Resources and Wetlands Technical Report (Authority and FRA 2016b) and Draft Supplemental EIR/EIS (Authority and FRA 2018a). The Authority coordinated with the USACE to obtain a verified delineation of all waters of the U.S. that may be affected by the Central Valley Wye alternatives. Verification was obtained from USACE on April 27, 2018.

4.1 Effect Determination Methodology and Definitions

The impact evaluation approach used in this Summary Report quantifies direct effects on jurisdictional waters that could result from construction or operation of the Central Valley Wye alternatives. For each alternative analyzed, the direct permanent, direct temporary, and indirect-bisected effects correspond to the maximum spatial extent within which discharge of dredged or fill material or associated function loss may occur. This quantitative evaluation is conservative, because the acreage of waters of the U.S. that would be affected by the Central Valley Wye alternatives are anticipated to be smaller than the area of maximum potential effect that is represented in this Summary Report. The impact conclusions reached in the Draft Supplemental EIR/EIS and this Summary Report (depicted later in the chapter and shown in Table 4-1) allow comparison of the estimated effects across all Central Valley Wye alternatives. This comparison, in turn, provides support for the identification of the LEDPA.

In addition, direct and potential indirect effects are evaluated qualitatively for each alternative. A comparative evaluation is presented by the type of aquatic resource (wetlands, other waters of the U.S.), the feature type (e.g., constructed watercourse, natural watercourse, seasonal wetland, vernal pool), and by relative condition class. Characterization of the relative existing conditions of jurisdictional waters (poor, fair, good, or excellent) facilitates a meaningful evaluation of effects of the Central Valley Wye alternatives on those resources. It is important to consider the spatial extent of an effect in relation to the quality of the resource affected; for example, a spatially small effect on an excellent-quality resource might be of greater consequence than a larger effect on a poor- or fair-quality resource.

Finally, this analysis summarizes the cumulative effects of the construction and operation of the Central Valley Wye alternatives in combination with other past, present, and reasonably foreseeable projects.

For the purpose of this Summary Report, effects are grouped in four categories: direct permanent, direct temporary, indirect, and indirect-bisected. Figure 4-1 illustrates three of the four types of effects and Figure 4-2 illustrates indirect bisected effects specific to vernal pool features. Also see Figure 16.1, Impact Evaluation Schematics, in Chapter 16.

The four impact categories are defined as:

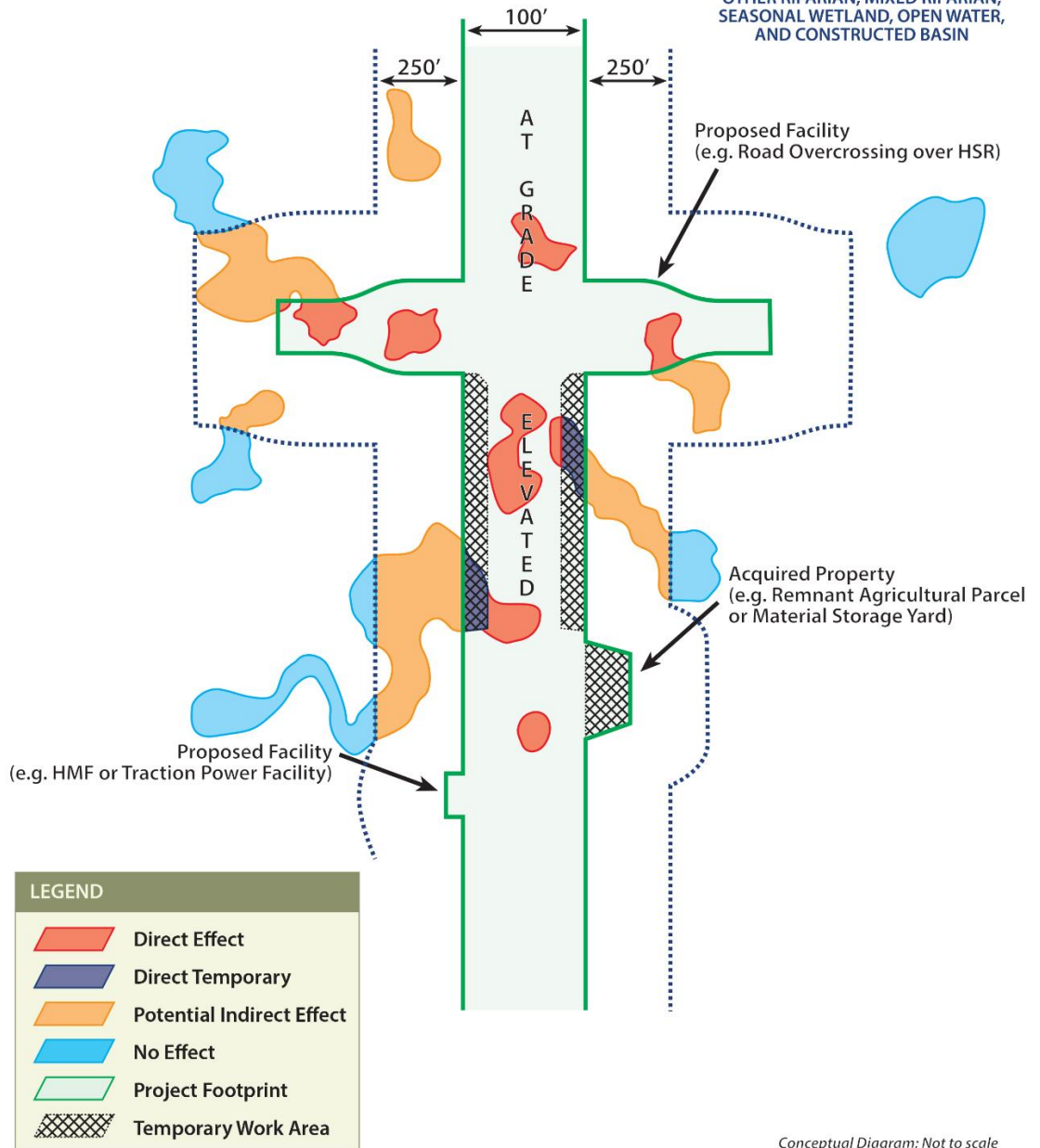
- **Direct Permanent:** Direct permanent effects consist of any permanent loss of jurisdictional waters resulting from the discharge of dredge or fill material. These impacts are generally associated with permanent infrastructure, including the right-of-way for the HSR tracks, the stations, the road undercrossings/overcrossings, and the electrical facilities.
- **Direct Temporary:** Direct temporary effects consist of any temporary loss of jurisdictional waters that would occur during project construction activities and are primarily associated with laydown and storage areas as well as utility relocations in the project footprint. These effects would be addressed through the restoration of the affected area to pre-project conditions following the completion of construction. No permanent structures, such as tracks,

stations, or other facilities, are included in this category. Effects lasting more than one year will be treated as permanent.

- **Indirect:** Indirect effects consist of adverse effects of discharges to jurisdictional waters other than direct losses of the resources. Indirect effects occur later in time (after construction or operations activities are conducted) or are farther removed in distance (outside the project footprint), but are still reasonably foreseeable. Such adverse effects could potentially result from a number of construction-related actions that alter hydrology or degrade water quality or habitat conditions.
- **Indirect-Bisected:** Indirect-bisected effects include vernal pools (waters of the U.S.) that fall partially within but extend beyond the project footprint. Only the portion outside the project footprint is considered to be subject to indirect-bisected effects. An impact on any portion of the vernal feature that occurs inside the footprint is defined as a direct permanent impact. For the purposes of USACE permitting, indirect-bisected vernal pools and swales are considered a full loss of the feature. Where there are indirect-bisected effects on vernal pools and swales, mitigation is proposed for the entirety of that vernal pool (including portions that extend into and beyond the wetland study area), and out to 250 feet from direct permanent effects on vernal pools. Vernal pool features located entirely within the wetland study area but outside the project footprint have been evaluated for their potential to be indirectly affected by the project.



CWA SECTION 404 FRESHWATER MARSH, PALUSTRINE FORESTED WETLAND, OTHER RIPARIAN, MIXED RIPARIAN, SEASONAL WETLAND, OPEN WATER, AND CONSTRUCTED BASIN



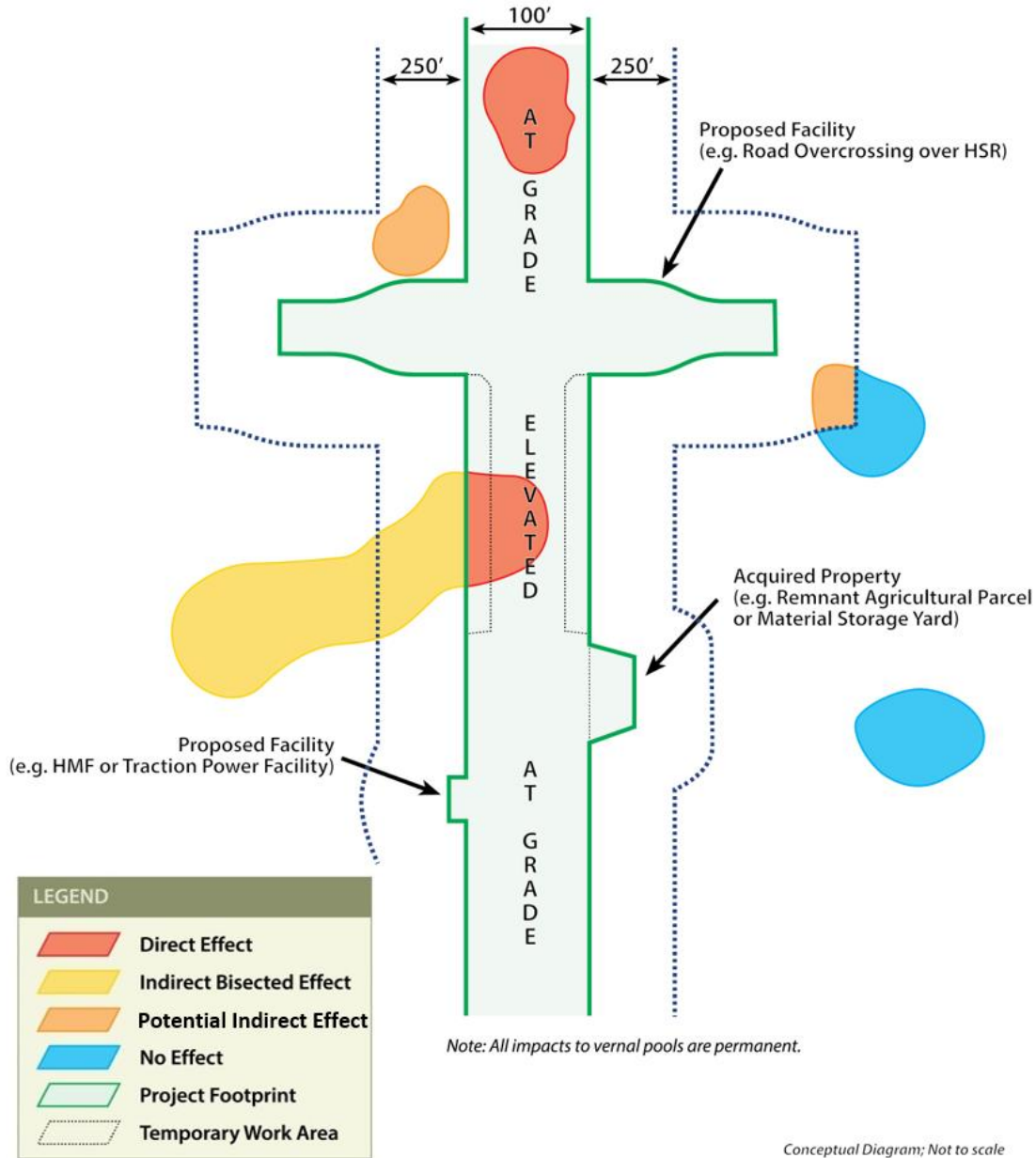
Conceptual Diagram; Not to scale

12/5/16

Source: Authority and FRA, 2018c

FINAL- MARCH 10, 2017

Figure 4-1 Types of Effects on Jurisdictional Waters



7/11/16

Source: Authority and FRA, 2018c

FINAL—MARCH 10, 2017

Figure 4-2 Vernal Pools Effects Illustration

4.2 Comparison of Effects on Jurisdictional Waters

4.2.1 Direct Effects

Construction of the Central Valley Wye alternatives would result in temporary and permanent effects on jurisdictional waters as shown in Table 4-1. Specifically, direct adverse effects on jurisdictional waters would include placement of fill or removal of aquatic features resulting from the construction of roads, rail track, and associated infrastructure. While all the Central Valley Wye alternatives would require construction where jurisdictional wetlands and non-wetland waters are present, the SR 152 (North) to Road 11 Wye Alternative would have the fewest permanent and temporary effects on jurisdictional waters.

4.2.2 Indirect Effects

As discussed in Section 4.1, construction and operational-related activities may result in the redirection of flow within jurisdictional waters and alteration of wetland features. In natural watercourses, these activities may result in the removal or disruption of hydrology, vegetation, water quality conditions, and other functions provided by these jurisdictional waters. The potential indirect effects on jurisdictional waters may include temporary effects such as erosion, siltation, and runoff into natural and constructed water features downstream of the project footprint. These effects would occur on a limited basis because the project design includes measures to avoid and minimize changes in site hydrology.

In addition, all Central Valley Wye alternatives would require periodic maintenance within the right-of-way (i.e., removal of vegetation, litter, and debris from culverts, drains, and other structures). These actions may result in similar temporary indirect effects on jurisdictional waters (e.g., changes in flow, changes in turbidity); however, any indirect effects would occur on a limited basis because measures would be implemented to control erosion and siltation. Moreover, the design characteristics of the Central Valley Wye alternatives include measures requiring maintenance personnel to attend a Worker Environmental Awareness Program (WEAP) training and certify they understand the material and will comply with associated regulatory requirements to protect jurisdictional waters. A description of more specific qualitative indirect effects on jurisdictional water types is provided below.

Vernal Pools

Indirect effects on vernal pools may include changes in hydrology resulting from the construction of the track infrastructure (e.g., embankment, retained fill) and the possible introduction of invasive species during construction and operations. Avoidance and minimization measures specifying implementation of a weed control plan (BIO-IAMF#8, Prepare and Implement a Weed Control Plan) and cleaning of vehicles prior to moving to new areas (BIO-IAMF#19, Cleaning of Construction Equipment) would minimize these effects.

Other Palustrine Wetlands

Indirect effects on other palustrine wetlands (i.e., seasonal wetlands, and palustrine forested wetlands) would include modification of local hydrology and the redirection of flow within these wetlands resulting from construction and operations activities. Machinery used during operations to clean drains, control vegetation, and remove litter would result in disturbance of riparian habitat. Construction site best management practices (BMP) (BIO-IAMF#24, Construction Site Housekeeping) will include implementation of temporary soil stabilization and sediment control measures to limit the extent of indirect effects resulting from construction activities.

Table 4-1 Direct Effects on Wetlands and Other Waters in the Central Valley Wye by Alternative¹ (acres)

| Wetland and Other Waters of the U.S. Type | 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 | | |
|------------------------------------------------------|-------------------------------------------|----------------|--------------|-------------------------------------------|--------------|--------------|--------------------------------------|-------------|--------------|-------------------------------------------|-------------|--------------|
| | Direct Effects | | | Direct Effects | | | Direct Effects | | | Direct Effects | | |
| | Permanent ¹ | Temporary | Total | Permanent | Temporary | Total | Permanent | Temporary | Total | Permanent | Temporary | Total |
| Wetlands | | | | | | | | | | | | |
| Vernal Pool ² | 0.18 | — ³ | 0.18 | 0.19 | — | 0.19 | 0.10 | — | 0.10 | 0.19 | — | 0.19 |
| Indirect Bisected Vernal Pools ⁴ | 0.04 | — | 0.04 | 0.04 | — | 0.04 | 0.64 | — | 0.64 | 0.04 | — | 0.04 |
| Seasonal Wetland | 0.69 | 0.09 | 0.78 | 1.46 | 0.52 | 1.99 | 0.94 | 0.54 | 1.47 | 0.39 | 0.11 | 0.49 |
| Palustrine Forested Wetland ⁵ | 0.08 | 0.04 | 0.12 | 0.00 | 0.00 | 0.00 | 0.08 | 0.04 | 0.12 | 0.00 | 0.00 | 0.00 |
| Subtotal Wetlands | 1.00 | 0.13 | 1.13 | 1.69 | 0.52 | 2.21 | 1.76 | 0.58 | 2.34 | 0.62 | 0.11 | 0.72 |
| Other Waters of the U.S. (Non-wetland waters) | | | | | | | | | | | | |
| Constructed Basin | 7.73 | 0.53 | 8.26 | 4.76 | 0.28 | 5.05 | 4.73 | 0.21 | 4.94 | 6.71 | 0.42 | 7.12 |
| Constructed Watercourse | 14.19 | 5.57 | 19.76 | 13.11 | 5.11 | 18.22 | 24.45 | 3.98 | 28.43 | 10.67 | 3.73 | 14.40 |
| Natural Watercourse | 6.34 | 3.72 | 10.06 | 7.83 | 4.26 | 12.09 | 5.02 | 4.95 | 9.97 | 4.73 | 3.01 | 7.74 |
| Subtotal Other Waters of the U.S. | 28.26 | 9.82 | 38.08 | 25.71 | 9.65 | 35.36 | 34.19 | 9.15 | 43.34 | 22.11 | 7.15 | 29.26 |
| Grand Total | 29.26 | 9.95 | 39.21 | 27.40 | 10.17 | 37.57 | 35.96 | 9.73 | 45.68 | 22.72 | 7.26 | 29.98 |
| <i>Natural Waterbodies</i> | <i>7.34</i> | <i>3.85</i> | <i>11.19</i> | <i>9.53</i> | <i>4.78</i> | <i>14.30</i> | <i>6.78</i> | <i>5.53</i> | <i>12.31</i> | <i>5.34</i> | <i>3.12</i> | <i>8.47</i> |
| <i>Constructed Waterbodies</i> | <i>21.92</i> | <i>6.10</i> | <i>28.02</i> | <i>17.87</i> | <i>5.40</i> | <i>23.27</i> | <i>29.18</i> | <i>4.20</i> | <i>33.37</i> | <i>17.38</i> | <i>4.14</i> | <i>21.52</i> |

Source: Calculations generated using ESRI ArcGIS versions 10.1, 10.2, and 10.3, based on Wetland Delineation Report dataset (2-Feb-18) and project footprints dated 14-Feb-16 (Avenue 21 to Road 13), 14-Sept-16 (SR 152 [North] to Road 13 and SR 152 [North] to Road 19), and 9-Nov-16 (SR 152 [North] to Road 11). Minor differences in the totals are the result of rounding.

¹ Permanent, direct effects consist of HSR right-of-way (ROW), roadway ROW, permanent access easements, and permanent utility easements.

² All Vernal Pool effects are considered permanent.

³ A dash (—) is shown where there is no potential for an impact.

⁴ Indirect Bisected Vernal Pools are considered Permanent Direct Effects.

SR = State Route

Constructed Waterbodies

The extent of indirect effects on constructed waterbodies (i.e., constructed basins and watercourses) would be limited to regular modification and maintenance of these features to serve their agricultural or stormwater function. Indirect effects on constructed waterbodies would be similar to those described for other palustrine wetlands—such as potentially increased erosion, siltation, and runoff and introduction of invasive species—resulting from construction and operations activities. Operations and maintenance activities would also result in indirect effects from the periodic maintenance of the right-of-way culverts and other structures (i.e., drain cleaning and vegetation and litter removal).

4.2.3 Cumulative Effects

The cumulative resource study area (RSA) for aquatic resources comprises the following sub basins in the San Joaquin River Basin: Middle San Joaquin-Lower Chowchilla, Fresno River, Lower San Joaquin River, Upper Merced, and Upper Tuolumne (U.S. Geologic Survey 8-digit Hydrologic Unit Codes [HUC] 18040001, 18040002, 18040007, 18040008, and 18040009). Construction of additional projects within or near the cumulative RSA for wetlands would also affect jurisdictional waters, leading to direct and indirect effects such as removal of aquatic features, modification of local hydrology, and redirection of flow. Areas potentially affected include seasonal wetlands, canals, ditches, lacustrine, retention and detention basins, riparian, and seasonal riverine complexes.

To prevent reduction or degradation of jurisdictional waters, the Central Valley Wye alternatives design includes a measure to create, restore, enhance, and preserve wetlands. Other measures would minimize turbidity and siltation resulting from ground-disturbing activities by implementing a dewatering plan and construction site BMP field manual.

While operations of the Central Valley Wye alternatives would require maintenance and vehicular activity near jurisdictional waters and wetlands, these activities would not measurably contribute to this cumulative effect. As discussed in Section 4.2.2, Indirect Effects, the design of the Central Valley Wye alternatives would require maintenance personnel to attend WEAP training to understand regulatory requirements for jurisdictional waters. With these measures in place, the likelihood of accidental spills, introduction of contaminants/pollutants, and resulting degradation of jurisdictional waters would be minimized.

4.2.4 Comparison of Alternatives

The Avenue 21 to Road 13 Wye Alternative would result in the largest permanent and temporary effects on jurisdictional waters of approximately 35.96 acres and 9.73 acres, respectively (Table 4-1). The SR 152 (North) to Road 13 Alternative would have approximately 6.70 acres less permanent effects at approximately 29.26 acres and approximately 0.22 acres more of temporary effects at approximately 9.95 acres. The SR 152 (North) to Road 19 Alternative would have similar, though slightly less, permanent effects relative to the SR 152 (North) to Road 13 Alternative at approximately 27.40 acres, while temporary effects would be slightly greater at approximately 10.17 acres. The SR 152 (North) to Road 11 Alternative would have the lowest permanent and temporary effects on jurisdictional waters at approximately 22.72 acres and 7.26 acres, respectively.

4.3 Avoidance and Minimization through the Development of Central Valley Wye Alternatives

The USACE may not permit a discharge unless appropriate and practicable steps have been taken to minimize adverse effects on the aquatic ecosystem (40 C.F.R. § 230.10(d)). Subpart H of the Section 404(b)(1) guidelines identifies a range of minimization steps (40 C.F.R. §§ 230.70–230.77). This section of the guidelines indicates that “many actions” can be taken to fulfill the requirement of minimization, and identifies suggested actions rather than an exhaustive list of required measures. The guidelines identify the following specific steps to be used as appropriate:

- **Actions concerning the location of discharge:** The location of the discharge may be selected to avoid effects by avoiding sensitive components of aquatic ecosystems or by using locations that have previously been used for fill (40 C.F.R. § 230.70).
- **Actions concerning the material to be discharged:** The nature of proposed fill and the manner in which it is used may be designed to avoid adverse chemical effects and physical dispersal of fill into the aquatic ecosystem (40 C.F.R. § 230.71).
- **Actions controlling the material after discharge:** BMPs such as physical barriers and the manner of fill placement may be used to control the fill after discharge (40 C.F.R. § 230.72).
- **Actions affecting the method of dispersion:** Where environmentally desirable, the fill may be distributed broadly to minimize effects on the ecosystem, or screens or other turbidity and particulate barriers may be used to capture sediment (40 C.F.R. § 230.73).
- **Actions related to technology:** Appropriate technology for particular fill sites should be used, including, as relevant, the use of mats under equipment to avoid rutting and appropriate future maintenance to minimize erosion (40 C.F.R. § 230.74).
- **Actions affecting plant and animal populations:** Locations for placement of fill should be chosen to avoid effects on flora and fauna, where feasible. In addition, appropriate restoration should be conducted to restore natural habitat and ecosystem functions (40 C.F.R. § 230.75).
- **Actions affecting human use:** Where feasible, fill activity and location should be selected to minimize permanent aesthetic effects and the effects on the timing of other human activities in the aquatic environment (40 C.F.R. § 230.76).
- **Other actions:** Where dredging or dams are proposed, the release of water or the manner of dredging should be designed to minimize effects on aquatic ecosystems (40 C.F.R. § 230.77).

To meet the requirements of 40 C.F.R. Part 230.10(d), the following avoidance and minimization measures would be incorporated into the design of the Central Valley Wye alternatives:

- For the four alternatives carried forward from the Checkpoint B stage, the Authority has incorporated design features to minimize discharges into waters, including natural waterbodies and associated habitats.
- Additional design features, compliant with the State Water Resources Control Board (SWRCB) Construction General Permit, have been incorporated into all four alternatives, including the use of BMPs to control and minimize indirect effects associated with the discharge of pollutants, stormwater runoff, and erosion.
- Additional avoidance and minimization measures, referred to as impact avoidance and minimization features (IAMF) for wetland and other non-wetland waters (jurisdictional waters) are described in Section 4.3.1, Central Valley Wye Design Features for Jurisdictional Waters and Other Non-Wetland Waters. A comprehensive list of all IAMFs for all resource categories contained in this Summary Report is provided in Appendix G, Impact Avoidance and Minimization Features and Mitigation Measures. These mitigation measures cover relevant technical disciplines, including biological resources (consistent with “actions affecting plant and animal populations”), and human-use characteristics such as communities, parks, and cultural resources (consistent with “actions affecting human use”).

The following subsections describe the various techniques used to avoid and minimize effects on jurisdictional waters and other non-wetland waters.

4.3.1 Central Valley Wye Design Features for Jurisdictional Waters and Other Non-Wetland Waters

To the maximum extent feasible, the project footprints of the Central Valley Wye alternatives were modified following the Checkpoint B stage to further avoid direct, permanent effects on jurisdictional waters and other non-wetland waters. Specifically, where engineering constraints

were absent, the Authority has implemented additional design refinements to further avoid direct effects on natural waterbodies and associated habitats at the following locations:

- San Joaquin River
- Eastside Bypass
- Ash Slough
- Berenda Slough
- Chowchilla River
- Dutchman Creek
- Deadman Creek

In general, design refinements consisted of the following: (1) HSR track profile was refined and embankment fill limits defined; (2) bridge limits were established and abutments located to provide the shortest structure feasible, and (3) the HSR and roadway right-of-way was adjusted only to incorporate the minimum necessary for HSR operations and maintenance. In summary, these measures resulted in additional avoidance of natural watercourses, Great Valley mixed riparian, and other riparian types.

Appendix G of this Summary Report identifies additional measures to reduce or avoid potential effects on jurisdictional waters identified in the environmental analysis. IAMFs are incorporated into the Central Valley Wye alternatives design and construction in order to avoid or minimize environmental effects. The following IAMFs would be incorporated as part of the project to avoid effects on jurisdictional waters:

- BIO-IAMF#3: Construction Period WEAP Training
- BIO-IAMF#4: Operation and Maintenance Period WEAP Training
- BIO-IAMF#5: Prepare and Implement a Restoration and Revegetation Plan
- BIO-IAMF#6: Prepare and Implement a Biological Resources Management Plan
- BIO-IAMF#8: Prepare and Implement a Weed Control Plan
- BIO-IAMF#10: Construction Work Windows
- BIO-IAMF#19: Cleaning of Construction Equipment
- BIO-IAMF#20: Dewatering and Water Diversion

Detailed information on these IAMFs is provided in Appendix G.

4.3.2 Central Valley Wye Design Features for Construction Stormwater Pollution Prevention Plan

The SWRCB Construction General Permit (Order No. 2009-0009 DWQ, National Pollutant Discharge Elimination System (NPDES) No. CAS000002) establishes three project risk levels based on site erosion and receiving water risk factors. Risk Levels 1, 2, and 3 correspond to low-, medium-, and high-risk levels, respectively. Preliminary analysis indicates that most of the Central Valley Wye alternatives would fall under Risk Level 1, the lowest risk level. However, sections of the Central Valley Wye alternatives may be more appropriately categorized as Risk Level 2 given local rainfall, soil erodibility, and the lengths of the constructed slopes.

The Construction General Permit requires preparation and implementation of a stormwater pollution prevention plan (SWPPP) providing 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 (HYD-IAMF#3, Prepare and Implement a Construction Stormwater Pollution Prevention Plan). The construction SWPPP will include, but will not be limited to, measures to address the following:

- Managing hydro modification to maintain 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 will be implemented where local regulations or drainage requirements dictate

- Implementing practices to minimize 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 checking vehicle condition daily
- Implementing practices to reduce erosion of exposed soil, including soil stabilization, watering for dust control, and using perimeter silt fences and sediment basins
- Implementing practices to maintain current water quality, such as using silt fences, stabilized construction entrances, grass buffer strips, ponding areas, and organic mulch layers; inlet protection; and Baker tanks and sediment traps to settle sediment
- Implementing practices to capture and provide proper off-site disposal of concrete washwater, including isolation of runoff from fresh concrete during curing to prevent the runoff from reaching local drainage systems and possible treatment with dry ice or other acceptable means to reduce the alkaline character (high pH) of the runoff that typically results from new concrete
- Developing and implementing a spill prevention and emergency response plan to handle potential fuel or other spills
- Using diversion ditches to intercept off-site surface runoff
- Avoiding areas that may have substantial erosion risk, where feasible, including areas with erosive soils and steep slopes
- Where feasible, limiting construction to dry periods when flows in waterbodies are low or absent

Implementation of a SWPPP is the responsibility of the construction contractor's qualified SWPPP practitioner or designee. As part of that responsibility, the effectiveness of construction BMPs must be monitored before and after storm events. Records of these inspections and monitoring results will be submitted to the SWRCB/Regional Water Quality Control Board as part of the annual report required by the Statewide Construction General Permit. The reports will be available to the public online. The SWRCB and Regional Water Quality Control Board have the opportunity to review these documents.

4.3.3 Central Valley Wye Design Features for Stormwater Management and Treatment

During the detailed design phase, each receiving stormwater system's capacity will be evaluated to accommodate post-project (operations phase) runoff for the design-year storm event. As necessary, on-site stormwater management measures, such as detention or selected upgrades to the receiving system, will be designed to provide adequate capacity and to comply with the applicable stormwater design standards and criteria including the latest version of the Authority Technical Memorandum 2.6.5 *Hydraulics and Hydrology Guidelines*. On-site stormwater management facilities will be designed and constructed to capture runoff and provide treatment prior to discharge of stormwater 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 will be used to detain runoff on-site and to reduce off-site runoff according to design standards and criteria. 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 will also be used, where appropriate. Stormwater infiltration or detention facilities will be built in compliance with the applicable design standards.

4.3.4 Central Valley Wye Design Features for Flood Protection

The CVFPB regulates specific river, creek, and slough crossings for flood protection. These crossings must meet the provisions of the California Code of Regulations, Title 23. Title 23

requires that new crossings maintain hydraulic capacity through such measures as in-line piers, adequate stream bank height (freeboard), and measures to protect against stream bank and channel erosion.

Under 33 C.F.R. Part 208.10, improvements, including crossings, must be constructed in a manner that does not reduce the capacity or functionality of the channel or any federal flood-control project. The CVFPB reviews applications for encroachment permits for approval of a new channel crossing or other channel modification. For a proposed crossing or placement of a structure near a federal flood-control project, the CVFPB coordinates review of the encroachment permit application with the USACE pursuant to assurance agreements with the USACE and USACE Operation and Maintenance Manuals under 33 C.F.R. Part 208.10 of the Rivers and Harbors Act, and 33 U.S.C. Section 408. Under Section 408, the USACE must approve any proposed modification involving a federal flood control project. A Section 408 permit is required if construction modifies a federal levee or if the project encroaches on a federal facility without modifying it.

Prior to construction, the contractor will prepare a flood protection plan for Authority review and approval (HYD-IAMF#2, Flood Protection). The Central Valley Wye alternatives will be designed both to remain operational during flood events and to minimize increases in 100- 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.
- Minimize development within the floodplain such 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- 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 more than 1 foot above current levels, or as required by state or local agencies, and such that project features within the floodway itself will not increase existing 100-year floodwater surface elevations in Federal Emergency Management Agency–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. Incorporate scour-control measures to reduce erosion potential.
- 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 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.

5 OTHER ENVIRONMENTAL RESOURCES: EXISTING CONDITIONS

This chapter provides an overview of the existing conditions regarding other environmental resources including biological resources (special-status plant and wildlife species, habitat linkages and wildlife movement corridors, and habitats of concern), agricultural lands, parklands, cultural resources, noise and vibration, and environmental justice).

5.1 Biological Resources

5.1.1 Definition of the Study Areas for Biological Resources

The existing conditions described in this chapter include plant communities, land cover types, wildlife habitat types, wildlife species, habitat linkages, and wildlife movement corridors. The overall RSA for biological resources encompasses the project footprint, including the proposed HSR right-of-way and associated facilities (TPSSs, switching and paralleling stations, and areas associated with modifying or relocating roadways for those facilities—including overcrossings and interchanges), and construction areas (including laydown, storage, and similar areas). Biologists conducted field surveys to determine the presence or absence of biological resources and to document the location of any biological resources through habitat characterization and mapping. Habitat characterization and mapping were conducted throughout the biological resource RSAs. Details about the mapping process used for each biological resource are provided in the Biological Resources and Wetlands Technical Report (Authority and FRA 2016b).

At the time of preparation of this document, permission to enter has been granted for some properties, but access to most properties has not been granted, and therefore most surveys have not yet been completed. The survey team was granted access to and conducted surveys on approximately 13 percent of the property, by acreage, within or adjacent to the project footprint of the Central Valley Wye alternatives. Some limited surveys (e.g., special-status plants) are expected to be completed as permission to enter becomes available prior to construction.

To address regulatory requirements and assess potential effects on biological and wetland resources, the Authority and FRA developed the *Central Valley Biological Resources and Wetlands Survey Plan* (Authority and FRA 2010b) which established various specific biological RSAs. These RSAs are described in the following subsections, shown in Table 5-1, and illustrated on Figure 5-1. The Biological Resources and Wetlands Technical Report (Authority and FRA 2016b) and the Second Supplemental Wetlands Delineation Report (Authority and FRA 2018b) provide additional details.

- **Habitat study area**—Project footprint plus a 1,000-foot buffer around project elements to evaluate direct and indirect effects on habitats and the special-status wildlife species that use them. The habitat study area was divided into two areas: a core habitat study area and an auxiliary habitat study area. A third, or supplemental, habitat study area was identified for select species that required further analysis based on agency- or protocol-recommended species-specific buffers:
 - The *core habitat study area* includes the Central Valley Wye alternatives project footprints and a 250-foot buffer.
 - The *auxiliary habitat study area*, from the edge of the core habitat study area laterally 750 feet.
 - The *supplemental habitat study area* extends up to 10 miles outward from the project footprint, depending on the target species.
- **Wetland study area**—Project footprint plus a 250-foot buffer to evaluate direct and indirect effects on jurisdictional waters and special-status wildlife and plants. Direct effects on waters are assumed to occur within the project footprint and the area of evaluation of potential indirect effects is conducted within the 250-foot buffer. If a portion of a vernal pool or swale is within the project footprint and therefore directly affected, then the whole vernal pool or swale will be considered directly affected for purposes of identifying effects and mitigation

measures. This type of effect is referred to as *indirect bisected*. These effects are discussed in Section 4.2, Comparison of Effects on Jurisdictional Waters.

- **Special-status plant study area**—Project footprint plus a 100-foot buffer to evaluate indirect effects on upland special-status plant resources (including special-status plants and special-status plant communities). For vernal pool plant species, the wetland study area and auxiliary habitat study area (if applicable) are used to evaluate effects.
- **Wildlife movement study area**—Project footprint plus a 20-mile buffer based on the species likely to be present and determined based on agency guidance, literature, and best professional judgment, and in consultation with appropriate regulatory agencies.

Table 5-1 Definitions of Resource Study Areas

| Resource Study Area | Area of Impact | General Description |
|----------------------------------------------------|----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Habitat Study Area¹ | | |
| Core Habitat Study Area | | |
| Direct Effects | Project footprint (includes permanent and temporary effects) | Evaluate direct and indirect effects on habitats and the special-status wildlife species that use them. This was the area that was physically surveyed, if access was available. |
| Potential Indirect Effects | Project footprint plus 250-feet for terrestrial biological effects | |
| Auxiliary Habitat Study Area^{2,3} | | |
| Potential Indirect Effects | 250–1,000-foot buffer outside core habitat study area for terrestrial biological effects | Surveyed through extrapolation of observations made in the core habitat study area from aerial photograph interpretation and windshield surveys. |
| Supplemental Habitat Study Area | | |
| Potential Indirect Effects | Extends up to 10 miles outward from the project footprint for terrestrial biological effects | Identifies species-specific habitats based on aerial photograph interpretation and documented occurrences of the species, and on observations of special-status species and their habitats made in the field. |
| Special-Status Plant Study Area³ | | |
| Direct Effects | Project footprint | Evaluate direct and indirect effects on upland sensitive plant resources (including special-status plants, special-status plant communities, protected trees, and elderberry shrubs). For vernal pool plant species, the wetland study area and auxiliary habitat study area (if applicable) are used to evaluate effects. |
| Potential Indirect Effects | Project footprint plus 100-foot buffer for terrestrial biological effects | |

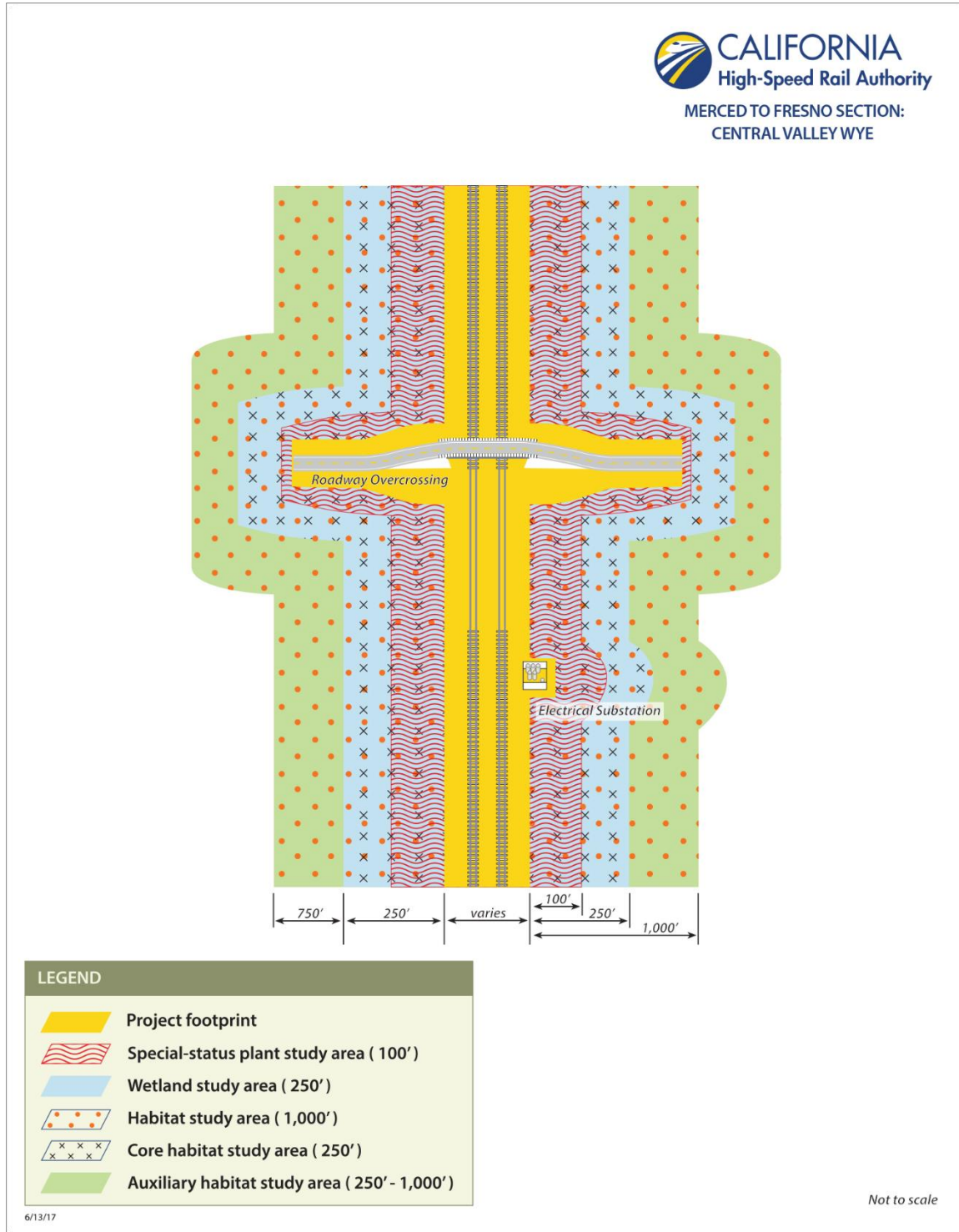
| Resource Study Area | Area of Impact | General Description |
|---------------------------------------|-----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Wildlife Movement Study Area | | |
| Direct and Potential Indirect Effects | 20-mile buffer outside project footprint for terrestrial biological effects | Determined based on agency regulations and guidance, literature, and best professional judgment, and in consultation with appropriate regulatory agencies. |

Source: Author's compilation, 2016

¹ The RSA for the habitat study area generally includes the project footprint plus a 1,000-foot buffer to evaluate direct and indirect effects on habitats and the special-status wildlife species that use them. The habitat study area was divided into two areas: a core habitat study area and an auxiliary habitat study area. A third, or supplemental, habitat study area was identified for select species that required further analysis based on agency- or protocol-recommended species-specific buffers.

² Effects on special-status plant species occurring in vernal pools are also considered in the context of the wetland study area and the auxiliary habitat study area (as applicable).

³ Not applicable to electrical interconnection and network upgrades (EINU) components due to the temporary and minor permanent nature of associated impacts.



Source: Authority and FRA, 2018a

FINAL - JUNE 13, 2017

Figure 5-1 Schematic of Biological Resource Study Areas

5.1.2 Impact Avoidance and Minimization Features

The Central Valley Wye alternatives incorporate standardized HSR features to avoid and minimize impacts. These features are referred to as IAMFs. The Authority will implement IAMFs during project design and construction and as such, the analysis of effects of the Central Valley Wye alternatives in this section factors in all applicable IAMFs. A comprehensive list of all IAMFs for all resource categories contained in this Summary Report is provided in Appendix G, Impact Avoidance and Minimization Features and Mitigation Measures. IAMFs applicable to biological resources and wetlands include:

- BIO-IAMF#1, Project Biologist
- BIO-IAMF#2, Agency Access
- BIO-IAMF#3, Construction Period WEAP Training
- BIO-IAMF#4, Operation and Maintenance Period WEAP Training
- BIO-IAMF#5, Prepare and Implement a Restoration and Revegetation Plan
- BIO-IAMF#6, Prepare and Implement a Biological Resources Management Plan
- BIO-IAMF#7, Prepare and Implement an Annual Vegetation Management Plan
- BIO-IAMF#8, Prepare and Implement a Weed Control Plan
- BIO-IAMF#9, Security Fence Maintenance Plan
- BIO-IAMF#10, Construction Work Windows
- BIO-IAMF#11, Conduct Biological Monitoring during Construction Activities
- BIO-IAMF#12, "Take" Notification and Reporting
- BIO-IAMF#13, Environmentally Sensitive Areas, Wildlife Exclusion Fencing and Non-Disturbance Zones
- BIO-IAMF#14, Monofilament Restrictions
- BIO-IAMF#15, Avoidance of Entrapment
- BIO-IAMF#16, Artificial Dens Associated with Wildlife Exclusion Fencing and Non-Disturbance Zones
- BIO-IAMF#17, Equipment Staging Areas
- BIO-IAMF#18, Construction Utility Requirements and Waste Disposal
- BIO-IAMF#19, Cleaning of Construction Equipment
- BIO-IAMF#20, Dewatering and Water Diversion
- BIO-IAMF#21, Vehicle Traffic and Construction Site Speed Limits
- BIO-IAMF#22, Work Stoppage
- BIO-IAMF#23, Compliance Reporting
- BIO-IAMF#24, Construction Site Housekeeping
- BIO-IAMF#25, Wildlife Crossings
- BIO-IAMF#26, General Nesting Season Restrictions
- BIO-IAMF#27, Conservation Dogs
- HYD-IAMF#1: Storm Water Management

- HYD-IAMF#2: Flood Protection
- HYD-IAMF#3: Prepare and Implement a Construction Stormwater Pollution Prevention Plan
- HYD-IAMF#4: Prepare and Implement an Industrial Stormwater Pollution Prevention Plan

5.1.3 Overview of Affected Environment: Plant Communities and Land Cover Types in the Resource Study Area of All Alignments

Plant communities and land cover types observed within the habitat study area are listed in Table 5-2 and illustrated in Appendix H in the vicinity of the counties of Merced, Madera, Stanislaus, and Fresno as well as the Cities of Chowchilla, Merced and Waterford, as shown in the lower right corner map inset on each sheet. Descriptions of the communities and land cover types are provided in the following subsections.

The classification of the land cover and vegetation communities were adapted from the Merced to Fresno Final EIR/EIS (Authority and FRA 2012b) or identified using the CDFW's *Hierarchical List of Natural Communities with Holland Types* (CDFW 2016c) and *A Guide to Wildlife Habitats of California* (Mayer and Laudenslayer 1988).

Table 5-2 Land Cover Types in the Central Valley Wye Project Footprint (acres)¹

| Land Cover Type ² | 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 |
|------------------------------|-------------------------------------------|-------------------------------------------|--------------------------------------|-------------------------------------------|
| | Project Footprint | Project Footprint | Project Footprint | Project Footprint |
| Agricultural Lands | | | | |
| Dairies | 58.01 | 33.64 | 16.00 | 28.59 |
| Fallow Field | 18.46 | 57.90 | 18.46 | 18.46 |
| Field Crops | 1,197.58 | 1,110.24 | 904.38 | 1,166.07 |
| Inactive Agriculture | 77.82 | 61.32 | 81.65 | 56.25 |
| Orchards | 780.85 | 1,286.50 | 1,077.26 | 814.39 |
| Pastures | 26.11 | 57.38 | 28.27 | 21.58 |
| Rice Fields | 0.00 | 0.00 | 0.00 | 0.00 |
| Row Crops | 143.58 | 114.85 | 171.50 | 96.11 |
| Vineyards | 243.44 | 397.30 | 195.36 | 285.42 |
| <i>Subtotal</i> | <i>2,545.85</i> | <i>3,119.14</i> | <i>2,492.88</i> | <i>2,486.87</i> |
| Developed Area | | | | |
| Barren | 60.79 | 98.18 | 61.78 | 55.61 |
| Commercial/Industrial | 87.76 | 93.67 | 43.30 | 84.32 |
| Transportation Corridor | 289.28 | 343.41 | 134.09 | 242.55 |
| Urban | 104.31 | 148.64 | 57.17 | 80.67 |
| <i>Subtotal</i> | <i>542.14</i> | <i>683.91</i> | <i>296.33</i> | <i>463.14</i> |

| Land Cover Type ² | 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 |
|------------------------------------------|-------------------------------------------|-------------------------------------------|--------------------------------------|-------------------------------------------|
| | Project Footprint | Project Footprint | Project Footprint | Project Footprint |
| Natural and Seminal Areas | | | | |
| California Annual Grassland | 99.71 | 130.20 | 33.33 | 78.11 |
| Eucalyptus Woodlands | 0.00 | 0.00 | 0.00 | 0.00 |
| Mixed Riparian | 0.36 | 1.06 | 0.42 | 0.68 |
| Other Riparian | 1.44 | 0.54 | 2.43 | 0.86 |
| Ruderal | 39.00 | 54.19 | 25.07 | 38.34 |
| Valley Sink Scrub | 4.26 | 4.26 | 4.26 | 4.26 |
| <i>Subtotal</i> | <i>144.77</i> | <i>190.25</i> | <i>65.50</i> | <i>122.25</i> |
| Aquatic Habitats | | | | |
| Depressional/ Palustrine Wetlands | | | | |
| Palustrine Forested Wetland | 0.12 | 0.00 | 0.12 | 0.00 |
| Seasonal Wetland | 0.78 | 1.98 | 1.47 | 0.49 |
| Vernal Pools | 0.18 | 0.19 | 0.10 | 0.19 |
| <i>Subtotal</i> | <i>1.09</i> | <i>2.17</i> | <i>1.70</i> | <i>0.69</i> |
| Other Waters | | | | |
| Constructed Watercourses | 19.76 | 18.23 | 28.44 | 14.40 |
| Natural Watercourses | 10.06 | 12.09 | 9.97 | 7.74 |
| Open Water | 0.00 | 0.00 | 0.00 | 0.00 |
| Constructed Basins | 8.26 | 5.05 | 4.94 | 7.12 |
| <i>Subtotal</i> | <i>38.09</i> | <i>35.36</i> | <i>43.34</i> | <i>29.26</i> |
| Total | 3,271.93 | 4,030.84 | 2,899.75 | 3,102.21 |

Source: Calculations generated using ESRI ArcGIS versions 10.1, 10.2, and 10.3 from data generated by field surveys and aerial photo interpretation during 2010–2015. Minor differences in the totals are the result of rounding.

¹ Acreages reported here are different than impact acreages reported in Chapter 4 because these acreages indicate impacts on jurisdictional waters as well as adjacent habitat (e.g., riparian banks).

² The acreages reported in this table include both permanent and temporary impacts within the project footprint.

Agricultural Lands

Agricultural lands comprise between 77.4 percent (SR 152 [North] to Road 19 Wye Alternative) and 86.0 percent (Avenue 21 to Road 13 Wye Alternative) of the project footprint for the Central Valley Wye alternatives. Nine types of agricultural land are found in the habitat study area: orchards, vineyards, field crops, row crops, dairies, pastures, fallow fields, rice fields, and inactive agriculture. These land uses, along with urban land uses, characterize the overwhelming majority of land in the habitat study area. Agricultural lands may provide marginal habitat for seasonal forage and refugia for a limited number of common species and special-status species.

Agricultural lands account for a majority of the land use within the habitat study area. Constructed watercourses, such as canals and drains, and basins associated with agriculture are discussed in Section 3.2.2, Other Waters of the U.S. Agricultural lands provide limited plant and wildlife habitat value relative to natural and seminatural habitats as a result of lower species diversity, frequent disturbance, and uniform vegetation structure. Additionally, wildlife species are often regarded as pests and many farmers actively haze birds and poison small mammals to reduce crop damage and loss. Vegetation other than the managed crop generally comprises weedy species adapted to high levels of disturbance and is often actively managed with herbicides, mowing, or tilling. Sparse annual grasses and weedy forbs may be present within hay fields and along the crop edges; however, because these weeds decrease crop value, these undesirable plants are often eradicated.

Developed Areas

Developed areas comprise between 10.2 percent (Avenue 21 to Road 13 Wye Alternative) and 17.0 percent (SR 152 [North] to Road 19 Wye Alternative) of the project footprint for the Central Valley Wye alternatives. In general, the types of developed areas are unchanged from the Merced to Fresno Final EIR/EIS, although there have been changes in the location and extent of transportation corridors as infrastructure updates have been completed. Developed areas in the habitat study area include urban areas, commercial and industrial buildings, transportation corridors, and barren areas where vegetation has been removed or is absent. A brief description of each of these subtypes follows.

Urban

Urban habitat includes relatively high-density residential areas and parks that may include landscaped areas, yards, gardens, and various buildings. Many urban areas include large landscape and shade trees such as ash (*Fraxinus* spp.), cedar (*Cedrus* spp.), eucalyptus, London plane (*Platanus acerifolia*), maple (*Acer* spp.), redwood (*Sequoia sempervirens*), and pine (*Pinus* spp.). Because rural residences are primarily dispersed, these areas have a significant agricultural landscape component, rural residential habitat is included in agricultural habitat types. Parkland includes developed and maintained open, grassy areas, picnic facilities, and children's playgrounds.

Commercial and Industrial

Commercial and industrial areas include urban shops, businesses, warehouses, industrial plants, factories, junkyards, equipment storage yards, airports, and various municipal facilities as well as associated parking lots. Rural commercial areas include landfills, farm equipment yards, and agricultural processing and storage facilities; dairy farms are not considered to be a commercial and industrial habitat type but are instead described separately as an agricultural habitat type. Urban commercial and industrial areas often have associated landscaped vegetation.

Transportation Corridors

Transportation corridors in the habitat study area include roads and railways, including portions of SR 99, SR 152, and SR 233, numerous paved urban and county roads, and the BNSF corridor. For the purposes of habitat characterization, narrow strips of landscaped or ruderal vegetation associated with these corridors were not separately mapped and quantified; instead, these areas were mapped together with their associated corridor. Dirt farm roads associated with agricultural fields also were not distinguished separately from the adjacent agricultural land use.

Barren

Barren areas are open plots of rock, gravel or soil that are either completely devoid of vegetation or contain only sparse (less than 2 percent), widely scattered, predominantly weedy herbaceous plants. Within the habitat study area, barren areas are associated with equipment yards adjacent to agricultural fields and various water storage or delivery features.

Natural and Seminatural Areas

Natural and semi-natural areas comprise between 2.3 percent (Avenue 21 to Road 13 Wye Alternative) and 4.7 percent (SR 152 [North] to Road 19 Wye Alternative) of the project footprint for the Central Valley Wye alternatives. Natural and seminatural habitats are distinguished from the land uses and vegetation types described in the previous sections by the degree of current human influence on the vegetation composition and structure. While natural and seminatural vegetation types have been altered to some extent by past and present human activities, the composition and structure of these communities is generally not actively managed or controlled. A distinction is also made between those habitats that are largely characterized by native vegetation and those in which the dominant vegetation comprises introduced species. Natural and seminatural habitats associated with aquatic features such as vernal pools, other seasonal wetlands, and riparian corridors are discussed in Section 3.2, Delineated Jurisdictional Waters. Natural and seminatural terrestrial habitats (California annual grassland, eucalyptus woodland, and ruderal vegetation) are described in the following sections.

California Annual Grassland

California annual grassland habitat within the habitat study area is best classified as part of the *Amsinckia (menziesii, tessellata)* Alliance as defined by Sawyer et al. (2009) and the nonnative grassland type described by Holland (1986). This community is characterized by a sparse to dense cover of grasses and herbaceous species less than 3 feet high. Scattered trees and shrubs may be present, but provide minimal cover.

California annual grassland in the habitat study area is further characterized by large expanses of open grassland composed of nonnative annual grasses such as ripgut brome, soft chess (*Bromus hordeaceus*), foxtail barley (*Hordeum jubatum*), medusa-head (*Taeniatherum caput-medusae*), and wild oat (*Avena fatua*). Common nonnative herbaceous species include yellow star-thistle, Italian thistle (*Carduus pycnocephalus*), prickly lettuce, mustards, and wild radish (*Raphanus sativa*). Many native annual and perennial herbaceous species may also be present within this grassland community; such species include Canadian horsetweed, telegraph weed (*Heterotheca grandiflora*), California poppy (*Eschscholzia californica*), and silver cudweed (*Gnaphalium canescens*). California annual grassland may be used for cattle or sheep grazing and is generally not seeded or irrigated when compared to similar areas classified as pasture. Areas of California annual grassland are on soils suitable for vernal pools and other seasonal wetlands.

Eucalyptus Woodlands

Eucalyptus woodlands are classified by Sawyer et al. (2009) as eucalyptus (*E. globulus*, *E. camaldulensis*) seminatural woodland stands or eucalyptus groves. There is no corresponding natural community type in Holland (1986). These areas are characterized by relatively dense stands of eucalyptus trees. Within the habitat study area, the understory vegetation typically comprises introduced annual grasses such as ripgut brome and Bermuda grass with goose grass (*Galium aparine*) and dovefoot geranium (*Geranium molle*). In some areas, giant reed is also a common associated understory species.

Ruderal Vegetation

Ruderal vegetation types occur in areas where the natural vegetation has been removed or significantly degraded by past or current human activity. Ruderal vegetation is often associated with vacant lots, roadsides, and other highly disturbed areas. Vegetation in these areas is highly variable but often includes a mix of nonnative annual grasses such as ripgut brome, soft chess, wild oat, Italian ryegrass (*Festuca perennis [Lolium perenne]*), foxtail barley, and weedy forbs such as bur clover (*Medicago polymorpha*), filaree (*Erodium botrys*), yellow star-thistle, Italian thistle, milk thistle (*Silybum maritimum*), Russian thistle (*Salsola tragus*), and many others. Due to the highly variable nature of ruderal habitats, this type was not classified according to Sawyer et al. (2009) or Holland (1986). Ruderal areas may be similar to California annual grassland but are

characterized by a greater level of disturbance. Ruderal areas are also similar to inactive farmland but do not occur in areas with evidence of active farming in the recent past.

Valley Sink Scrub

Valley Sink Scrub consists of Low, open to dense succulent shrublands characterized by alkali-tolerant plants in the Chenopodiaceae family, especially iodine bush (*Allenrolfea occidentalis*).

Aquatic Habitats

Aquatic habitats comprise between 0.93 percent (SR 152 [North] to Road 19 Wye Alternative) and 1.55 percent (Avenue 21 to Road 13 Wye alternative) of the project footprint for the Central Valley Wye alternatives. A variety of vegetation and land cover types associated with wetlands and other water features occur in the wetland study area, and are largely unchanged from those described in the Merced to Fresno Final EIR/EIS (Authority and FRA 2012b). Aquatic plant communities and land cover types include the following:

- Depressional/Palustrine Wetlands
 - Palustrine forested wetland
 - Vernal pools
 - Seasonal wetland
- Other Waters
 - Constructed basins
 - Constructed watercourses
 - Natural watercourses, including perennial rivers and creeks, intermittent watercourses, and intermittent to ephemeral sloughs and creeks such as the following named watercourses:
 - San Joaquin River
 - Fresno River
 - Chowchilla River
 - Merced River
 - Tuolumne River
 - Ash Slough
 - Berenda Slough
 - Eastside Bypass of the San Joaquin River
 - Deadman Creek
 - Dutchman Creek
 - Dry Creek

5.1.4 Biological Resources: Affected Environment

Special-Status Plant Species

Plant species are considered to be special-status species if they are legally protected under the federal Endangered Species Act (FESA), California Endangered Species Act (CESA), California Native Plant Protection Act, or if they meet the definitions of rare, threatened, or endangered under CEQA Guidelines Sections 15380 and 15125.

Biologists evaluated 61 special-status plant species, including 12 federally and state-listed species, for their potential to occur in the special-status plant study area. The evaluation was based on the species range, the presence of known occurrences in the Central Valley Wye vicinity, and the presence of potential habitat within the special-status plant study area. No habitat is present in the special-status plant study area for eight of the special-status plant species, and they are thus presumed absent. Seven species have low potential to occur due to the special-status plant study area being within their known range, but they have never been found within 10 miles of the Central Valley Wye Special-Status Plant RSA. These seven species are also presumed absent. Eight species have moderate potential to occur. Habitat is present in the special-status plant study area

for these species, but either the special-status plant study area is just outside of the species ranges or only historic occurrences are present within 10 miles. Thirty-eight species have high potential to occur. The special-status plant study area is within the range of these species, there are known occurrences of the species within 10 miles, and habitat for the species is present. The 46 species with moderate to high potential to occur based on the presence of habitat, historic occurrences, or known occurrences within 10 miles.

The plant communities and land cover types identified in the special-status plant study area include agricultural lands, developed areas, natural and seminatural areas, and aquatic areas. Although these species have moderate to high potential to occur in the special-status plant RSA, their likelihood of occurrence is very low in most areas within the RSA because the habitat is fragmented and in most areas has been disturbed by disking, cattle grazing, or other activities.

Although the amount of natural and seminatural habitat is relatively low as a percentage of the overall land cover types, the SR 152 (North) to Road 19 Wye Alternative has more natural and seminatural habitats (4.7 percent of the total), including vernal pools, than the other three alternatives. Thus, there is an overall higher likelihood that special-status plants dependent on these habitat types could occur within the SR 152 (North) to Road 19 Wye Alternative compared to the other three alternatives.

Special-Status Wildlife Species

Wildlife species are considered to be special-status species if they are legally protected under the FESA, CESA, CEQA Guidelines Sections 15380 and 15125, or other state or federal regulation (e.g., Migratory Bird Treaty Act) or are species considered sufficiently rare by the scientific community to qualify for such designation. Based on a background literature review, biologists identified 93 special-status wildlife species as having the potential to occur in the region. Of the 93 special-status wildlife species initially evaluated, 26 species were ruled out based on the lack of suitable habitat, the extensive areas converted by human development, the extensive water diversions, and the local or regional extirpations, or because the habitat study area lies outside of these species' known geographic range. The remaining 64 special-status wildlife species were determined to have a moderate or high potential to occur in the habitat study area.

No protocol-level presence-absence surveys for special-status species were conducted due to limited parcel access. Therefore, presence of 64 special-status wildlife species with moderate or high potential to occur was presumed if potentially suitable habitat was identified within the core habitat study area, based on the vegetation map and land cover type. The presence of special-status wildlife species to occur in a particular habitat is linked to the physical characteristics of the landscape. If suitable habitat was present, it was presumed occupied. The results of the wildlife habitat assessment indicate that 24 vegetation and wildlife habitat types were mapped in the habitat study area, as shown in Appendix H and described in Section 6.1.3. Of the four alternatives, the Avenue 21 to Road 13 Wye Alternative provides the greatest amount of habitat for special-status wildlife due to higher acreages of vernal pools and riparian cover types.

Habitat Linkages and Wildlife Movement Corridors

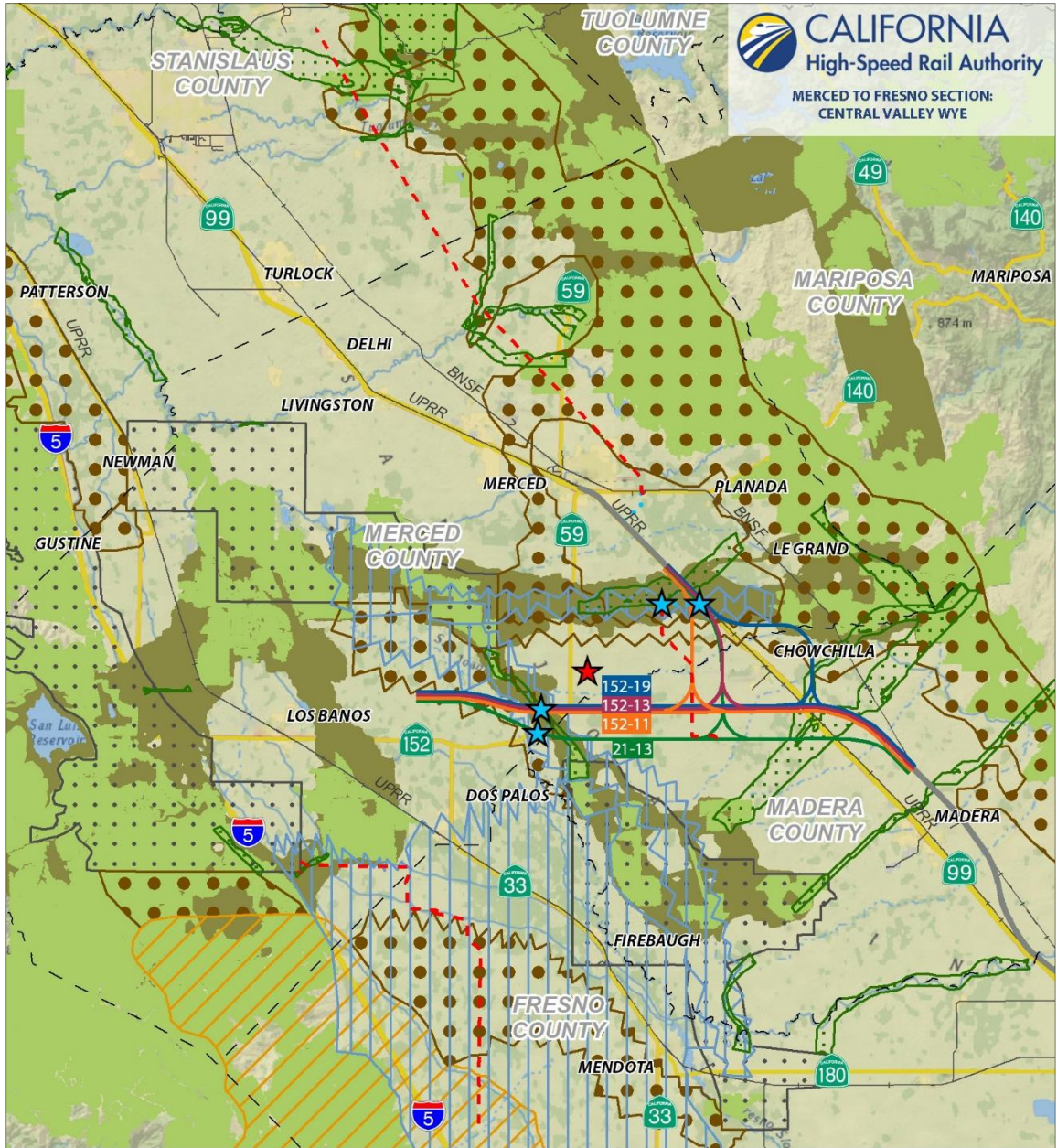
Habitat linkages are planning areas that provide broad connections for wildlife movement between two or more habitat areas. The Central Valley Wye wildlife movement study area intersects the following designated or modeled wildlife movement corridors:

- The Eastman Lake–Bear Creek Essential Connectivity Areas (ECA) identified by the California Essential Habitat Connectivity Project (Spencer et al. 2010), which crosses the Central Valley Wye alternatives as well as the Site 7—Le Grand Junction/Sandy Mush Road, Dutchman Switching Station and 115 kV Tie-Line associated with the SR 152 (North) to Road 19 Wye Alternative along the Deadman Creek and Dutchman Creek corridors.
- The Ash Slough–Merced National Wildlife Refuge ECA identified by Spencer et al. (2010), which is associated with the corridors of the San Joaquin River, Ash Slough, and the Eastside Bypass north and south of SR 152.

- The San Luis Canal-Kesterson National Wildlife Refuge ECA identified by Spencer et al. (2010) continues to be crossed by the Site 6—El Nido, Los Banos—Oro Loma—Canal 70 kV Power Line component, common to all the Central Valley Wye alternatives.
- The “Sandy Mush Road area” as designated in the *Draft Recovery Plan for Upland Species of the San Joaquin Valley, California* (USFWS 1998), which largely follows the Dutchman Creek corridor and Sandy Mush Road across the Central Valley Wye alternatives parallel to SR 99.
- The “Madera—Merced Linkage” as designated in *Missing Linkages: Restoring Connectivity to the California Landscape* (Penrod et al. 2001), which includes the area near Deadman Creek and Dutchman Creek near Sandy Mush Road and Le Grand.
- Additional wildlife corridors near Berenda Slough and the Fresno River channels modeled for the CDFW by the Information Center for the Environment at the University of California, Davis, through evaluation of current land cover and management, road density, urban area density, natural area density, waterway density, and other elements (Huber 2007).

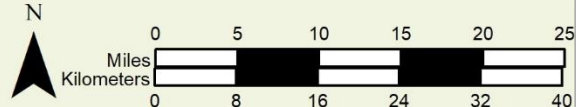
In addition, the Pacific Flyway spans the majority of California and encompasses the Central Valley, including the wildlife movement study area.

Additional details on the planning efforts, chronology, and locations of the previously listed corridors are provided in the Biological Resources and Wetlands Technical Report (Authority and FRA 2016b). Figure 5-2 illustrates the corridors’ locations with respect to the Central Valley Wye alternatives.



LEGEND

- Central Valley Wye Alternatives
- Electrical Interconnection
- Network Upgrade
- Existing Rail Line
- California Essential Habitat Connectivity
- Natural Landscape Blocks
- Essential Connectivity Areas
- San Joaquin Valley Modeled Wildlife Corridors
- San Joaquin Valley Recovery Plan Linkages
- San Joaquin Kit Fox Recovery Areas
- Core Areas
- Linkages
- Satellite Areas



315010064.01.181

Source: Authority and FRA, 2018a; Huber, 2007

FINAL – SEPTEMBER 11, 2017

Figure 5-2 Wildlife Movement Corridors in the Wildlife Movement Study Area



Source: USFWS, 2005, 2015; WES, 2016

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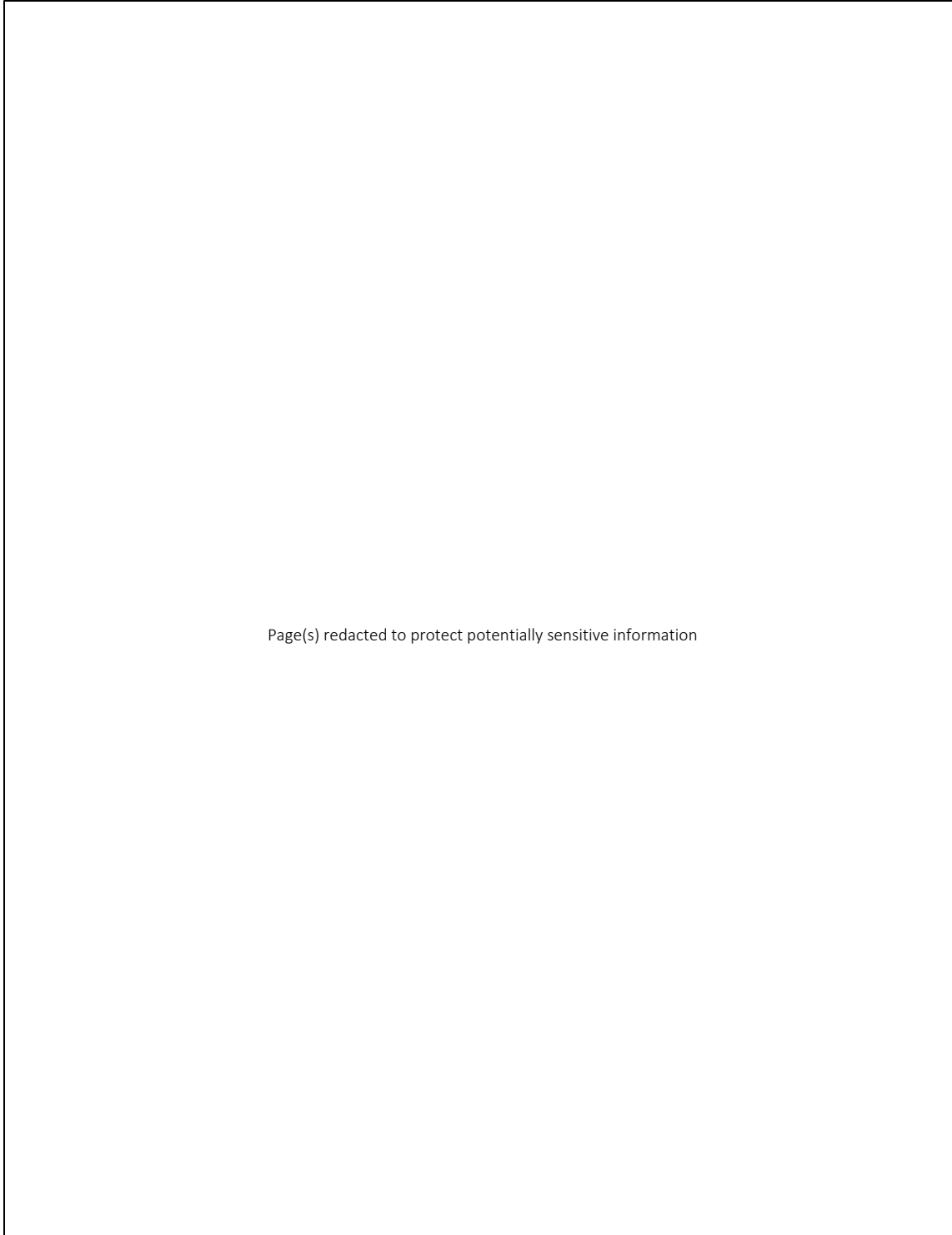
Figure 5-3a Special-Status Plant Communities in the Special-Status Plant Study Area



Source: USFWS, 2005, 2015; WES, 2016

FINAL – SEPTEMBER 2016

Figure 5-3b Special-Status Plant Communities in the Special-Status Plant Study Area



Source: USFWS, 2005, 2015; WES, 2016

FINAL – SEPTEMBER 2016

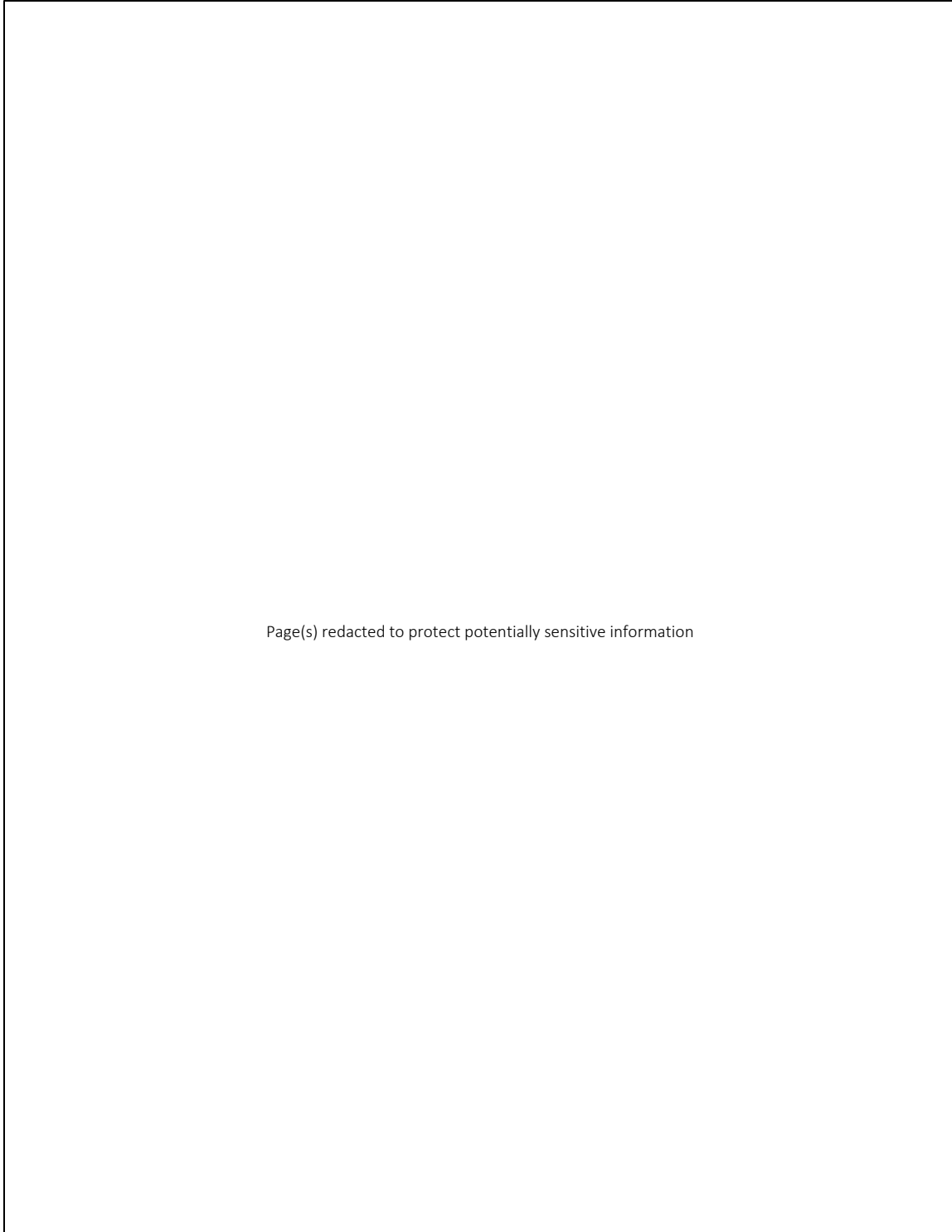
Figure 5-3c Special-Status Plant Communities in the Special-Status Plant Study Area



Source: USFWS, 2005, 2015; WES, 2016

FINAL – SEPTEMBER 2016

Figure 5-3d Special-Status Plant Communities in the Special-Status Plant Study Area



Source: USFWS, 2005, 2015; WES, 2016

FINAL – SEPTEMBER 2016

Figure 5-3e Special-Status Plant Communities in the Special-Status Plant Study Area

Special-Status Plant Communities

Affected Environment

Special-status plant communities identified as potentially occurring in the special-status plant study area based on CNDDDB search results (CDFW 2016a) include mixed riparian, northern claypan vernal pool, valley sacaton grassland, and sycamore alluvial woodland. Botanists conducted field surveys to determine the presence or absence of special-status plant communities. At the time of the preparation of this document, permission to enter had been granted for some properties, but access to most properties had not been granted; consequently, most surveys have not yet been completed. The properties that were surveyed for botanical resources comprise approximately 13 percent of the total acreage of property within and adjacent to the project footprints of the Central Valley Wye alternatives. Riparian, wetland, and vernal pool communities are the only special-status plant communities that were observed during surveys of the special-status plant study area. Other special-status plant communities may be present in areas that were not accessible during the survey. For purposes of this discussion, the term “special-status” reflects terrestrial and aquatic plant communities that have been recognized as significant by the scientific community, represent a rare vegetation type, have limited distribution, or are recognized as rare by CDFW. Table 5-3 shows the land cover types mapped in the special-status plant study area that would be considered special-status plant communities and Figures 5-3a through 5-3e illustrate the location of special-status plant communities within the special-status plant study area in relation to the four alternatives.

Table 5-3 Special-Status Plant Communities Occurring in the Special-Status Plant Study Area of all Central Valley Wye Alternatives

| Land Cover Type | Closest Corresponding Holland (1986) Type | Identified as High Inventory Priority by CDFW |
|-----------------------------|-------------------------------------------|-----------------------------------------------|
| Vernal Pool | Northern Claypan Vernal Pool | Yes |
| Mixed Riparian | Great Valley Mixed Riparian Forest | Yes |
| Other Riparian | Central Coast Arroyo Willow Riparian | Yes |
| Palustrine Forested Wetland | Great Valley Mixed Riparian Forest | Yes |
| Seasonal Wetland | Northern Claypan Vernal Pools | Yes |
| Valley Sink Scrub | Desert Sink Scrub | Yes |

Source: Holland, 1986; CDFG, 2010; CDFW, 2016

Essential Fish Habitat

The National Marine Fisheries Service (NMFS) has designated most waterbodies that were historically accessible to Chinook salmon (*Oncorhynchus tshawytscha*) as essential fish habitat (EFH). EFH has been designated for Chinook salmon in the San Joaquin River up to the boundary of HUC 18040001 at Friant Dam (73 Fed. Reg. 60987–60994).

Although EFH has been designated within the Middle San Joaquin River, surface water is only intermittently present in the Middle San Joaquin River since completion of the Central Valley Project in the late 1940s and early 1950s. The approximately 25-mile-long segment of the river between the Gravelly Ford gauging station and Mendota Pool is commonly without surface water due to diversions and infiltration losses, and conveys surface water only as a result of flood flow releases from Friant Dam. Since 1992, the CDFW has erected a diversion barrier at the Merced River confluence with the Middle San Joaquin River from mid-September to mid-December to stop salmonids from moving up the river above this location (CH2M HILL 2003, 2005). Fish habitat above the Merced River confluence, while potentially suitable for Chinook salmon and Central Valley steelhead, is currently adversely affected by habitat degradation, including altered flow regimes and this managed fish barrier.

As a result of the SJRRP Settlement (SJVRPA 2009) and Public Law 111-11, the NMFS, USFWS, and U.S. Bureau of Reclamation (USBR) have implemented the SJRRP (USBR 2010) with implementation support from the California Department of Water Resources and CDFW. The SJRRP is a comprehensive, long-term effort to restore flows to the San Joaquin River from Friant Dam to the confluence of the Merced River and restore a self-sustaining Chinook salmon fishery in the river while reducing or avoiding adverse water supply impacts from restoration flows. Interim flow releases for water years 2010 through 2012 have been completed for the purpose of data collection (USBR 2010). USBR (2013) analyzed the impacts of flows for 2013 to 2017 in a draft Environmental Assessment. Spring-run Chinook salmon may be reintroduced to the San Joaquin River after the salmon hatchery facility at the CDFW's trout hatchery in Friant (Salmon Conservation and Research Facility) becomes established (USBR 2013). Because EFH in the habitat study area for all four Central Valley Wye alternatives is limited to the San Joaquin River, the only difference among the alternatives is that the Avenue 21 to Road 13 Wye Alternative is located south of the other three. EFH is currently of poor quality in the habitat study area due to the river being dry, sandy substrate, and dominance of nonnative vegetation along the banks.

Critical Habitat

Designated critical habitat for eight species (San Joaquin Orcutt grass, Colusa grass, fleshy owl's clover, Greene's tuctoria, vernal pool fairy shrimp, vernal pool tadpole shrimp, Conservancy fairy shrimp, and Central Valley steelhead) is present within the core habitat study area. Designated critical habitat for vernal pool fairy shrimp, and vernal pool tadpole shrimp is present within the core habitat study area north of Sandy Mush Road. Designated critical habitat for seven other species also occurs in the region, but does not overlap with the study area. In the case of the vernal pool species with designated critical habitat in the core habitat study area, the actual acreage of vernal pools (i.e., the primary constituent elements for these species) is less than the total mapped critical habitat because only a portion of the area designated as critical habitat for vernal pool species are actually vernal pools. An analysis of the land cover mapping data and wetland delineation data conducted for the Central Valley Wye alternatives determined that less than 1 percent of the designated critical habitat areas was delineated as vernal pool habitat and seasonal wetland habitat under all alternatives.

5.2 Other Environmental Resources

5.2.1 Transportation and Traffic

The transportation RSAs are comprised of several types of transportation uses and include major roadways, transit conditions, aviation, emergency and property access, and pedestrian and bicycle access. Boundaries vary for these RSAs. The RSAs for effects on transportation resources includes the project footprint for each of the Central Valley Wye alternatives. The transportation RSAs also include the extent of roadway networks that may experience change in traffic volume of more than 50 peak-hour vehicular trips as well as areas that might be indirectly affected as a result of construction and operation of the Central Valley Wye alternatives.

Affected Environment

This section describes the affected environment for transportation within the Central Valley Wye alternatives RSA, including major roadways, traffic volumes, truck routes and volumes, transit service and facilities, rail service and facilities, and aviation services and facilities, pedestrian and bicycle access, and emergency access and property access.

State Routes

Regional access in the transportation RSA is provided by SR 59, SR 99, SR 132, SR 140, SR 152, and SR 233. Traffic volumes on the state routes are collected and compiled by Caltrans and presented as annual average daily traffic (AADT). AADT is the 24-hour volume at a given location averaged over a 365-day year (the total year volume is often reported as vehicle miles travelled and is used in various transportation planning and traffic engineering methodologies).

Regionally Significant Roadways

The Merced County Association of Governments and the Madera County Transportation Commission have developed a “Regionally Significant Road System” based on the Federal Highway Administration’s functional classification system of streets and highways. City and county general plans also designate important regional roadways. The region contains state routes as well as other important regional roadways that serve as connections to population centers outside of the transportation RSA.

Regional Truck Routes

The Federal Surface Transportation Assistance Act of 1982 defined a system to describe truck routes. The truck routes within the transportation RSA includes the national network (federal) and terminal access (state, local) access routes.

Roadway Segments

The SR 152 (North) to Road 13 Wye, SR 152 (North) to Road 19 Wye, and SR 152 (North) to Road 11 Wye Alternatives road segments in the transportation RSA experience low traffic volumes and all roadway segments operate at Level-of-Service (LOS) LOS A which has a volume-to-capacity ratio of 0.00-0.60. Under these alternatives, the highest traffic volume in the transportation RSA occurs along Los Banos Highway, which at its peak experiences traffic volumes of less than half its capacity. Existing (2015) peak hour conditions of selected roadway segments in the transportation RSA for the Avenue 21 to Road 13 Wye Alternative has even lower traffic volumes, with the busiest roadways experiencing traffic volumes of less than 10 percent of their existing capacity, and all roadway segments operating at LOS A.

Transit Conditions

Existing transit services that serve the populations within the transportation RSA include aviation, passenger, and bus services.

Freight Rail

Freight rail is an integral part of the economy and transportation system of the transportation RSA. BNSF and UPRR provide freight movement in and through Merced, Madera, Fresno, and Stanislaus Counties on a daily basis (approximately 20-25 trains per day). Several industrial/manufacturing and agricultural companies within the two counties use rail freight service. The largest of these rail freight service users are located in the cities of Merced, Atwater, and Los Banos.

BNSF is also the primary owner of the railroad right-of-way used by the Amtrak San Joaquin Route. The railroad owns a 276-mile section of the San Joaquin Corridor from Bakersfield to Port Chicago.

Pedestrian and Bicycle Facilities

Pedestrian and bicycle access in the transportation RSA are mostly located in the urbanized areas within the RSA including the cities of Chowchilla, Merced, and Waterford; as well as the community of Fairmead. Pedestrian facilities in the cities of Chowchilla and Merced include sidewalks, crosswalks, and pedestrian signals, while bicycle facilities include Class I bike paths, Class II bike lanes and Class III bike routes. The community of Fairmead has limited pedestrian and bicycle facilities, however the low traffic volumes in the community is conducive to bicycling. There are no designated bike routes within the RSA within the city of Waterford (City of Waterford, n.d.).

5.2.2 Noise and Vibration

The RSA for noise and vibration includes and extends beyond the project footprint for each of the Central Valley Wye alternatives. Separate RSAs are defined for noise effects and vibration effects. The noise RSA extends 2,500 feet from the Central Valley Wye alternatives’ centerlines and includes all sensitive receivers that could potentially be exposed to noise effects. The

vibration RSA screening distance is up to 275 feet from the proposed track centerline for each alternative alignment, depending on the land use and train frequency.

Affected Environment

Land Uses and Noise Levels

The Central Valley Wye alternatives extend through various noise-sensitive land-use areas in unincorporated Merced and Madera Counties, the city of Chowchilla, and the community of Fairmead, terminating just north of Madera Acres. The Central Valley Wye alternatives would be located adjacent to Henry Miller Road and either SR 152 or Avenue 21 in the east-west direction; adjacent to Road 11, Road 13 or Road 19 in the north-south direction; and then would curve north toward the UPRR/SR 99 corridor and south toward the BNSF corridor. Adjacent land uses consist primarily of agriculture, undeveloped land, and institutional areas. Noise-sensitive receivers in the noise and vibration RSAs include those identified as sensitive to increased noise or vibration levels that are within the screening distances. The noise-sensitive receivers that fall within the screening distances are nearly all single-family residences, though there are also three schools (Fairmead Elementary, Fairmead Head Start, and Chowchilla Seventh-Day Adventist School), the Chowchilla Seventh-Day Adventist Church, and a portion of the Chowchilla Cemetery.

Existing Noise Levels by Alternative

The noise RSA segments for the SR 152 (North) to Road 13 Wye Alternative is predominantly rural agricultural, with scattered rural residential and commercial buildings along SR 152, a cemetery, and several small private airstrips. The rural residential community of Fairmead and its surrounding land uses of low-density single-family residences and several community facilities also occur in the noise RSA for this alternative. Ambient noise sources include traffic on SR 152, SR 99, Road 13, Avenue 23, and Maple Street in Fairmead; trains on the UPRR and BNSF, small aircraft, and agricultural activities. In the vicinity of the Site 7—Wilson, Wilson Substation, industrial uses are located to the east, west, and south and the 230 kV Tie-Line, SR 99 represents the dominant noise source due to the volume and speed of vehicles along the highway. Day-night sound level (L_{dn}) for this alternative ranges from 51 to 73 dBA.

The SR 152 (North) to Road 19 Wye Alternative noise RSA segments are similar to the SR 152 (North) Road 13 Wye Alternative and include rural agricultural and scattered rural residences. Ambient noise sources include vehicular traffic along Avenue 26, SR 99, and trains on UPRR, and agricultural activities. Existing land uses associated with Site 6—El Nido and Site 7—Le Grand Junction/Sandy Mush Road predominately include agricultural uses with rural single-family residences. Ambient noise sources are generally limited to local roadway traffic and agricultural operations. L_{dn} for this alternative ranges from 41 to 73 dBA.

The noise RSA segments for the Avenue 21 to Road 13 Wye Alternative are mostly rural agricultural, with scattered rural residences, and one small private airstrip. A private elementary school and church are located along Road 13 and the Fossil Discovery Center of Madera County is located along Avenue 21 1/2 within the noise RSA. The ambient noise sources include traffic on Avenue 21 as well as the ambient noise sources identified for the SR 152 (North) to Road 13 Wye Alternative. The Electrical Interconnections and Network Upgrade Sites 6-El Nido and Site 7-Wilson are the same as described for the SR 152 (North) to Road 13 Wye Alternative. L_{dn} for this alternative ranges from 49 to 73 dBA.

The SR 152 (North) to Road 11 Wye Alternative noise RSA segments are similar to the SR 152 (North) to Road 13 Wye Alternative and include rural agricultural, scattered rural residences, commercial buildings, a cemetery, and several small private airstrips. The ambient noise sources include traffic on Road 11 as well as the ambient noise sources identified for the SR 152 (North) to Road 13 Wye Alternative. The Electrical Interconnections and Network Upgrade Sites 6-El Nido and Site 7-Wilson are the same as described for the SR 152 (North) to Road 13 Wye Alternative. L_{dn} for this alternative ranges from 51 to 73 dBA.

Existing Vibration Levels

Existing vibration sources within the vibration RSA for all of the Central Valley Wye alternatives are primarily train operations near the City of Chowchilla. Trains traveling within the vibration RSA include freight services operated by UPRR and BNSF, and Amtrak passenger trains.

5.2.3 Agricultural Lands

The RSA for impacts on agricultural farmland encompasses the areas where direct and indirect impacts could result in conversion of Important Farmland to a nonagricultural use. Direct impacts include temporary use and permanent conversion of Important Farmland and would be confined to the project footprint, including associated electrical interconnection and network upgrades (EINU), where construction and operations of the Central Valley Wye alternatives would occur. Indirect impacts could increase the amount of Important Farmland conversion beyond that needed for use within the project footprint, such as severance of Important Farmland parcels and effects of HSR-generated wind on insect pollination or aerial pesticide applications. Therefore, the RSA comprises the project footprint for each of the Central Valley Wye alternatives and additional areas beyond the project footprint where potential conversion of Important Farmland could occur.

Affected Environment

Regional Agriculture

According to a report from the American Farmland Trust, more than 161,000 acres of land were converted to urban uses in the San Joaquin Valley between 1990 and 2008 as a result of population and development pressures (American Farmland Trust 2013). Of this land, 78 percent was agricultural land, and 61 percent was high-quality farmland (defined in the report as Farmland Mapping and Monitoring Program Prime Farmland, Unique Farmland, and Farmland of Statewide Importance).

Important Farmland

Despite a gain in some Important Farmland categories between 2008 and 2014, Merced County experienced a net loss of more than 1,500 acres of agricultural land, Madera County lost more than 2,800 acres, Fresno County lost more than 9,099 acres, and Stanislaus County gained more than 18,500 acres (DOC 2008, 2014, 2016a, 2016b). In the same time period, Merced County and Madera County lost nearly 12,900 acres and nearly 9,600 acres of Grazing Land, respectively. Although Grazing Land is not classified as Important Farmland, changes in the amount of Grazing Land, especially in areas where other types of agricultural land are also undergoing change, can be indicative of the development pressure in the area (DOC 2016c). However, changes in Grazing Land are not used as a primary indicator of developmental pressure because in some cases, with the planting of crops or irrigation of the site, Grazing Land is converted to Important Farmland.

Lands under Williamson Act and Farmland Security Zone Contracts, Local Agricultural Zoning and Conservation Easements

Williamson Act and Farmland Security Zone (FSZ) contracts occur in each county crossed by the Central Valley Wye alternatives. In Merced County, the amount of agricultural land under contract increased by approximately 10,000 acres between 2010 and 2014, and in Madera County the amount of contracted agricultural land decreased by approximately 2,000 acres in the same time period (DOC 2010, 2014). In Fresno County, agricultural land under contract decreased by approximately 30 acres between 2010 and 2013, and in Stanislaus County by approximately 6,500 acres over the same time period (DOC 2013, 2015).

5.2.4 Parks, Recreation, and Open Space

The RSA for direct and indirect effects on parks, recreational facilities, and open space includes the project footprint for each of the Central Valley Wye alternatives, plus 1,000 feet from the proposed track centerline and 1,000 feet from any roadway construction or new/modified electrical infrastructure required to implement the Central Valley Wye alternatives.

Affected Environment

Open-Space Corridors

Berenda Slough and Ash Slough are soft-bottom water diversion facilities designated as open space under the *Chowchilla 2040 General Plan* (City of Chowchilla 2011). The sloughs receive water from the Chowchilla River that is then transported to irrigation networks within the agricultural areas south and west of the city of Chowchilla. Currently, neither slough serves a recreational purpose and they are both dry at different times of the year. The Berenda Reservoir, approximately 1.7 miles east of the parks, recreation, and open space RSA, has several recreational uses, including picnic areas, boating, and swimming, that would be served by the planned trail developments along Berenda and Ash Sloughs. The SR 152 (North) to Road 13 Wye Alternative, SR 152 (North) to Road 19 Wye Alternative, and the SR 152 (North) to Road 11 Wye Alternative are located within 1,000 feet of Berenda and Ash Sloughs. Ash Slough is also located within the RSA for the Avenue 21 to Road 13 Wye Alternative, but Berenda Slough is outside the RSA for that alternative. Additionally, the Site 7—Le Grand Junction/Sandy Mush Road, Wilson—Dairyland (idle) 115 kV Power Line alignment associated with the SR 152 (North) to Road 19 Wye Alternative, currently spans Ash Slough.

School District Play Areas and Recreation Facilities

Fairmead Elementary School, at the northeast corner of Maple Street and Avenue 22 3/4, is within the Chowchilla Elementary School District. The school's play areas consist of a centralized playground, a paved recreation area, two basketball courts, and a grassy open space. The centralized playground and paved area are fenced and not accessible outside of school hours; however, the two basketball courts and grassy field are available for public use outside of school hours and on weekends. The public portions of the Fairmead Elementary School would be located within 630 feet of the project footprint of the SR 152 (North) to Road 19 Wye Alternative and within 700 feet of the project footprints of the SR 152 (North) to Road 13 Wye and SR 152 (North) to Road 11 Wye alternatives. Fairmead Elementary School is not within the RSA for the Avenue 21 to Road 13 Wye Alternative.

Washington Elementary School is located at 4402 W. Oakdale Road in Winton, California and facilities include a soccer/football field and two baseball diamonds. The SR 152 (North) to Road 19 Wye Alternative, specifically a structure work area associated with the Site 7—Le Grand Junction/Sandy Mush Road, Warnerville—Wilson 230 kV Transmission Line, would be located approximately 450 feet from the outdoor field areas of the Washington Elementary School. Washington Elementary School is not within the RSA for SR 152 (North) to Road 13 Wye Alternative, Avenue 21 to Road 13 Wye Alternative, or SR 152 (North) to Road 11 Wye Alternative.

El Capitan High School is located at 100 Farmland Avenue in Merced, California and recreation facilities include basketball, volleyball, and tennis courts, a swimming pool, soccer and baseball fields, and track and field amenities. The SR 152 (North) to Road 19 Wye Alternative, specifically a structure work area associated with the Site 7—Le Grand Junction/Sandy Mush Road, Warnerville—Wilson 230 kV Transmission Line, would be located approximately 200 feet from the baseball field of the El Capitan High School. El Capitan High School is not within the RSA for SR 152 (North) to Road 13 Wye, Avenue 21 to Road 13 Wye, or SR 152 (North) to Road 11 Wye alternatives.

Richard Bernasconi Neighborhood Park is located at 3770 De Soto Way in Merced, CA and includes a playground, baseball fields, basketball courts, and picnic tables. The SR 152 (North) to Road 19 Wye Alternative, specifically two structure work areas, a pull and tension site, and helicopter landing zone associated with the Site 7—Le Grand Junction/Sandy Mush Road, Warnerville—Wilson 230 kV Transmission Line, would be located approximately 860, 900, 840 and 600 feet, respectively from the Richard Bernasconi Neighborhood Park facilities. Richard Bernasconi Neighborhood Park is not within the RSA for SR 152 (North) to Road 13 Wye, Avenue 21 to Road 13 Wye, or SR 152 (North) to Road 11 Wye alternatives.

5.2.5 Aesthetics and Visual Resources

The RSA for aesthetics and visual resources is the Central Valley Wye viewshed (i.e., the area that potentially could have views of Central Valley Wye features, and the area potentially viewed from the Central Valley Wye). The Central Valley Wye alternatives are on mostly flat terrain comprised predominantly of agricultural and rural residential areas.

Affected Environment

Existing Visual Resources

Visual resources include locally designated scenic routes, views toward or within natural areas, typical views from residential areas, and long views across the landscape that are evocative of the natural environment of the greater San Joaquin Valley. In general, the Central Valley Wye alternatives pass through the following regional landscapes: (1) Rural San Joaquin Valley; (2) San Joaquin River, Chowchilla River, Ash Slough, and Berenda Slough; (3) Robertson Boulevard (SR 233).

Viewer Groups and Existing Viewer Sensitivity

Viewer groups within the RSA consist of roadway/highway/future HSR passengers (travelers), agricultural workers, park and trail users (recreationists), and residents. The Federal Highway Administration method recognizes viewer activity and awareness, local values, and cultural significance as key factors in predicting viewer sensitivity. Sensitivity to visual change varies among viewer groups. The majority of viewers in the aesthetics and visual resources RSA are travelers on either SR 99 or SR 152. While their numbers are large, their sensitivity is generally low to moderate. Away from the major highways, the viewers are primarily agricultural workers. The viewers with the greatest sensitivity are residents observing changes in the visual environment around their homes. These viewers have the highest viewer response to changes in the visual and aesthetic environment.

Landscape Units and Key Viewpoints

Key viewpoints capture specific views that provide examples of visual character. The RSA is divided into five landscape units, each containing a specific visual character. (1) San Joaquin River landscape unit; (2) Rural Agricultural landscape unit; (3) Freeway and Expressway landscape unit; (4) Robertson Boulevard landscape unit; and (5) Fairmead landscape unit. None of the Central Valley Wye alternatives pass through all key viewpoints.

San Joaquin River Landscape Unit

The SR 152 (North) to Road 13 Wye Alternative begins west of the San Joaquin River, near the intersection of Henry Miller Road and Carlucci Road. The San Joaquin River landscape unit is sparsely developed, except for agricultural uses. The primary viewer group is agricultural workers. The agricultural workplace is out in the landscape, but workers focus on the tasks of, driving, selecting crops, assembling irrigation equipment, or other work. Therefore, their sensitivity to the surrounding landscape is moderate. Their exposure is low, as most workers do not remain in one location consistently and their activities are spread across the landscape unit. Overall, this viewer group would have a moderately low viewer response to changes in visual character.

The San Joaquin River landscape unit within the SR 152 (North) to Road 19 Wye Alternative is very sparsely developed, except for agricultural uses. The few homes and agricultural buildings stand out more from the landscape, as blocks, due to the sparse development pattern. The SR 152 (North) to Road 19 Wye Alternative would pass through the same area of the San Joaquin River landscape unit as described for the SR 152 (North) to Road 13 Wye Alternative.

The Avenue 21 to Road 13 Wye Alternative begins west of the San Joaquin River, near the intersection of Henry Miller Road and Carlucci Road. The Rural Agricultural landscape unit for this alternative is primarily agricultural with scattered individual residences and agricultural buildings. The primary viewer group is agricultural workers with low exposure and moderate

sensitivity. Overall, this viewer group is anticipated to have a moderately low viewer response to changes in visual character.

The SR 152 (North) to Road 11 Wye Alternative would pass through the same area of the San Joaquin River landscape unit as the SR 152 (North) to Road 13 Wye Alternative. The Rural Agricultural landscape unit for this alternative is primarily agricultural with scattered individual residences and agricultural buildings. The primary viewer group is agricultural workers. The sensitivity of this viewer group to the surrounding landscape is moderate. Their exposure is low, as most workers do not remain in one location consistently and their activities are spread across the landscape unit. Overall, this viewer group is anticipated to have a moderately low viewer response to changes in visual character.

Rural Agricultural Landscape Unit

The Rural Agricultural landscape unit within the SR 152 (North) to Road 13 Wye Alternative is primarily agricultural with scattered individual residences and agricultural buildings. While agricultural uses vary, from low-lying row crops to view-confining orchards, the mix of agricultural development is characterized as a single landscape unit.

The viewer groups, exposures, and responses for the Rural Agricultural landscape unit would be the same for the SR 152 (North) to Road 19 Wye Alternative as for the SR 152 (North) to Road 13 Wye Alternative.

The Rural Agricultural landscape unit within the Avenue 21 to Road 13 Wye Alternative is primarily agricultural with scattered individual residences and agricultural buildings. The primary viewer group is agricultural workers, either working in the fields and orchards or driving through the area. Vividness is moderate, with the waterway crossing and tall trees in the distance providing landmarks distinguishing this location from others along Avenue 21. As with other locations in the Rural Agricultural landscape unit, viewers are mostly agricultural workers with a moderately low viewer response to changes in visual character.

The Rural Agricultural landscape unit within the SR 152 (North) to Road 11 Wye Alternative is primarily agricultural with scattered individual residences and agricultural buildings. The SR 152 (North) to Road 11 Wye Alternative passes through a similar mix of agricultural uses to those that the SR 152 (North) to Road 13 Wye Alternative encounters. The variation between the two alternatives comes with the mix of uses, but each include low-lying crops and orchards, providing common visual resources. Overall, visual quality of the landscape unit is moderate. Overall visual quality is moderately high. Because the road is lightly traveled, viewer exposure is low. The primary viewers are travelers and agricultural workers, with moderate viewer sensitivity.

The Rural Agricultural landscape unit descriptions adequately portray the existing visual conditions associated with the various components of Site 6 – El Nido and Site 7 – Le Grand Junction/Sandy Mush Road, with the exception of the southernmost 2.3 miles of the existing, Warnerville – Wilson 230 kV Transmission Line.

Freeway and Expressway Landscape Unit

The Freeway and Expressway landscape unit within the SR 152 (North) to Road 13 Wye Alternative includes SR 99 and SR 152 and the Chowchilla Canal. Viewers are travelers on highways, either drivers or passengers and their visual sensitivity is low to moderately low. Overall, viewers in the traveler viewer group are anticipated to have a low viewer response to changes in visual character.

Viewers in the Freeway and Expressway landscape unit within the SR 152 (North) to Road 19 Wye Alternative are travelers on highways, either drivers or passengers. Their visual sensitivity is low to moderately low; while exposure to views is also low as traffic moves fast through the area. Overall, viewers in the traveler viewer group are anticipated to have a low viewer response to changes in visual character.

SR 99 is the primary north-south corridor in the eastern San Joaquin Valley in the Avenue 21 to Road 13 Wye Alternative. In views from SR 99 when skies are clear, the Sierra Nevada range is

often visible to the east. The existing UPRR tracks and SR 99 are part of an existing, wider transportation corridor through the San Joaquin Valley. Viewers in the Freeway and Expressway landscape unit are travelers on highways, either drivers or passengers. Their visual sensitivity is low to moderately low; drivers are focused on the highway, with few distractions from the passing agricultural views. There would be a relatively large number of viewers from this viewpoint, but viewer sensitivity and exposure would be low because views would be from vehicles traveling at highway speeds, resulting in a low viewer response to changes in visual character.

The Freeway and Expressway landscape unit descriptions adequately portray the existing visual conditions associated with the Site 7 – Wilson, Wilson Substation and 230 kV Tie-Line and the southernmost 2.3 miles of the existing Site 7 – Le Grand Junction/Sandy Mush Road, Warnerville – Wilson 230 kV Transmission Line located in or adjacent to the City of Merced and SR 99.

Robertson Boulevard Landscape Unit

The Robertson Boulevard landscape unit within the SR 152 (North) to Road 13 Wye Alternative encompasses Robertson Boulevard and its flanking historic landscape of ornamental palm trees. There is an existing gap in the tree row along Robertson Boulevard approximately 1,700 feet in length, which is the result of removal of palm trees to accommodate construction of the SR 152 interchange. From SR 152 north, the road becomes SR 233 and serves as the primary western entrance to the city of Chowchilla. Travelers along the road are the main viewer group for the Robertson Boulevard landscape unit because of the prominence of the palms lining the roadway. Many homes have views to the boulevard obscured by mature landscaping, making their exposure moderate, resulting in an overall moderately high viewer response.

The SR 152 (North) to Road 19 Wye Alternative and would pass through the same area of the Robertson Boulevard landscape unit as described for the SR 152 (North) to Road 13 Wye Alternative.

The Avenue 21 to Road 13 Wye Alternative would pass through Robertson Boulevard and its flanking historic landscape of ornamental palm trees. From SR 152 north, the road becomes SR 233 and serves as the primary western entrance to the city of Chowchilla. South of SR 152, Robertson Boulevard is less travelled, but lined with the same procession of palms. There are fewer residences south of SR 152. The palm-lined roadway remains highly vivid in this location. The trees are mature and stretch mostly uninterrupted. The Robertson Boulevard Tree Row is eligible for the National Register of Historic Places under Criterion A for its association with the initial establishment of Chowchilla (the trees were planted to beautify Chowchilla's main street and draw settlers into the community), and under Criterion C as an exceptional example of an early 20th century designed landscape along a roadway. The Robertson Boulevard Tree Row is significant at the local level, with a period of significance of 1912–1913.

The SR 152 (North) to Road 11 Wye Alternative would pass through the same area of the Robertson Boulevard landscape unit as described for the SR 152 (North) to Road 19 Wye Alternative.

Fairmead Landscape Unit

The Fairmead landscape unit within the SR 152 (North) to Road 13 Wye Alternative includes residents with a high viewer sensitivity because their views are of extended duration, and residents have a high level of concern for the quality of their day-to-day living environment. Exposure to views from residences in the Fairmead area is potentially high, due to the limited landscaping in most areas. These near-foreground viewpoints comprise the set of locations of this type that are of potential concern, with high viewer sensitivity and high viewer exposure.

The SR 152 (North) to Road 19 Wye Alternative would pass through the same areas of the Freeway and Expressway, Robertson Boulevard, and Fairmead landscape units.

The Robertson Boulevard landscape unit within the Avenue 21 to Road 13 Wye Alternative encompasses Robertson Boulevard and its flanking historic landscape of ornamental palm trees. Travelers along the road are the main viewer group, with a moderately high viewer response, because of the prominence of the palms lining the straight roadway. Residents also make up a

secondary viewer group, more so north of SR 152 where homes are closer together in a linear neighborhood. These residents have a moderately high viewer response because of their moderate visual exposure to the neighborhood along the roadway and high sensitivity to views around their homes.

The SR 152 (North) to Road 11 Wye Alternative would pass through the same area of the of the Fairmead landscape unit as described for the SR 152 (North) to Road 13 Wye Alternative.

5.2.6 Cultural Resources

RSAs are the geographic boundaries in which the environmental investigations specific to each resource topic were conducted. An area of potential effects (APE) is the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist (36 C.F.R. § 800.13(d)). The two distinct APEs are the archaeological and historic architectural APEs.

Affected Environment

Prehistoric and Historic Archaeological Sites in the Areas of Potential Effect

The archaeology of the San Joaquin Valley is as varied as the area is extensive, encompassing a full range of hunter-gatherer adaptations from the earliest, technologically conservative, low-density colonizers to the most recent, technologically elaborate, and densely packed populations that were present at historic contact (Rosenthal et al. 2007:147). Historic archaeological sites in California are locations where human activities were carried out during the historic period, generally defined as beginning with European contact in the mid-18th century and ending approximately 50 years ago. Based on the pedestrian field survey encompassing 21 percent of the 10,586 acres in the combined archaeological and expanded APE, and the records search results from the Southern San Joaquin Information Center and the Central California Information Center, archaeologists identified one prehistoric site assumed to be eligible for the National Register of Historic Places within the archaeological APE of the Central Valley Wye alternatives. In addition, two historic-era sites were identified within the archaeological APE, both of which are exempt per Programmatic Agreement Attachment D.

Historic Architectural Resources in the Area of Potential Effect

The historic architectural resources inventoried and evaluated for the Central Valley Wye alternatives reflect the major historic events and trends that occurred within the APE, including rural areas of Merced and Madera Counties. The most common historic architectural property types in the APE are residential farm complexes that date from the mid-1940s to the early 1960s. For more detail on the historic architectural framework, refer to the Central Valley Wye alternatives HASR (Authority and FRA 2016b).

5.2.7 Environmental Justice

The reference community for the environmental justice analysis is the two-county region of Merced and Madera Counties.⁷ This area represents the general population that could be affected adversely and beneficially by the Central Valley Wye alternatives, and is presented throughout this analysis to provide context and allow for comparison and contrast between communities within the RSA and the surrounding areas. The RSA for direct effects on low-income and minority populations is defined as census block groups partially or fully within 0.5 mile from the boundary of the Central Valley Wye alternatives' project footprints and support facilities. Potentially affected communities within the RSA are Chowchilla and the unincorporated communities of Fairmead and Madera Acres. Due to the rural nature of the Central Valley and the low population density in the project vicinity, census block groups within the RSA are large and

⁷ Implementation of electrical interconnections and network upgrades (EINU) components throughout portions of Merced, Madera, Fresno, and Stanislaus Counties would not result in substantial and disproportionate impacts on low-income and/or minority populations and, therefore, are not discussed further.

can extend for miles beyond the project footprints of the Central Valley Wye alternatives. Consequently, the population within the RSA includes a larger population than would likely be affected by the Central Valley Wye alternatives.

Affected Environment

Table 5-4 shows demographic information for the reference community, consisting of Merced and Madera Counties and encompassing 4,125 square miles. Merced County is the largest reference community in the RSA, containing approximately 63 percent of the reference community's population and households. Overall, the RSA is composed almost entirely of low-income and minority populations. Non-low-income and non-minority populations are located east of SR 99 in the vicinity of Chowchilla.

Table 5-4 Reference Community Demographic Characteristics (2014)

| Characteristics | Merced County | Madera County | California |
|--------------------------------------------|---------------|---------------|------------|
| Size (square miles) | 1,972 | 2,153 | 163,696 |
| Total Population | 261,609 | 152,452 | 38,066,920 |
| Total Households | 76,516 | 42,723 | 12,617,280 |
| Percent Low-Income Individuals | 26 | 23 | 16 |
| Median Household Income | \$43,100 | \$45,500 | \$61,500 |
| Percent Minority | 69 | 63 | 61 |
| Percent Linguistically Isolated Households | 13 | 9 | 10 |
| Percent Over 65 | 10 | 12 | 12 |
| Percent Unemployed | 18 | 10 | 11 |

Source: U.S. Census Bureau ACS 2010-2014a, 2010-2014b, 2010-2014c, 2010-2014d, 2010-2014e, 2010-2014f, 2010-2014g

Low-Income Populations

Overall, 25 percent of the reference community consists of low-income individuals. This percentage is substantially higher than that of the state of California as a whole, where low-income individuals make up 16 percent of the total population. Merced County (26 percent) has a higher percentage of low-income individuals than Madera County (23 percent). Approximately 22 percent of individuals within the environmental justice RSA are low income. Compared to the reference community, the environmental justice RSA has a slightly lower percentage of low-income individuals (22 percent low-income). Of the communities within the RSA, the community of Fairmead and Chowchilla—with 39 and 30 percent of individuals living below the poverty level—would be considered low-income populations. Fairmead exceeds both criteria for low-income populations, as it contains more than 25 percent low-income persons and has a percentage of low-income persons more than 10 percent greater than the reference community average of 24 percent.

Minority Populations

The reference community has a large minority population, where 67 percent of the total population identifies as minority. Hispanics are the predominant minority within the reference community, with approximately 56 percent of the population identifying as Hispanic or Latino. Approximately 63 percent of the environmental justice RSA's population is composed of minority individuals, which is comparable to that of the reference community (67 percent). Throughout most of the RSA, the Hispanic or Latino population alone accounts for over half the total population (51 percent). Fairmead and Madera Acres have the highest percentages of minority group representation, with 80 percent and 70 percent of their populations self-identifying as minority, respectively. Chowchilla notably has the largest African-American population in the RSA, at 12 percent of the population.

Other Underserved Populations

Linguistically isolated households, elderly populations, and the unemployed may have require special relocation needs. Approximately 10 percent of households in the reference community were linguistically isolated, 11 percent of the reference community were elderly, and 12 percent of the reference community population was unemployed as of the last census (U.S. Census Bureau ACS 2010-2014a, 2010-2014d, 2010-2014f). These rates of sensitive populations within the reference community were comparable to those of California.

Migrant workers are predominantly low-income and minority populations and are defined as farm workers whose employment requires travel, preventing them from returning to a permanent residence every day. According to the most recent National Agricultural Workers Survey, from 2007 to 2009, nationwide, 72 percent of farm workers were foreign-born, and 23 percent of all farm workers had family incomes below federal poverty guidelines (Carroll et al. 2011). In addition, the proportion of unauthorized farm workers in the United States increased, from 7 percent in 1989 to 37 percent in 1994–1995, peaking at 55 percent in 1999–2000 (CRS 2009). The National Center for Farmworker Health estimated that in 2012 Merced County had 20,398 crop production workers and Madera County had 24,175 crop production workers (National Center for Farmworker Health 2015).⁸

⁸ Crop production workers include both migrant workers and seasonal farm workers.

6 COMPARATIVE ANALYSIS OF EFFECTS ON OTHER ENVIRONMENTAL RESOURCES FOR CENTRAL VALLEY WYE ALTERNATIVES

This chapter provides comparative analyses of effects on biological resources including special-status plant species, special-status wildlife species, wildlife corridors, and critical habitat. It also includes comparative analyses of other differentiating effects related to non-biological resources, including noise and vibration, agricultural lands, cultural resources, and environmental justice. Effects are described both in terms of direct and indirect effects for biological resources and in terms of *construction* and *operational* effects for non-biological resources.

Construction period and project period effects for non-biological resources are generally defined as follows:

- **Construction Effects:** Permanent (short-term and long-term) and temporary effects associated with the construction of the HSR infrastructure. The construction period includes testing of the HSR System before passenger service begins.
- **Operations Effects:** Permanent effects related to the operations and maintenance of the HSR System. Project operations include HSR System operations and related project improvements, such as roadway modifications, maintenance of power supply components, and maintenance of the HSR. Some permanent effects initially occur during construction, but because they are permanent, they are associated with the project effects (e.g., conversion of agricultural lands to transportation uses). Note, there would be no change in the operations and maintenance activities associated with the existing PG&E facilities from baseline conditions; therefore no effect would occur.

6.1 Biological Resources

This section provides an overview of effects on special-status plant communities, special-status plant species, special-status wildlife species, habitat linkages and wildlife movement corridors, and habitats of concern. Figure 16.1 (Impact Evaluation Schematics) in Chapter 16 provides diagrams representing direct, indirect, and indirect-bisected impact categories.

6.1.1 Special-Status Plant Communities

A list of special-status plant communities known or potentially occurring in the Special-Status Plant RSA was generated based on a review of present plant communities. The following data sources were used:

- A detailed land cover and wetland delineation map was created based upon the National Agriculture Imagery Program imagery using ArcGIS 10 software using a mapping scale of 1 inch = 200 feet. A minimum mapping unit of 1.0 acre was used for wetland complexes, and a minimum mapping unit of 0.25 acre was used for standalone wetlands. A minimum mapping unit of 10 acres was used for all other land cover types, with the smaller unit used when discrete boundary and types could be discerned. Natural and constructed watercourses were mapped as line features, attributed with their approximate average width. Features wider than 40 feet were mapped as polygons. Jurisdictional area boundaries along water features were mapped to the landward drip line for mixed riparian, other riparian, and palustrine forested wetlands.
- The *List of Vegetation Alliances and Associations* for California (CDFG 2010), which indicates whether natural communities are of special status, given the current state of the California classification
- CNDDDB query for special-status natural communities occurring within 10 miles of the Central Valley Wye alternative centerlines (CDFW 2016a).

Direct Construction Effects

All of the Central Valley Wye alternatives require disruption of plants and permanent removal of vegetation within the HSR right-of-way; however, adjacent vegetation requiring removal to accommodate construction activities (i.e., access and laydown area) would be restored after construction activities are completed. Construction activities associated with the Central Valley Wye alternatives would require delineation of environmentally sensitive areas or environmentally restricted areas on final construction plans and in the field (BIO-IAMF#8). The design of the Central Valley Wye alternatives would minimize the impacts of removing vegetation for construction.

The properties that were surveyed for botanical resources comprise approximately 13 percent of the total acreage of property within and adjacent to the project footprints of the Central Valley Wye alternatives. Accordingly, not all special-status plant communities that exist on private properties were surveyed throughout the special-status plant RSA because of limited property access. However, all special-status plant communities were mapped using information collected from surveys or through analysis of remotely collected data, and whether properties were surveyed or not has no bearing on whether or not they are affected. Consequently, these plant communities could be permanently affected by the construction of the Central Valley Wye alternatives, resulting in direct construction impacts where such communities are present and impacts cannot be avoided. The features of the Central Valley Wye alternatives could collectively contribute to the alteration of special-status plant communities.

Direct Operations Effects

All of the Central Valley Wye alternatives would include periodic removal of vegetation and disturbance (i.e., trampling or crushing) of plants due to maintenance activities. The Authority would require maintenance personnel to attend a WEAP training and certify that they understand the regulatory agency requirements and procedures necessary to protect biological resources (BIO-IAMF#4). Therefore, the design of the Central Valley Wye alternatives would minimize the impacts of trampling and crushing of special-status plant communities because maintenance personnel would be aware of their presence in the vicinity.

Indirect Construction Effects

Indirect effects on special-status plant communities outside the project footprint could include degradation of habitat resulting from construction equipment leaks; construction dust resulting in a reduction in photosynthetic capability (especially during flowering periods); and an increased risk of fire (e.g., construction equipment use and smoking by construction workers) in adjacent open spaces. Dust generated during construction would not be expected to significantly contribute to violations of air quality standards for particulate matter with a diameter of 10 microns or less, or particulate matter with a diameter of 2.5 microns or less, which are designed to protect the public welfare from harm to crops and vegetation. However, some plants may still be affected by larger dust and soil particles that are not considered air pollutants or are generated locally. There is also an increased risk of fire in adjacent open spaces due to maintenance activity and the potential for the introduction of noxious plant species from increased human activity.

As part of the design of the Central Valley Wye alternatives, the Authority would incorporate IAMFs to minimize indirect effects on special-status plant communities, including BIO-IAMF#8; BIO-IAMF#11; BIO-IAMF#19; and BIO-IAMF#21. However, indirect effects may still occur because it is difficult to remove established invasive nonnative plants from native plant communities without intensive and regular management (e.g., manual hand-pulling, herbicide application) and monitoring.

Indirect Operations Effects

All of the Central Valley Wye alternatives have the potential to increase erosion and runoff due to alterations in topography and hydrology from vegetation removal, which could affect aquatic habitats that support special-status plants in nearby water features. There is also an increased risk of fire in adjacent open spaces due to maintenance activity and the potential for the

introduction of noxious plant species from increased human activity. Maintenance criteria will be included as part of the Biological Resources Management Plan (BIO-IAMF#6), which will include, but not be limited to, measures for the protection of special-status species and measures for erosion and siltation control.

Mitigation Measures

The Authority will implement mitigation measures to further minimize the impacts on special-status plant communities. **BIO-MM#1, Conduct Protocol-Level Pre-construction surveys for Special-Status Plant Species and Special-Status Plant Communities** and **BIO-MM#2, Prepare and Implement Plan for Salvage, Relocation, and/or Propagation of Special-Status Plant Species** implement surveys to identify special-status plants in areas where permission to enter was not granted prior to construction and allow for the removal of special-status plant species prior to disturbance. **BIO-MM#3, Prepare and Implement a Habitat Management Plan** and **BIO-MM#4, Off-Site Habitat Restoration, Enhancement, and Preservation** allow for on-site and off-site restoration and preservation of special-status plant species habitat. With implementation of **BIO-MM#1** through **BIO-MM#4**, the adverse effects on special-status plant communities would be reduced.

Comparison of Alternatives

Construction of the Central Valley Wye alternatives could result in direct and indirect impacts on special-status plant communities. Areas affected by each of the Central Valley Wye alternatives from construction as a result of destruction or removal of suitable habitat are shown in Table 6-1. Among the seven plant communities considered, valley sink scrub plant communities would be affected to the greatest extent, with each of the four Central Valley Wye alternatives resulting in the same impact. The least extent of impacts would occur to palustrine forested wetlands under the SR 152 (North) to Road 19 and SR 152 (North) to Road 13 Wye Alternatives. When impacts on all seven plant communities are considered together, the greatest extent of impacts would occur under the Avenue 21 to Road 13 Wye Alternative, followed, in order of decreasing impact area, by the SR 152 (North) to Road 19 Wye Alternative, the SR 152 (North) to Road 13 Wye Alternative, and the SR 152 (North) to Road 11 Wye Alternative.

Table 6-1 Direct Impacts on Special-Status Plant Communities by Central Valley Wye Alternative (acres)¹

| Special-Status Plant Community | Alternative | | | | Total Range of Effect ² |
|--------------------------------------------|-------------------------------|-------------------------------|--------------------------|-------------------------------|------------------------------------|
| | SR 152 (North) to Road 13 Wye | SR 152 (North) to Road 19 Wye | Avenue 21 to Road 13 Wye | SR 152 (North) to Road 11 Wye | |
| Vernal Pools | 0.18 | 0.19 | 0.10 | 0.19 | 0.10 – 0.19 |
| Indirect Bisected Vernal Pool ³ | 0.04 | 0.04 | 0.64 | 0.04 | 0.04 – 0.64 |
| Mixed Riparian | 0.36 | 1.06 | 0.42 | 0.68 | 0.36 – 1.06 |
| Other Riparian | 1.44 | 0.54 | 2.43 | 0.86 | 0.54 – 2.43 |
| Seasonal Wetlands | 0.78 | 1.98 | 1.47 | 0.49 | 0.49 – 1.98 |
| Palustrine Forested Wetland | 0.12 | 0.00 | 0.12 | 0.00 | 0.00 – 0.12 |

| Special-Status Plant Community | Alternative | | | | |
|--------------------------------|-------------------------------|-------------------------------|--------------------------|-------------------------------|------------------------------------|
| | SR 152 (North) to Road 13 Wye | SR 152 (North) to Road 19 Wye | Avenue 21 to Road 13 Wye | SR 152 (North) to Road 11 Wye | Total Range of Effect ² |
| Valley Sink Scrub | 4.26 | 4.26 | 4.26 | 4.26 | 4.26 – 4.26 |
| Total | 7.19 | 8.08 | 9.45 | 6.52 | 6.52 – 9.45 |

Source: Calculations generated using ESRI ArcGIS versions 10.1, 10.2, and 10.3 from data generated by field surveys and aerial photo interpretation during 2010–2016. Minor differences in the totals are the result of rounding.

¹ Acreages reported here are different than impact acreages reported in Chapter 4 because these acreages indicate impacts on jurisdictional waters as well as adjacent habitat (e.g., riparian banks).

² Total range of effect identifies the least to most amount of habitat affected by the Central Valley Wye alternatives.

³ Indirect Bisected vernal pools occur both inside and outside of the project footprint. The portion outside the footprint is referred to as “indirect bisected,” but is considered a permanent direct effect for purposes of calculating mitigation requirements.

All decimal values are presented to the hundredths place. Totals from 0.005 to 0.009 are therefore rounded to 0.01. Totals less than or equal to 0.004 acre are therefore rounded to zero (0).

SR = State Route

6.1.2 Special-Status Plant Species

The following list of sources were used to identify special-status plant species known or potentially occurring in the Special-Status Plant RSA based on existing federal, state, and private databases and agency information.

- USFWS Species List**—An official list of federal candidate, proposed, threatened, and endangered plant species for the habitat study area was obtained from the USFWS Information for Planning and Conservation website. The list was generated on March 29, 2016 and updated on November 22, 2016 and December 21, 2017 (USFWS 2017, NMFS 2018) and is provided in Volume 2 of the Draft Supplemental EIR/EIS, Appendix 3.7-A, U.S. Fish and Wildlife Service and National Marine Fisheries Service Species Lists.
- CNDDDB**—A list of special-status plant species was prepared through a two-fold inquiry of the CNDDDB via a standard quad search using the RareFind program (CDFW 2016a) and a geographic information systems (GIS) mapping exercise of all occurrences within a 10-mile radius of the Central Valley Wye alternative centerlines (CDFW 2016a). This two-fold inquiry was performed so that all special-status plant species with the potential to occur in the alignment were captured in the query. Volume 2 of the Draft Supplemental EIR/EIS Appendix 3.7-B, California Natural Diversity Database Search Results, and Appendix 2-D-4, Biological Resources Survey Summary, provides the results of the initial RareFind quad search conducted in December 2014. To identify any additional species that have been recorded within 10 miles of the Central Valley Wye alternatives since the initial 2014 query, the 10-mile-radius GIS query is updated every 4–6 months; the most recent query was conducted on September 15, 2016, and confirmed that the 2014 species list is still accurate. Additionally, a GIS query of the CNDDDB for occurrences of special-status plant species within a 10-mile radius of the EINU components was conducted on August 5, 2016 (CDFG 2016b).
- California Native Plant Society Online Inventory of Rare and Endangered Plants of California (CNPS Online Inventory)**—A list of California Native Plant Society (CNPS) special-status plant species was obtained by querying the CNPS Online Inventory for special-status plants within the 22 U.S. Geological Survey 7.5-minute quads identified in Literature Review (CNPS 2014; CNPS 2016). The CNPS Online Inventory is a credible and widely recognized resource used by conservationists, consultants, planners, researchers, and resource managers to obtain information about California’s rare plants.

Direct Construction Effects

Direct effects on special-status plant species and native plant species may result from the removal of vegetation for the placement of permanent infrastructure within the project footprint. Additional direct effects may result from construction crews removing vegetation within temporary

impact areas and from construction vehicles and personnel disturbing vegetation (i.e., trampling, covering, and crushing individual plants, populations, or suitable potential habitat for special-status plant species) (Table 6-2). The design of the Central Valley Wye alternatives would incorporate IAMFs to avoid or minimize effects on special-status plant species, including BIO-IAMF#8; BIO-IAMF#13.

Direct Operations Effects

Ongoing operations and maintenance activities (e.g., routine inspection and maintenance of the HSR right-of-way) are unlikely to have any direct effects on special-status plant species because these activities would occur where the natural vegetation (i.e., areas with potential habitat for special-status plant species) has already been removed during Central Valley Wye alternatives construction. Direct effects, if they occur, would include mortality from incidental trampling or crushing caused by increased human activity related to the maintenance of equipment and facilities associated with the HSR system and exposure to accidental spills, including contaminants or pollutants.

The Authority will require maintenance personnel to attend a WEAP training and certify that they understand the regulatory agency requirements and procedures necessary to protect biological resources, including those that would avoid incidental trampling or crushing and spills. Effects on special-status plant species would be minimized through the implementation of IAMFs that result from the WEAP training. No mitigation is proposed for direct operational effects on special-status plant species.

Indirect Construction Effects

Indirect effects on special-status plant species and native plant species would potentially include erosion, siltation, and runoff into natural and constructed watercourses; soil and water contamination from construction equipment leaks; construction dust affecting plants by reducing their photosynthetic capability (especially during flowering periods); altered hydrology that could change the wetland functions of aquatic habitats; increased risk of fire (e.g., construction equipment use and smoking by construction workers) in adjacent open spaces; habitat degradation through fragmentation and changes in habitat heterogeneity; and the introduction of noxious plant species (nonnative, detrimental species) resulting from ground disturbance.

The design of the Central Valley Wye alternatives would incorporate IAMFs to avoid or minimize effects on special-status plant species, including BIO-IAMF#8; and BIO-IAMF#19. However, indirect effects may still occur because it is difficult to remove established invasive nonnative plants from native plant communities without intensive and regular management and monitoring.

Indirect Operations Effects

Any change in local hydrology and vernal pools could cause a change in habitat conditions for vernal pool-dependent special-status plants. Indirect effects may result from grading and stockpiling soils upslope of the pools during operations, leading to sediment transfer into the water column. Depending on drainage BMPs, some changes to local hydrology could cause mobilization of otherwise standing water, scour, and changes to the period of inundation of vernal pools. Chemical spills from fuel, transmission fluid, lubricating oil, and motor oil leaks could contaminate the water column, resulting in degraded habitat of special-status plants.

Operational maintenance requires vegetation and pest control through a variety of methods, including the application of herbicides and pesticides. Pesticide and herbicide application would be applied by certified pesticide applicators in accordance with all requirements of the California Department of Pesticide Regulation and County Agricultural Commissioners. If operational maintenance requires weed abatement activities, such as the use of herbicides, these activities could also contribute to chemical runoff and pollution of adjacent suitable habitats.

BIO-IAMF#4, which would require that maintenance personnel attend a WEAP training to gain knowledge of biological resources and associated regulatory requirements, would be incorporated into the design of the Central Valley Wye alternatives. In addition, the Authority will

prepare an Annual Vegetation Control Plan that would identify “sensitive areas” in vegetation control areas to assist in the avoidance of impacts on special-status plant species. Effects on special-status plant species would be minimized through the implementation of IAMFs specifying WEAP training and the vegetation management plan. These measures would minimize the potential for effects on special-status plant species. No mitigation is proposed.

Mitigation Measures

The Authority would implement mitigation measures to further minimize impacts on special-status plant species. **BIO-MM#1**, will require surveys to identify special-status plants that were not identified in areas where permission to enter was not granted prior to construction, allowing for the avoidance of special-status plant species disturbance. **BIO-MM#2**, will allow for the removal of special-status plant species prior to disturbance. **BIO-MM#3**, and **BIO-MM#4** will allow for on-site and off-site habitat restoration and preservation of special-status plant species, and **BIO-MM#45, Compensate for Impacts on Special-Status Plant Species**, will allow for on-site and off-site habitat restoration and preservation of special-status plant species. These measures, combined with design characteristics, work together to avoid direct impacts on special-status plant species and provide for restoration to address unavoidable impacts.

Comparison of Alternatives

The SR 152 (North) to Road 19 Wye Alternative would have the highest potential for impacts on special-status plant species because it would directly and indirectly affect more acres of suitable habitat for special-status plant species (Table 6-2) than the other three Central Valley Wye alternatives. The Avenue 21 to Road 13 Wye Alternative would have the lowest potential for direct impacts on special-status plant species and an intermediate potential for indirect impacts, compared to the other alternatives. The SR 152 (North) to Road 13 Wye Alternative would have an intermediate potential for direct impacts on special-status plant species and the lowest potential for indirect impacts, compared to the other alternatives. The SR 152 (North) to Road 11 Wye Alternative would have an intermediate potential for direct impacts on special-status plant species and an intermediate potential for indirect impacts.

Table 6-2 Comparison of Direct Effects on Special-Status Plant Species by Wye Alternative (acres)

| Species Potentially Affected | Associated Land Cover Type | Alternative | | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------|-------------------------------|--------------------------|-------------------------------|
| | | SR 152 (North) to Road 13 Wye | SR 152 (North) to Road 19 Wye | Avenue 21 to Road 13 Wye | SR 152 (North) to Road 11 Wye |
| Alkali milk-vetch, heartscale, crownscale, lesser saltscale, subtle orache, round-leaf filaree, Parry's rough tarplant, hispid bird's-beak, palmate-bracted bird's-beak, Hoover's cryptantha, Ewan's larkspur, recurved larkspur, golden goodmania, shining navarretia, fragile pentachaeta, Merced phacelia, Keck's checkerbloom, Lemmon's jewelflower, San Joaquin woollythreads, showy golden madia, forked hare-leaf, Hoover's calycadenia, beaked Clarkia | California Annual Grassland | 99.71 | 130.20 | 33.33 | 78.11 |
| Vernal pool smallscale, succulent owl's-clover, Hoover's spurge, dwarf downingia, spiny-sepaed button-celery, hogwallow starfish, Ferris' goldfields, little mousetail, shining navarretia | Vernal Pool ¹ | 0.23 | 0.23 | 0.75 | 0.23 |
| Delta button-celery, Wright's trichocoronis | Other Riparian | 1.44 | 0.54 | 2.43 | 0.86 |
| Sanford's arrowhead, Peruvian dodder, Boggs Lake hedge-hyssop | Natural Watercourse, Open Water, Seasonal Wetland | 10.84 | 14.07 | 11.44 | 8.24 |
| Hall's tarplant, Lost Hills crownscale | Valley Sink Scrub | 4.26 | 4.26 | 4.26 | 4.26 |
| San Joaquin woollythreads | California Annual Grassland ² , Valley Sink Scrub (within mapped range) | 4.32 | 28.87 | 4.32 | 4.32 |

| Species Potentially Affected | Associated Land Cover Type | Alternative | | | |
|------------------------------|------------------------------------------------|-------------------------------|-------------------------------|--------------------------|-------------------------------|
| | | SR 152 (North) to Road 13 Wye | SR 152 (North) to Road 19 Wye | Avenue 21 to Road 13 Wye | SR 152 (North) to Road 11 Wye |
| Palmate-bracted bird's-beak | California Annual Grassland, Valley Sink Scrub | 103.97 | 134.45 | 37.59 | 82.37 |

Source: Calculations generated using ESRI ArcGIS versions 10.1, 10.2, and 10.3 from data generated by field surveys and aerial photo interpretation during 2010–2016

¹Impacts to Vernal Pool land cover types include the indirect-bisected impacts on vernal pools.

SR = State Route

6.1.3 Special-Status Wildlife Species

Wildlife species are considered to be special-status species if they are legally protected under FESA or CESA or other regulations (e.g., Migratory Bird Treaty Act) or are species considered sufficiently rare by the scientific community to qualify for such listing.

The land cover types in the project footprint have the potential to support special-status wildlife species. No protocol or focused surveys for special-status wildlife species have been conducted. Therefore, the presence of special-status wildlife species to occur in a particular habitat is linked to the physical characteristics of the landscape. Suitable habitat for each species was presumed occupied for purposes of the effects analysis.

The following sources were reviewed to identify special-status wildlife species potentially occurring in the Core Habitat RSA.

- **USFWS Species List**—An official list of federal candidate, proposed, threatened, and endangered wildlife species for the habitat study area was obtained from the USFWS Information for Planning and Conservation website. The list was generated on March 29, 2016 and updated on November 22, 2016 and December 21, 2017 (USFWS 2017), and is provided in Volume 2, Appendix 3.7-A of the Draft Supplemental EIR/EIS.
- **CNDDDB**—A list of special-status wildlife species was prepared through a two-fold inquiry of the CNDDDB via a standard 22-quad search area in RareFind and a GIS query of all occurrences within 10 miles of the Central Valley Wye alternative centerlines and electrical interconnections and network upgrade components (CDFW 2016a, CDFW 2016b). The list of CNDDDB-reported special-status species is provided in Volume 2, Appendix 3.7-B and Appendix 2-D-4 of the Draft Supplemental EIR/EIS.
- **CWHR System**—GIS data of special-status wildlife species whose known geographic ranges occur within a 10-mile radius of the Central Valley Wye alternatives (CDFW 2014b) were obtained through the CWHR System. These species range data were used to augment data acquired from the CNDDDB to identify additional special-status wildlife species with a known geographic range within the regional area but for whom no occurrence data have been reported in the CNDDDB.
- **USFWS Birds of Conservation Concern for Region 8 (California and Nevada)**—A list of Birds of Conservation Concern (BCC) species was obtained and considered for evaluation (USFWS 2008). The list of BCC is found in the USFWS' list of BCC for the Bird Conservation Region that covers the Core Habitat RSA. BCC are migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the FESA.
- **Additional Sources for Special-Status Fish Species**—Moyle (2002), CalFish (2014), and University of California (2015) were consulted to identify special-status fish species in the habitat study area. These documents were used to identify known barriers to the upstream and downstream migrations of anadromous species and fish species that could occur in the habitat study area.

Direct Construction Effects

Construction activities have the potential to disturb the life cycles of special-status species and to result in a loss of suitable habitat for these species. Direct effects on special-status wildlife species were determined by estimating the amount of associated land cover types that would be disturbed by construction of the various alternatives. The following subsections identify the potential direct effects on the different classes of wildlife species during construction. See Table 6-3 for a quantitative comparison of direct effects of the Central Valley Wye alternatives on special-status wildlife species habitat.

Invertebrates

The Avenue 21 to Road 13 Wye Alternative would disturb the most habitat for vernal pool branchiopods (Conservancy fairy shrimp, vernal pool tadpole shrimp, and vernal pool fairy

shrimp), estimated at 2.49 acres, while the SR 152 (North) to Road 11 Wye Alternative would disturb the least habitat, estimated at 1.87 acres. Valley elderberry longhorn beetle habitat would be most affected under the Avenue 21 to Road 13 Wye Alternative (2.97 acres) and least affected under the SR 152 (North) to Road 11 Wye Alternative (1.53 acres).

While the actual quantity (acres) of the impacts as described above would differ between alternatives, the types of impacts on special-status invertebrate species would be similar across all Central Valley Wye alternatives because the construction of all alternatives would result in the same types of grading and other ground-disturbing activities. Vernal pool branchiopods or their cysts could be disturbed, injured, or killed if any construction activity occurs within seasonal wetlands, including vernal pools, when wet or dry. These effects could also occur as a result of changes in the retention/infiltration of runoff, disturbance of the underlying hardpan soils of these habitats, and potential increase in siltation and turbidity from grading, vehicle traffic, contaminants, and other related ground-disturbing activities. Construction effects can alter the watershed of specific vernal pools, which, in turn, could alter seasonal inundation conditions. Valley elderberry longhorn beetles would be directly affected by the damage or removal of elderberry host plants. Removal of young elderberry shrubs would reduce the long-term habitat of the valley elderberry longhorn beetle by inhibiting recruitment of young elderberry shrubs into the canopy. Direct effects also include the permanent conversion of occupied habitat to project infrastructure or changes to micro/local hydrology.

The design of the Central Valley Wye alternatives would incorporate IAMFs to avoid or minimize effects on special-status invertebrates, including BIO-IAMF#13. Additionally, the Authority would implement the mitigation measures and as a result, effects on special-status invertebrates would be minimized.

Fish

The SR 152 (North) to Road 13, and Road 19 Wye alternatives would disturb the same extent of special-status fish species habitat (2.24 acres): habitat for Central Valley steelhead, Central Valley spring-run Chinook salmon, hardhead, Kern brook lamprey, San Joaquin roach, and the Chinook salmon Central Valley fall-/late fall-run evolutionarily significant unit. The Avenue 21 to Road 13 Wye Alternative would disturb the least extent of special-status fish habitat (1.97 acres).

While the actual quantity (acres) of the impacts as described above would differ between alternatives, the types of impacts on special-status fish species would be similar across all Central Valley Wye alternatives because the construction of all alternatives would result in the same types of grading and other ground-disturbing activities. Direct effects on special-status fish species (i.e., steelhead, Chinook salmon, hardhead, San Joaquin roach, Kern brook lamprey) include construction activities in suitable habitat that may disturb, injure, or kill individuals or if waters are disturbed, degraded, or polluted by sedimentation, construction equipment spills or leaks, and shading from overhead elevated structures. Direct effects may consist of physical disturbance, interruptions to fish passage, sedimentation, turbidity, altered water temperatures, oxygen depletion, and contamination. Final bridge design plans are not currently available, but construction would require work below the ordinary high water mark. The unconsolidated alluvium underlying most of the project area is generally prone to consolidation settlement where subjected to heavy structural loads. To limit long-term settlement, accommodate lateral loading, and to support structures below the scour depth and zone of seasonal moisture change, we anticipate that the aerial structures, undercrossings, and other bridge structures proposed for the project would be supported using a deep foundation system. The maximum allowable post-construction settlement is one inch for all structures and structural settlement would not impact the channel flows. Dewatering during construction, if needed, may result in the stranding and mortality of special-status fish. Pile driving in the channel when surface water is present could lead to disturbance and possible mortality if sound levels reach the lethal range.

Amphibians

The SR 152 (North) to Road 19 Wye Alternative would affect the greatest extent of California tiger salamander habitat (315.31 acres) and western spadefoot habitat (71.92 acres). The Avenue 21

to Road 13 Wye Alternative would disturb the least extent of habitat for California tiger salamander and western spadefoot (114.66 acres and 17.02 acres, respectively).

While the actual quantity (acres) of the impacts as described above would differ between alternatives, the types of impacts on special-status amphibians would be similar across all Central Valley Wye alternatives because the construction of all alternatives would result in the same types of grading and other ground-disturbing activities. Direct effects on special-status amphibian species (California tiger salamander and western spadefoot toad) would include construction activities in suitable upland or aquatic habitat that could cause mortality, injury, or harassment of adults, eggs or egg masses, and larvae. Construction may also result in the temporary destruction, degradation, fill, or pollution of aquatic breeding or upland nesting habitats and the temporary loss of burrows or other upland refugia. Mortality, injury, or harassment may also occur if these species become trapped in open, excavated areas. Other potential direct effects on aquatic habitat that change seasonal inundation patterns would be similar to those described for vernal pool branchiopods. Direct effects also include the permanent conversion of occupied aquatic and upland habitat to project infrastructure, fragmentation of habitats and landscapes resulting from construction of the Central Valley Wye alternatives, which would interfere with seasonal movement and dispersal of special-status amphibians, and changes to micro/local hydrology that could affect inundation periods of aquatic habitat.

The design of the Central Valley Wye alternatives would incorporate IAMFs to avoid or minimize effects on special-status amphibians, including BIO-IAMF#8; BIO-IAMF#13; BIO-IAMF#14; BIO-IAMF#15; and BIO-IAMF#21. Additionally, the Authority would implement the mitigation measures; consequently, effects on special-status amphibians would be minimized.

Reptiles

The SR 152 (North) to Road 13 Wye Alternative would disturb the greatest extent of habit for blunt-nosed leopard lizard (43.42 acres) compared to the other three Central Valley Wye alternatives. The SR 152 (North) to Road 19 Wye Alternative would disturb the greatest extent of habitat for the following special-status reptile species: western pond turtle (124.87 acres), Blainville's horned lizard (283.26 acres), giant garter snake (32.24 acres), and silvery legless lizard (28.88 acres). The SR 152 (North) to Road 11 Wye Alternative would disturb the least habitat for giant garter snake (19.93 acres). The Avenue 21 to Road 13 Wye Alternative would disturb the least habitat for the following species: blunt-nosed leopard lizard (20.18 acres), western pond turtle (50.61 acres), and Blainville's horned lizard (124.44 acres). Habitat for San Joaquin coachwhip would experience the same extent of disturbance across all Central Valley Wye alternatives (4.32 acres).

While the actual quantity (acres) of the impacts as described above would differ between alternatives, the types of impacts on special-status reptiles would be similar across all Central Valley Wye alternatives because the construction of all alternatives would result in the same types of grading and other ground-disturbing activities. Direct effects on special-status reptiles (western pond turtle, blunt-nosed leopard lizard, Blainville's horned lizard, silvery legless lizard, San Joaquin coachwhip, and giant garter snake) include construction activities in suitable habitat that could cause mortality, injury, or harassment of adults, eggs, or juveniles. Construction may also result in the temporary destruction, degradation, or pollution of habitat and the temporary loss of nesting areas, burrows, or other refugia. Mortality, injury, or harassment may also occur if these species become trapped in open, excavated areas. Direct effects also include the permanent conversion of occupied habitat to project infrastructure, and fragmentation of habitats and landscapes resulting from construction of the wye alternatives, which would interfere with seasonal movement and dispersal of special-status reptiles. Due to its status as a California Fully Protected species, blunt-nosed leopard lizard may not be subjected to mortality, injury, or entrapment. The features of the Central Valley Wye alternatives could collectively disturb habitat for special-status reptiles, affecting both individuals and populations of special-status reptiles.

The design of the Central Valley Wye alternatives would incorporate IAMFs to avoid or minimize effects on special-status reptiles, including BIO-IAMF#13; BIO-IAMF#14; BIO-IAMF#15; and BIO-

IAMF#21 and as a result, effects of construction activities in suitable special-status reptile habitat would be minimized.

Birds

The SR 152 (North) to Road 13 Wye Alternative would disturb the most habitat for the following special-status bird species and groups of species: greater sandhill crane (1,592.02 acres), tricolored blackbird (1,491.80 acres), and wading birds/shorebirds/ducks (1,685.64 acres). The SR 152 (North) to Road 19 Wye Alternative would disturb the most habitat for the following special-status bird species: American peregrine falcon (4,031.34 acres), bald eagle (1,700.62 acres), golden eagle (1,687.47 acres), Swainson's hawk (3,317.30 acres), Western snowy plover (1,673.28 acres), Least Bell's vireo (13.69 acres), western burrowing owl (2,239.00 acres), ground nesting birds (1,905.13 acres), and tree nesting birds (3,187.16 acres). The Avenue 21 to Road 13 Wye Alternative would disturb the least habitat for the following special-status bird species: American peregrine falcon (2,897.38 acres), bald eagle (1,339.43 acres), golden eagle (1,329.05 acres), Swainson's hawk (2,539.74 acres), greater sandhill crane (1,253.12 acres), Western snowy plover (interior population) (1,313.42 acres), tricolored blackbird (1,106.45 acres), ground nesting birds (1,274.60 acres), wading birds/shorebirds/ducks (1,353.94 acres), and tree nesting birds (2,563.00 acres). The SR 152 (North) to Road 11 Wye Alternative would disturb the least habitat for least Bell's vireo. (9.28 acres) and western burrowing owl (1,439.70 acres).

While the actual quantity (acres) of the impacts as described above would differ between alternatives, the types of impacts on special-status birds would be similar across all Central Valley Wye alternatives because the construction of all alternatives would result in the same types of grading and other ground-disturbing activities. Construction activities (e.g., grubbing, grading, excavation, driving off-road) could remove or disturb potential nesting habitat for special-status raptors, passerine birds, wading birds, shorebirds, duck species, and migratory birds including the following species: western yellow-billed cuckoo, California condor, least Bell's vireo, western burrowing owl, and Swainson's hawk.

Direct effects may include bird mortality or injury. As part of the design of the Central Valley Wye alternatives, the Authority will develop and implement requirements to identify special-status bird nests to be avoided during construction and to require that the project biologist or agency-approved biologist will conduct a pre-construction nesting bird survey (BIO-IAMF#26). If active nests are found, the project biologist and biological monitors, in consultation with the Authority and appropriate resource agency, will establish a 500-foot nest avoidance buffer zone around raptor nests, and other sized nest avoidance buffer zones for non-raptor species as appropriate. The project biologist will maintain the buffer zone until nestlings have fledged and are no longer reliant on the nest or parental care for survival or the nest is abandoned (as determined by the project biologist). The design of the Central Valley Wye alternatives would minimize direct impacts, including removal or disturbance of potential nesting habitat; mortality, injury, or permanent conversion of occupied nesting and foraging habitat; habitat fragmentation; and disturbance of nests during the breeding season (February 1 to September 1), which could potentially result in the loss of eggs or developing young (i.e., nest abandonment during the incubation, nestling, or fledgling stages).

Burrowing owls extensively use open landscapes with suitable natural or artificial burrows. Suitable habitat exists along most of the project footprint. Vibration from construction equipment along with increased vehicular construction traffic could collapse occupied burrows.

Raptors may nest in riparian habitat, in roadside trees, in windbreaks, in oak woodlands, and on built towers. Several special-status species were identified as potentially occurring in the survey area, including Swainson's hawks.

Direct effects also include the permanent conversion of occupied nesting and foraging habitat to project infrastructure and fragmentation of habitats and landscapes resulting from construction of the Central Valley Wye alternatives, which could interfere with seasonal movement and dispersal of special-status birds.

The design of the Central Valley Wye alternatives would incorporate IAMFs to avoid or minimize effects on special-status birds, BIO-IAMF#26. Additionally, the Authority would implement the mitigation measures to avoid and minimize effects on special-status birds.

Mammals

The SR 152 (North) to Road 19 Wye Alternative would disturb the most habitat for the following special-status mammal species: pallid bat and western red bat (both 4,031.34 acres), western mastiff bat (4,029.74 acres), American badger (406.65 acres), and San Joaquin kit fox (1,825.02 acres). The Avenue 21 to Road 13 Wye Alternative would disturb the most habitat for ringtail (2.97 acres), and the SR 152 (North) to Road 13 Wye Alternative would disturb the most habitat for Fresno kangaroo rat (58.37 acres). The Avenue 21 to Road 13 Wye Alternative would disturb the least habitat for the following special-status mammal species: pallid bat, western red bat, and western mastiff bat (each 2,900.92 acres), American badger (237.21 acres), and Fresno kangaroo rat (21.17 acres). The SR 152 (North) to Road 11 Wye Alternative would disturb the least habitat for ringtail (1.53 acres), and San Joaquin kit fox (1,178.88 acres). Disturbance of habitat for giant kangaroo rat and Nelson’s antelope squirrel would be the same across all alternatives (0.06 acre and 4.26 acres, respectively).

While the actual quantity (acres) of the impacts as described above would differ between alternatives, the types of impacts on special-status mammals would be similar across all Central Valley Wye alternatives because the construction of all alternatives would result in the same types of grading and other ground-disturbing activities. Construction activities have the potential to affect special-status mammals, including special-status bats, special-status rodents, San Joaquin kit fox, American badger, and ringtail.

- **Special-Status Bat Species**—Increased lighting after sunset could disrupt foraging activities by special-status bat species, causing them to leave an area that has prolonged disturbance. Nocturnal insects are drawn by lighting, which in turn attracts foraging bats. Special-status bats attracted to lighted construction areas could have higher potential mortality through disorientation and effects with construction equipment. Direct effects on bats could include mortality of individuals during construction and temporary disturbances from noise, dust, and ultrasonic vibrations from construction equipment. Direct effects also include the permanent conversion of occupied roosting and foraging habitat to project infrastructure and fragmentation of habitats and landscapes resulting from construction of the Central Valley Wye alternatives, which would interfere with seasonal movement and dispersal of special-status bats.
- **San Joaquin Kit Fox**—Effects on San Joaquin kit foxes could occur because this species has the potential to actively use the project footprint and adjacent areas. Mortality and injury of San Joaquin kit foxes could occur from crushing burrows with construction equipment as well as from vehicle strikes in work areas. Ground disturbance could lead to the temporary loss of foraging and denning habitat, which in turn could result in increased vulnerability of San Joaquin kit fox to predation and a reduction in prey availability. Temporary effects on unhabituated San Joaquin kit fox could occur from noise, lighting, vibration, dust, and motion disturbance, which may disrupt normal feeding, breeding, or sheltering behavior of San Joaquin kit fox individuals. Direct effects also include the permanent conversion of occupied denning and dispersal habitat to project infrastructure and fragmentation of habitats and landscapes resulting from construction of the Central Valley Wye alternatives that would interfere with seasonal movement and dispersal of San Joaquin kit foxes.
- **American Badger**—Mortality and injury of American badgers could occur from burrows being crushed by construction equipment as well as from vehicle strikes in construction work areas. Ground disturbance could lead to the temporary loss of foraging habitat. Temporary effects on American badgers may occur from noise, lighting, vibrations, dust, and motion disturbance. Direct effects also include the permanent conversion of occupied habitat to project infrastructure and fragmentation of habitats and landscapes resulting from construction of the Central Valley Wye alternatives that would interfere with seasonal movement and dispersal of badgers.

- **Ringtail**—Mortality and injury of ringtail could occur from being crushed by construction equipment working in riparian habitats. Ground disturbance could lead to the temporary loss of foraging habitat. Temporary effects on ringtail may occur from noise, lighting, vibration, dust, and motion disturbance. Direct effects also include the permanent conversion of occupied habitat to project infrastructure and fragmentation of habitats and landscapes resulting from construction of the Central Valley Wye alternatives, which would interfere with seasonal movement and dispersal of ringtails.
- **Special-Status Rodent Species**—Direct effects on special-status rodent species (giant kangaroo rat, Nelson’s antelope ground squirrel, and Fresno kangaroo rat) could occur because these species have the potential to actively use the project footprint and adjacent areas of the Site 6—El Nido, Los Banos—Oro Loma—Canal 70 kV Power Line, common to all Central Valley Wye alternatives. Mortality and injury of special-status rodents could occur from crushing burrows with construction equipment as well as from vehicle strikes in work areas.

The design of the Central Valley Wye alternatives would incorporate IAMFs to avoid or minimize effects on special-status mammals, including BIO-IAMF#16. Additionally, the Authority would implement the mitigation measures to avoid and minimize these effects. With incorporation of the IAMFs and implementation of the mitigation measures, effects on special-status mammals would be reduced.

Native Fauna

Direct effects on non-listed native fauna (e.g., fish, mollusks, crustaceans, amphibians, birds, mammals, reptiles, and insects) are similar to those effects described above for special-status fish and wildlife species.

Indirect Construction Effects

Invertebrates

Indirect effects could result from the disturbance and stockpiling of soils contributing to the transportation of sediment loads to adjacent habitats suitable for vernal pool branchiopods. Changes in the contour of the landscape or the disturbance of hardpan soils could cause changes in the hydrological cycles of seasonal wetlands, including vernal pools, could alter the amount and quality of water available above- and below-ground and could change the inflow of water to particular pools or decrease or increase inundation. These changes in hydrology could affect the reproductive success and survival of these species and their food. Chemical spills from construction equipment (e.g., fuel, transmission fluid, lubricating oil, and motor oil) could contaminate the water column, resulting in habitat degradation, reduced reproductive success of vernal pool branchiopods, or branchiopod mortality. Indirect effects on vernal pool branchiopods may also include the shading of habitats by structures and the inadvertent introduction of nonnative invasive (noxious) weeds such as yellow star thistle (*Centaurea solstitialis*). For valley elderberry longhorn beetle, indirect effects during construction could include the accumulation of fugitive dust on elderberry host plants, potentially weakening their vigor, resulting in degradation of habitat for valley elderberry longhorn beetles. In addition, changes to local runoff could have negative effects on the health and vigor of these plants.

The design of the Central Valley Wye alternatives would incorporate IAMFs to avoid or minimize effects on special-status invertebrates, including BIO-IAMF#8; BIO-IAMF#13; and BIO-IAMF#19, Cleaning of Construction Equipment. These IAMFs would minimize the impacts of habitat degradation, alteration of vernal pool and seasonal wetland hydrology, reduction in reproductive success and survival of invertebrate species, water contamination, and potential reduced health and vigor of elderberry host plants from construction-related dust accumulation and changes in local runoff. These design characteristics would avoid some, but not all, indirect impacts on special-status invertebrate species and habitat.

The Authority would implement mitigation measures. With implementation of these measures, effects on special-status invertebrates would be minimized.

Amphibians

Indirect construction effects on breeding habitat for special-status amphibians are similar to effects on vernal pool branchiopods. In addition, potential indirect effects could include abandonment of upland refugia (e.g., burrows), temporary shifts in foraging patterns or territories, changes in breeding habitat water quality or hydroperiod. Project components such as security fencing, electrical infrastructure, and elevated structures could attract predators like raptors by providing human-made perch sites in the landscape.

The design of the Central Valley Wye alternatives would incorporate IAMFs to avoid or minimize effects on special-status amphibians, including BIO-IAMF#8; BIO-IAMF#13; and BIO-IAMF#19. These measures would minimize the spread of weeds during construction activities and require avoidance of sensitive areas, thereby preventing disturbance of special-status amphibians. In addition, the Authority would implement mitigation measures that would minimize and offset these effects. With implementation of these measures, effects on special-status amphibian habitat would be minimized and offset such that substantial changes to individuals or a population would occur.

Reptiles

Indirect effects on special-status reptiles may include the inadvertent introduction of invasive (noxious) weeds, such as yellow star thistle, which can reduce habitat suitability. Soil compaction and the placement of fill in suitable habitat may indirectly affect special-status reptiles by prohibiting burrowing, or by changing the frequency of vegetative cover. Construction activities may attract opportunistic predators (e.g., ravens, feral cats, raccoons) that may feed on special-status reptiles. Construction activities could result in temporary shifts in foraging patterns or territories, or refugia. Project components such as security fencing, electrical infrastructure, and elevated structures could attract predators like raptors by providing human-made perch sites in the landscape.

The design of the Central Valley Wye alternatives would incorporate IAMFs to avoid or minimize effects on special-status reptiles, including BIO-IAMF#8; BIO-IAMF#13; and BIO-IAMF#19. In addition, the Authority would implement mitigation measures, including compensatory mitigation, to minimize and offset these effects. With implementation of these measures, effects on special-status reptile habitat would be minimized and offset such that substantial changes to individuals or a population would not occur.

Fish

Indirect effects on special-status fish may include changes in water quality, which could lead to temporary shifts in foraging patterns or territories. Ground disturbance associated with construction may increase erosion and sedimentation into nearby creeks, rivers, and other waters. Chemical spills from construction equipment (e.g., fuel, transmission fluid, lubricating oil, and motor oil) could contaminate the water column, resulting in habitat degradation or reduced reproductive success of special-status fish in downstream habitats. Project components such as security fencing, electrical infrastructure, and elevated structures could attract predators like raptors by providing human-made perch sites in the landscape, resulting in increased predation on fish.

The design of the Central Valley Wye alternatives would incorporate IAMFs to avoid or minimize effects on special-status fish, including BIO-IAMF#20, Dewatering and Water Diversion and BIO-IAMF#25, Wildlife Crossings. In addition, the Authority would implement mitigation measures that would minimize these effects. With implementation of these measures, construction of the Central Valley Wye alternatives would not substantially contribute to erosion and sedimentation or water quality such that degradation of special-status fish species or habitat would occur. No compensatory mitigation would be necessary.

Birds

Indirect effects during the construction period may include the permanent or temporary displacement of special-status bird species to avoid disturbance (e.g., noise, vibration, visual

stimuli); such displacement could also result from the actual fragmentation of the landscape caused by the construction of the project components (e.g., security fences, elevated structures, railbeds, and associated facilities). These indirect effects could interfere with the daily movement, foraging, and dispersal of bird species. Repeated exposure to disturbance can reduce reproductive success and increase mortality through the exposure of nests to predators and the elements. Indirect effects could result from repeated disturbance of breeding birds by construction vehicles traveling in work areas.

The design of the Central Valley Wye alternatives would incorporate BIO-IAMF#26 to avoid or minimize effects on special-status birds as described in the discussion of direct impacts on birds. This IAMF includes effective measures to develop and implement general nesting season restrictions, preventing permanent or temporary displacement, disturbance, and fragmentation. In addition, the Authority would implement mitigation measures, including compensatory mitigation that would minimize and offset these effects. With implementation of these measures, effects on special-status birds would be minimized and offset such that substantial changes to individuals or a population would not occur.

Mammals

Construction activities have the potential to indirectly affect special-status mammals, including special-status bats, San Joaquin kit fox, American badger, and ringtail.

- **Special-Status Bat Species**—Ground-disturbing activities, such as excavation, vegetation removal, construction of the railbed, placement of temporary structures and staging areas, and equipment operation, would result in noise, dust, or vibration disturbance. These disturbances could indirectly disrupt breeding or roosting activity, or result in the temporary loss of foraging habitats.
- **San Joaquin Kit Fox**—Temporary habitat conversion could result in shifts in foraging patterns or territories, increased predation, and decreased reproductive success. Indirect effects could potentially include alteration of soils, such as compaction. Removal of burrowing prey species such as kangaroo rats may impact food availability for this species. The inadvertent introduction of invasive (noxious) weeds, such as yellow star thistle, could reduce habitat suitability for this species.
- **American Badger**—Indirect effects would be the same as those for the San Joaquin kit fox.
- **Ringtail**—Indirect effects would be similar to those for other species occurring in riparian habitats.
- **Special-Status Rodent Species**—Indirect effects on special-status rodent species (giant kangaroo rat, Nelson’s antelope ground squirrel, and Fresno kangaroo rat) could occur because these species have the potential to actively use the project footprint and adjacent areas of the Site 6—El Nido: Los Banos—Oro Loma—Canal 70 kV Power Line, common to all Central Valley Wye alternatives. Ground-disturbing activities, such as excavation, vegetation removal, placement of temporary structures and staging areas, and equipment operation would result in noise, dust, or vibration disturbance. These disturbances could disrupt breeding activity, or result in the temporary loss of foraging habitat. Giant kangaroo rat and Fresno kangaroo rat are nocturnal species and lighting of construction sites that spills into adjacent habitat could also disrupt normal foraging activities.

The design of the Central Valley Wye alternatives would incorporate BIO-IAMF#25. Although this measure would not eliminate indirect effects on special-status mammals from habitat fragmentation, it would provide movement opportunities and habitat connectivity at locations that would otherwise have been impermeable to wildlife if crossing structures were not included in project design.

Additionally, the Authority would implement mitigation measures, including compensatory mitigation. With implementation of these measures, effects on special-status mammals would be minimized and offset such that substantial changes to individuals or a population would not occur.

Native Fauna

Indirect effects on non-listed native fauna (e.g., fish, mollusks, crustaceans, amphibians, birds, mammals, reptiles, and insects) are similar to the effects on special-status fish and wildlife species.

Direct and Indirect Operations Effects

The following subsections describe the potential direct and indirect effects on the different taxonomic groups of wildlife species during operations. The design of the Central Valley Wye alternatives incorporates BIO-IAMF#4. The Authority will require maintenance personnel to attend a WEAP training and certify that they understand the regulatory agency requirements (i.e., FESA, CESA, the Bald and Golden Eagle Protection Act, and the Migratory Bird Treaty Act) and procedures necessary to protect biological resources, including requiring identification of special-status wildlife species, avoiding spills, and the employing the appropriate process if a dead or injured wildlife species is discovered. Effects on special-status wildlife species would be minimized through the implementation of the WEAP training. These operations and maintenance prescriptions will minimize the likelihood that individual special-status animals will be injured or killed during operations and would result in the reduction of direct and indirect effects on special-status wildlife species during operations and maintenance activities.

Invertebrates

Ongoing operations and maintenance activities are unlikely to have any direct effects on invertebrates because these activities would occur where the natural vegetation (i.e., areas with potential habitat for special-status invertebrate species) has already been removed during construction of the Central Valley Wye alternatives. Direct effects would include mortality from incidental trampling or crushing caused by increased human activity related to the maintenance of equipment and facilities associated with the HSR system and exposure to accidental spills, including contaminants or pollutants.

Removal of young elderberry shrubs that become established in the right-of-way over the duration of operations, could reduce the long-term habitat of the valley elderberry longhorn beetle by inhibiting recruitment of young elderberry shrubs into the canopy.

Operational maintenance requires vegetation and pest control through a variety of methods, including the application of herbicides and pesticides. Pesticide and herbicide application would be applied in accordance with all requirements of the California Department of Pesticide Regulation and County Agricultural Commissioners by certified applicators. If operational maintenance requires weed abatement activities, such as the use of herbicides, these activities could also contribute to chemical runoff and pollution of adjacent suitable habitats. However, maintenance activities that have potential effects on special-status wildlife species are limited to the at-grade portion of the project footprint. Overall, effects on special-status invertebrates would be minimized and no additional measures are proposed to offset the effects.

Amphibians

Direct effects on amphibians could be expected in drainages subject to or near operational maintenance activities. Chemical spills from fuel, transmission fluid, lubricating oil, and motor oil leaks have the potential to contaminate the water column, resulting in mortality, habitat degradation, or reduced reproductive success. Indirectly, project components such as security fencing, electrical infrastructure, and elevated structures could attract predators like raptors by providing human-made perch sites in the landscape. The design of the Central Valley Wye alternatives would minimize the indirect effects on special-status amphibians including chemical spills, water column contamination, habitat degradation, increased predation, and increased cover of invasive species. As a result, effects on special-status amphibians would be minimized and no additional measures are proposed.

Reptiles

Train operations and maintenance activities would be limited to activities in the fenced right-of-way or to the raised structure. However, because security fencing would not likely prohibit or deter most reptile and amphibian species from accessing the right-of-way, the occasional individual of a special-status amphibian or reptile species could enter the right-of-way, which would increase the likelihood of a direct strike resulting from train operations or related maintenance activities. Such direct strikes could lead to injury or mortality of the species. Direct effects from the Central Valley Wye alternatives may also include some similar effects on invertebrates, such as incidental trampling or crushing and exposure to accidental spills including contaminants or pollutants.

Indirect effects on reptiles include changes in the local landscape from invasive species as well as aquatic and terrestrial spills of fuel, transmission fluid, lubricating oil, and motor oil leaks. Indirectly, project components such as security fencing, electrical infrastructure, and elevated structures could attract predators like raptors by providing human-made perch sites in the landscape.

The design of the Central Valley Wye alternatives, and the incorporation of BIO-IAMF#4 would minimize the direct and indirect effects associated with operations. As a result, effects on special-status reptiles would be minimized and no additional measures are proposed.

Fish

Direct effects during operations could include exposure to contaminants or pollutants from accidental spills and increased sedimentation from erosion. Indirect effects on water quality would be similar to those discussed for the invertebrates. Depending on drainage BMPs, some changes to local hydrology, from operations-related maintenance and other activities, could cause scour and changes to local hydrologic profiles. Chemical spills from fuel, transmission fluid, lubricating oil, and motor oil leaks could also contaminate water, resulting in mortality, habitat degradation, or reduced reproductive success of special-status fish. Project components such as electrical infrastructure, fencing, and elevated structures could attract predators like raptors by providing human-made perch sites in the landscape, all of which could lead to an increase in predation on special-status fish species.

The design of the Central Valley Wye alternatives, and the incorporation of BIO-IAMF#4 would minimize the direct and indirect effects associated with operations. As a result, effects on special-status fish would be minimized and no additional measures are proposed.

Birds

Maintenance effects (e.g., mowing, weed control, and driving off-road) on birds during operations would result in the removal or disturbance of areas that provide potential nesting habitat for a diverse population of birds. Operations and maintenance activities conducted in areas of nesting habitat during the breeding season (generally between February 1 and September 1) could disturb nesting birds, which could cause nest abandonment and subsequent loss of eggs or developing young at active nests in or near the area of activity. Operations effects (e.g., operation of the Central Valley Wye alternatives at grade or on an elevated structure) could result in injury or mortality from bird strikes or bird interactions with fencing and the electrical systems, as well as by permanent disturbance or temporary displacement from noise, vibration, wind, or visual stimuli.

Indirect effects could occur from operations activities that disrupt nesting birds, potentially leading to nest failure or abandonment. Indirect effects may include avoidance behavior by some species in response to increased noise, lighting, and startle and motion disturbances during HSR operations and maintenance activities.

The design of the Central Valley Wye alternatives, and the incorporation of BIO-IAMF#4 would minimize the direct and indirect effects associated with operations. As a result, effects on special-status birds would be minimized; no additional measures are proposed.

Mammals

Direct operations effects on mammals would be primarily related to ground disturbance during operations activities. Burrowing, denning, and foraging habitat may be directly affected. In addition, increased noise levels and human presence may accelerate local shifts in populations. Some free-ranging mammals may avoid the area and be funneled along the HSR corridor until locating a wildlife crossing. Rodent control programs could directly poison predators such as San Joaquin kit fox through consumption of poisoned rodents or the reduction in the amount of available prey. Operations of the Central Valley Wye alternatives at grade or on elevated structure could result in injury or mortality from bat strikes or bat interactions with the electrical systems.

Operations of the Central Valley Wye alternatives could result in displacement of mammal species from noise, vibration, wind, and visual stimuli, and from the actual fragmentation of the landscape as a result of the construction of the Central Valley Wye alternatives infrastructure. These effects may result in shifts in foraging patterns or territories, or dispersal movements, increased predation, decreased reproductive success, and reduced population viability. Indirect effects may include any additional pressures on the landscape from the colonization of nonnative plant species. The change in plant species could further reduce adjacent habitat values. Local noise and motion disturbance effects resulting from Central Valley Wye alternatives operations may cause some avoidance behavior.

The design of the Central Valley Wye alternatives, and the incorporation of BIO-IAMF#4 would minimize the direct and indirect effects associated with operations. As a result, effects on special-status mammals would be minimized; no additional measures are proposed.

Mitigation Measures

Invertebrates

BIO-MM#5, Conduct Pre-Construction Sampling and Assessment for Vernal Pool Fauna, and BIO-MM#6, Seasonal Vernal Pool Work Restriction, will identify and document vernal pool fauna and habitat within the project footprint, guide the mitigation of unavoidable vernal pool fauna within the project footprint and will include BMPs to seasonally avoid special-status vernal pool brachiopods and vernal pool-dependent species. **BIO-MM#7, Implement and Monitor Vernal Pool Protection within Temporary Impact Areas**, will include BMPs to reduce impacts on vernal pools within temporary impact areas. **BIO-MM#3 and BIO-MM#4, BIO-MM#46, Compensate for Impacts on Vernal Pool Fairy Shrimp and Vernal Pool Tadpole Shrimp, and BIO-MM#47, Compensate for Impacts on Valley Elderberry Longhorn Beetle**, will allow for on-site and off-site restoration and preservation of special-status invertebrate species habitat, respectively. With implementation of **BIO-MM#3 through BIO-MM#7, BIO-MM#46, and BIO-MM#47**, the adverse effects on invertebrates would be reduced.

Amphibians

BIO-MM#9, Conduct Pre-Construction Surveys for Special-Status Reptile and Amphibian and BIO-MM#10, Conduct Special-Status Reptile and Amphibian Monitoring, Avoidance, and Relocation, will implement pre-construction surveys in suitable habitats to determine the presence of amphibian species within the project footprint and will require the contractor's Project Biological Monitor to oversee construction activities to avoid special-status amphibians or relocate them outside the construction area. **BIO-MM#11, Conduct Pre-Construction Surveys or Conduct Predictive Modeling for California Tiger Salamander and BIO-MM#12, California Tiger Salamander Exclusion Fencing**, will survey potential breeding habitat in the project footprint for the presence of California tiger salamander and will install and maintain exclusion fencing along the perimeter of the project footprint within California tiger salamander suitable habitat areas. **BIO-MM#13, Conduct Emergence and Larval Surveys for Western Spadefoot**, will conduct pre-construction emergence and larval surveys for western spadefoot during the fall and winter rainy season. **BIO-MM#3 and BIO-MM#4 and BIO-MM#48, Compensate for Impacts of California Tiger Salamander**, will allow for on-site and off-site restoration and preservation of special-status amphibian species, respectively. With implementation of **BIO-MM#3, BIO-MM#4,**

BIO-MM#48, and **BIO-MM#9** through **BIO-MM#13**, the adverse effects on amphibians would be reduced.

Reptiles

BIO-MM#9 and **BIO-MM#10** will implement pre-construction surveys in suitable habitats to determine the presence of reptile species within the project footprint and will require the contractor's Project Biological Monitor to oversee construction activities to avoid special-status reptiles or relocate them (for species other than blunt-nosed leopard lizard) outside the construction area. **BIO-MM#14, Conduct Protocol-Level Surveys for Blunt-Nosed Leopard Lizard**, and **BIO-MM#15, Phased Pre-Construction Surveys for Blunt-Nosed Leopard Lizard**, will require surveys in suitable habitats to determine the presence of blunt-nosed leopard lizard within the project footprint and will conduct visual pre-construction surveys in areas of potential blunt-nosed leopard lizard habitat no more than 30 days before ground-disturbing activities, which will avoid take of this fully protected species. **BIO-MM#16, Conduct Western Pond Turtle Pre-Construction Surveys**, and **BIO-MM#17, Conduct Western Pond Turtle Monitoring**, will involve conducting pre-construction surveys to determine the presence or absence of western pond turtles within the project footprint, and will require the Project Biologist to observe all construction activities within western pond turtle habitat identified during the pre-construction surveys and submit a memorandum documenting compliance. **BIO-MM#18, Implement Western Pond Turtle Avoidance and Relocation**, will include measures to avoid the western pond turtle and, if avoidance is not feasible, the Project Biologist will coordinate with CDFW to identify where to relocate western pond turtles. **BIO-MM#19, Avoid Suitable Giant Garter Snake Habitat**, and **BIO-MM#20, Conduct Work in Giant Garter Snake Habitat during the Active Season**, will protect giant garter snake aquatic habitat in the project footprint by installing environmentally sensitive area fencing and will require all construction activities affecting giant garter snake habitat to occur between May 1 and October 1, which is the active period for this species. **BIO-MM#21, Conduct Pre-Construction Surveys and Monitor for Giant Garter Snake**, will require a Project Biologist to conduct a pre-construction survey for giant garter snake within 24 hours before construction. **BIO-MM#22, Conduct Pre-Construction Surveys for Blainville's Horned Lizards, San Joaquin Coachwhip, and Silvery Legless Lizards**, and **BIO-MM#23, Conduct Blainville's Horned Lizards, San Joaquin Coachwhip, and Silvery Legless Lizards Monitoring, Avoidance, and Relocation**, will require a Biological Monitor to conduct pre-construction surveys in suitable habitats to determine the presence or absence of Blainville's horned lizards within the project footprint and will require a Biological Monitor to observe all construction activities in suitable habitat, avoid the horned lizard where feasible, or otherwise relocate them outside the project footprint in an area approved by the USFWS and CDFW. **BIO-MM#3** and **BIO-MM#4, BIO-MM#49, Compensate for Impacts on Blunt-Nosed Leopard Lizard and Nelson's Antelope Squirrel**, and **BIO-MM#53, Compensate for Destruction of Giant Garter Snake Habitat**, will allow for on-site and off-site restoration and preservation of special-status reptile species, respectively. With implementation of **BIO-MM#9, BIO-MM#10**, and **BIO-MM#14** through **BIO-MM#23**, as well as **BIO-MM#3** and **BIO-MM#4, BIO-MM#49**, and **BIO-MM#53**, the adverse effects on reptiles would be reduced.

Fish

The Authority will implement mitigation measures to minimize impacts on special-status fish species. **BIO-MM#8, Implement Fish Rescue Plan inside Cofferdam**, will provide a plan for fish rescue if and when water depths are low within the cofferdam. **BIO-MM#43, Measure Pile Driving Sound Pressure**, requires monitoring of underwater sound pressure levels from pile-driving during construction of the bridge over San Joaquin River to reduce fish mortality. **BIO-MM#3** and **BIO-MM#4** will allow for on-site and off-site restoration and preservation of special-status fish species habitat, respectively. With implementation of **BIO-MM#3, BIO-MM#4, BIO-MM#8**, and **BIO-MM#43** the adverse effects on fish would be reduced.

Birds

BIO-MM#24, Conduct Pre-Construction Surveys and Monitoring for Raptors, will require the Project Biologist to conduct visual pre-construction surveys where suitable habitats are present

for nesting raptors if construction and habitat removal activities are scheduled to occur during the bird-breeding season (February 1 to September 1). **BIO-MM#25, Bird Protection**, will require the Project Biologist to verify that the catenary system, masts, and other structures such as fencing are designed to be bird and raptor-safe. **BIO-MM#26, Conduct Protocol and Surveys for Swainson's Hawks** and **BIO-MM#27, Swainson's Hawk Nest Avoidance and Monitoring** will require the Project Biologist to conduct pre-construction surveys for Swainson's hawks and, if active nests are found within the project footprint, monitor them until the young fledge or for the length of construction, whichever occurs first. **BIO-MM#28, Monitor Removal of Nest Trees for Swainson's Hawks** will require the Biological Monitor to monitor nest trees for Swainson's hawks in the project footprint. If removal is required, 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 and implement **BIO-MM#50, Compensate for Loss of Swainson's Hawk Nesting Trees**. **BIO-MM#29, Conduct Protocol-Level Surveys for Burrowing Owls**, and **BIO-MM#30, Burrowing Owl Avoidance and Minimization**, will require a qualified, agency-approved biologist to conduct protocol-level surveys and prepare a memorandum identifying how BMPs be implemented related to burrowing owl avoidance and minimization features. **BIO-MM#51, Compensate for Loss of Burrowing Owl Active Burrows and Habitat**, describes how active burrows permanently lost during construction would be mitigated. **BIO-MM#3** and **BIO-MM#4** will allow for on-site and off-site restoration and preservation of special-status bird species habitat, respectively. With implementation of **BIO-MM#24** through **BIO-MM#30**, as well as **BIO-MM#3** and **BIO-MM#4**, **BIO-MM#50**, and **BIO-MM#51**, the adverse effects on birds would be reduced.

Mammals

BIO-MM#31, Conduct Pre-Construction Surveys for Special-Status Bat Species and **BIO-MM#32, Bat Avoidance and Relocation**, will require a qualified, agency-approved biologist to conduct a visual and acoustic pre-construction survey for roosting bats at potential roost sites and prepare a memorandum identifying how BMPs will be implemented during ground disturbing activities if active or hibernation roosts are found during the pre-construction surveys. **BIO-MM#33, Bat Exclusion and Deterrence**, will require the Project Biologist to prepare a memorandum identifying how BMPs related to ground disturbing activities would be implemented if non-breeding or non-hibernating individuals or groups of bats were found within the project footprint during the pre-construction surveys. **BIO-MM#34, Conduct Pre-Construction Surveys for American Badger and Ringtail** and **BIO-MM#35, American Badger and Ringtail Avoidance**, will require the Project Biologist to conduct pre-construction surveys for American badger and ringtail dens within suitable habitats in the project footprint and establish a 50-foot buffer around occupied American badger and ringtail dens found during the pre-construction surveys. **BIO-MM#36, Conduct Protocol-Level Pre-Construction Surveys for San Joaquin Kit Fox**, and **BIO-MM#37, Minimize Impacts on San Joaquin Kit Fox**, will require the Project Biologist to conduct pre-construction surveys and prepare a memorandum identifying how BMPs related to construction activity will be implemented to minimize impacts on San Joaquin kit fox. **BIO-MM#40, Conduct Pre-Construction Surveys for Giant Kangaroo Rat, Nelson's Antelope Ground Squirrel, and Fresno Kangaroo Rat**, and **BIO-MM#41, Monitoring, Avoidance and Relocation of Giant Kangaroo Rat, Nelson's Antelope Ground Squirrel, and Fresno Kangaroo Rat**, require a qualified agency-approved biologist to conduct pre-construction monitoring for special-status rodents within the species' ranges, establish buffers around occupied burrows, and provide for relocation if buffers are not feasible. **BIO-MM#52, Compensate for Destruction of San Joaquin Kit Fox Habitat**, describes how the permanent loss of San Joaquin kit fox habitat will be mitigated. **BIO-MM#38, Construction in Wildlife Movement Corridors**, requires the contractor's Project Biologist to submit a construction avoidance and minimization plan for wildlife movement linkages to the Authority via the Mitigation Manager for concurrence. **BIO-MM#3** and **BIO-MM#4** will allow for on-site and off-site restoration and preservation of special-status mammal species, respectively. With implementation of **BIO-MM#3**, **BIO-MM#4**, and **BIO-MM#31** through **BIO-MM#38**, **BIO-MM#40**, **BIO-MM#41**, and **BIO-MM#52**, the adverse effects on mammals would be reduced.

Comparison of Alternatives

Table 6-3 shows the permanent and temporary construction effects on special-status wildlife species by alternative based on the affinity each species has to specific land cover types identified within the study area. Although suitable habitat has been presumed occupied for terrestrial and aquatic communities, the habitat quality and location within the landscape may not be conducive to specific species requirements and, as such, substantial portions of these areas/acres may not be occupied.

The SR 152 (North) to Road 11 Wye Alternative has the least adverse effects on the aquatic habitats and associated aquatic organisms as compared to the other alternatives. For terrestrial habitats and organisms, all alternatives are generally comparable; however the Avenue 21 to Road 13 Wye Alternative generally has the least adverse effects, followed closely by the SR 152 (North) to Road 11 Wye Alternative.

Table 6-3 Direct Effects on Special-Status Wildlife Species Habitats by Central Valley Wye Alternative (acres)

| Species Group and Species | Associated Land Cover Type | Impact Type | Alternative | | | |
|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|--------------------------------------|-------------------------------|-------------------------------|--------------------------|-------------------------------|
| | | | SR 152 (North) to Road 13 Wye | SR 152 (North) to Road 19 Wye | Avenue 21 to Road 13 Wye | SR 152 (North) to Road 11 Wye |
| Invertebrates | | | | | | |
| Conservancy fairy shrimp, vernal pool fairy shrimp, and vernal pool tadpole shrimp | VP, SEW | Direct Permanent | 0.95 | 1.24 | 1.57 | 0.69 |
| | | Indirect Bisected | 1.21 | 1.21 | 0.92 | 1.18 |
| | | Total | 2.16 | 2.44 | 2.49 | 1.87 |
| Valley elderberry longhorn beetle | MIR, OTR, PFW with elderberry shrubs (excluding areas within Madera and Fresno Counties) | Direct Permanent | 1.49 | 1.21 | 2.11 | 1.15 |
| | | Direct Temporary | 0.43 | 0.39 | 0.86 | 0.38 |
| | | Total | 1.92 | 1.60 | 2.97 | 1.53 |
| Fish² | | | | | | |
| Central Valley steelhead | NAW, OTR (San Joaquin River only) | Direct Temporary and Permanent | 2.24 | 2.24 | 1.97 | 2.18 |
| | | Total Temporary and Permanent | 2.24 | 2.24 | 1.97 | 2.18 |
| Central Valley spring-run Chinook salmon | NAW, OTR (San Joaquin River only) | Direct Temporary and Permanent | 2.24 | 2.24 | 1.97 | 2.18 |
| | | Total Temporary and Permanent | 2.24 | 2.24 | 1.97 | 2.18 |
| Hardhead | NAW, OTR (San Joaquin River only) | Direct Temporary and Permanent | 2.24 | 2.24 | 1.97 | 2.18 |
| | | Total Temporary and Permanent | 2.24 | 2.24 | 1.97 | 2.18 |
| Kern brook lamprey | NAW, OTR (San Joaquin River only) | Direct Temporary and Permanent | 2.24 | 2.24 | 1.97 | 2.18 |
| | | Total Temporary and Permanent | 2.24 | 2.24 | 1.97 | 2.18 |

| Species Group and Species | Associated Land Cover Type | Impact Type | Alternative | | | | |
|------------------------------------------------------------|-------------------------------------------|--------------------------------------|-------------------------------|-------------------------------|--------------------------|-------------------------------|------|
| | | | SR 152 (North) to Road 13 Wye | SR 152 (North) to Road 19 Wye | Avenue 21 to Road 13 Wye | SR 152 (North) to Road 11 Wye | |
| San Joaquin roach | NAW, OTR (San Joaquin River only) | Direct Temporary and Permanent | 2.24 | 2.24 | 1.97 | 2.18 | |
| | | Total Temporary and Permanent | 2.24 | 2.24 | 1.97 | 2.18 | |
| Chinook salmon— Central Valley fall/late-fall run ESU | NAW, OTR (San Joaquin River only) | Direct Temporary and Permanent | 2.24 | 2.24 | 1.97 | 2.18 | |
| | | Total Temporary and Permanent | 2.24 | 2.24 | 1.97 | 2.18 | |
| Amphibians | | | | | | | |
| California tiger salamander | Aquatic: SEW, VP | Direct Permanent | 0.85 | 1.62 | 0.99 | 0.57 | |
| | | Direct Temporary | 0.11 | 0.55 | 0.59 | 0.12 | |
| | | <i>Subtotal</i> | <i>0.96</i> | <i>2.17</i> | <i>1.58</i> | <i>0.69</i> | |
| | Upland: BAR, AGS, MIR, OTR, PFW, PAS, RUD | Direct Permanent | 139.87 | 149.26 | 77.16 | 109.75 | |
| | | Direct Temporary | 48.56 | 163.88 | 35.92 | 45.82 | |
| | | <i>Subtotal</i> | <i>188.43</i> | <i>313.14</i> | <i>113.08</i> | <i>155.57</i> | |
| | Total | | 189.39 | 315.31 | 114.66 | 156.26 | |
| | Western spadefoot | Aquatic: SEW, VP | Direct Permanent | 0.85 | 1.62 | 0.99 | 0.57 |
| | | | Direct Temporary | 0.11 | 0.55 | 0.59 | 0.12 |
| <i>Subtotal</i> | | | <i>0.96</i> | <i>2.17</i> | <i>1.58</i> | <i>0.69</i> | |
| Upland: BAR, AGS, RUD surrounding suitable aquatic habitat | | Direct Permanent | 42.74 | 47.15 | 13.81 | 25.46 | |
| | | Direct Temporary | 1.56 | 22.60 | 1.63 | 2.91 | |
| | | <i>Subtotal</i> | <i>44.29</i> | <i>69.75</i> | <i>15.44</i> | <i>28.37</i> | |
| Total | | 45.26 | 71.92 | 17.02 | 29.06 | | |

| Species Group and Species | Associated Land Cover Type | Impact Type | Alternative | | | |
|----------------------------|--------------------------------------------------------------------------|------------------|-------------------------------|-------------------------------|--------------------------|-------------------------------|
| | | | SR 152 (North) to Road 13 Wye | SR 152 (North) to Road 19 Wye | Avenue 21 to Road 13 Wye | SR 152 (North) to Road 11 Wye |
| Reptiles | | | | | | |
| Western pond turtle | Aquatic: NAW, PFW, SEW | Direct Permanent | 7.11 | 9.30 | 6.04 | 5.11 |
| | | Direct Temporary | 3.85 | 4.78 | 5.53 | 3.12 |
| | | <i>Subtotal</i> | <i>10.96</i> | <i>14.07</i> | <i>11.57</i> | <i>8.24</i> |
| | Upland: AGS, MIR, OTR, RUD within 1,300 feet of suitable aquatic habitat | Direct Permanent | 70.02 | 70.85 | 28.87 | 48.63 |
| | | Direct Temporary | 10.63 | 39.95 | 10.18 | 10.04 |
| | | <i>Subtotal</i> | <i>80.65</i> | <i>110.80</i> | <i>39.04</i> | <i>58.67</i> |
| | Total | | 91.61 | 124.87 | 50.61 | 66.91 |
| Blunt-nosed leopard lizard | BAR, AGS, RUD within range | Direct Permanent | 29.89 | 24.83 | 9.33 | 26.16 |
| | | Direct Temporary | 13.53 | 17.22 | 10.85 | 11.28 |
| | | Total | 43.42 | 42.05 | 20.18 | 37.45 |
| Blainville's horned lizard | BAR, AGS, RUD within range | Direct Permanent | 133.29 | 135.66 | 68.15 | 107.90 |
| | | Direct Temporary | 70.48 | 147.60 | 56.29 | 68.43 |
| | | Total | 203.77 | 283.26 | 124.44 | 176.33 |
| Giant garter snake | Aquatic: NAW, RIC within range | Direct Permanent | 6.34 | 7.83 | 5.02 | 4.73 |
| | | Direct Temporary | 3.72 | 4.26 | 4.95 | 3.01 |
| | | <i>Subtotal</i> | <i>10.06</i> | <i>12.09</i> | <i>9.97</i> | <i>7.74</i> |
| | Upland: AGS, PAS within 200 feet of suitable aquatic habitat | Direct Permanent | 11.98 | 9.06 | 7.61 | 8.04 |
| | | Direct Temporary | 5.57 | 11.09 | 5.58 | 4.14 |
| | | <i>Subtotal</i> | <i>17.55</i> | <i>20.15</i> | <i>13.19</i> | <i>12.19</i> |
| | Total | | 27.61 | 32.24 | 23.15 | 19.93 |

| Species Group and Species | Associated Land Cover Type | Impact Type | Alternative | | | |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-------------------------------|-------------------------------|--------------------------|-------------------------------|
| | | | SR 152 (North) to Road 13 Wye | SR 152 (North) to Road 19 Wye | Avenue 21 to Road 13 Wye | SR 152 (North) to Road 11 Wye |
| Silvery legless lizard | AGS, VSS within range | Direct Permanent | 0.00 | 0.34 | 0.00 | 0.00 |
| | | Direct Temporary | 4.32 | 28.54 | 4.32 | 4.32 |
| | | Total | 4.32 | 28.88 | 4.32 | 4.32 |
| San Joaquin coachwhip | AGS, VSS, within range | Direct Permanent | 0.00 | 0.00 | 0.00 | 0.00 |
| | | Direct Temporary | 4.32 | 4.32 | 4.32 | 4.32 |
| | | Total | 4.32 | 4.32 | 4.32 | 4.32 |
| Birds | | | | | | |
| American peregrine falcon | Foraging: BAR, AGS, COI, COB, COW, DAI, EUC, FAF, FIC, INA, MIR, NAW, ORC, OTR, PFW, PAS, RIC, ROC, RUD, RUR, SEW, SLO, TRC, URB, URW, VP, VIN | Direct Permanent | 2,612.66 | 2,803.99 | 2,411.59 | 2,563.60 |
| | | Direct Temporary | 656.90 | 1,227.35 | 485.80 | 536.24 |
| | | Total | 3,269.56 | 4,031.34 | 2,897.38 | 3,099.84 |
| Bald eagle | Nesting: EUC, MIR, OTR, PFW | Direct Permanent | 1.49 | 1.21 | 2.11 | 1.15 |
| | | Direct Temporary | 0.43 | 0.39 | 0.86 | 0.38 |
| | | <i>Subtotal</i> | <i>1.92</i> | <i>1.60</i> | <i>2.97</i> | <i>1.53</i> |
| | Foraging: BAR, AGS, FAF, FIC, INA, NAW, PAS, RIC, ROC, RUD, SEW, SLO, VP | Direct Permanent | 1,322.74 | 1,214.27 | 1,065.14 | 1,247.54 |
| | | Direct Temporary | 351.82 | 484.75 | 271.32 | 291.90 |
| | | <i>Subtotal</i> | <i>1,674.56</i> | <i>1,699.02</i> | <i>1,336.46</i> | <i>1,539.44</i> |
| Total | 1,676.48 | 1,700.62 | 1,339.43 | 1,540.98 | | |
| Golden eagle | Nesting: EUC, MIR, OTR, PFW | Direct Permanent | 1.30 | 0.42 | 1.93 | 0.77 |
| | | Direct Temporary | 0.27 | 0.12 | 0.62 | 0.09 |
| | | <i>Subtotal</i> | <i>1.57</i> | <i>0.54</i> | <i>2.55</i> | <i>0.86</i> |
| | Foraging: BAR, AGS, FAF, FIC, INA, NAW, PAS, RIC, ROC, RUD, SEW, SLO, VP | Direct Permanent | 1,283.52 | 1,206.43 | 1,027.25 | 1,209.93 |
| | | Direct Temporary | 380.98 | 480.50 | 299.25 | 321.77 |

| Species Group and Species | Associated Land Cover Type | Impact Type | Alternative | | | | |
|--------------------------------------------|---------------------------------------------------------------------|-------------------------------------------------------|-------------------------------|-------------------------------|--------------------------|-------------------------------|----------|
| | | | SR 152 (North) to Road 13 Wye | SR 152 (North) to Road 19 Wye | Avenue 21 to Road 13 Wye | SR 152 (North) to Road 11 Wye | |
| | Foraging: BAR, AGS, FAF, FIC, INA, PAS, RIC, ROC, RUD, SEW, SLO, VP | <i>Subtotal</i> | 1,664.50 | 1,686.93 | 1,326.49 | 1,531.70 | |
| | Total | | 1,666.06 | 1,687.47 | 1,329.05 | 1,532.56 | |
| Swainson's hawk | Nesting: EUC, MIR, ORC, OTR, TRC | Direct Permanent | 611.84 | 809.78 | 913.71 | 662.90 | |
| | | Direct Temporary | 170.93 | 478.33 | 166.51 | 153.03 | |
| | | <i>Subtotal</i> | 782.77 | 1,288.11 | 1,080.22 | 815.92 | |
| | Foraging: BAR, AGS, FAF, FIC, INA, PAS, ROC, RUD, SEW, TRC, | Direct Permanent | 1,360.91 | 1,206.27 | 1,104.75 | 1,287.30 | |
| | | Direct Temporary | 302.93 | 479.99 | 221.16 | 243.73 | |
| | | <i>Subtotal</i> | 1,663.83 | 1,686.26 | 1,325.91 | 1,531.03 | |
| | Nesting/Foraging: | Direct Permanent | 205.26 | 208.44 | 104.18 | 179.66 | |
| | | Direct Temporary | 83.54 | 134.50 | 29.43 | 62.41 | |
| | | <i>Subtotal</i> | 288.80 | 342.93 | 133.61 | 242.07 | |
| | Total | | 2,735.40 | 3,317.30 | 2,539.74 | 2,589.02 | |
| | Greater sandhill crane | Foraging: AGS, FAF, FIC, INA, PAS, RIC, ROC, RUD, SEW | Direct Permanent | 1,341.02 | 1,173.61 | 1,083.04 | 1,271.55 |
| | | | Direct Temporary | 251.01 | 403.48 | 170.08 | 192.86 |
| Total | | | 1,592.02 | 1,577.09 | 1,253.12 | 1,464.40 | |
| Western snowy plover (interior population) | Foraging: BAR, AGS, FAF, FIC, INA, PAS, RIC, ROC, RUD | Direct Permanent | 1,360.22 | 1,204.81 | 1,103.81 | 1,286.91 | |
| | | Direct Temporary | 291.82 | 468.47 | 209.61 | 232.60 | |
| | | Total | 1,652.04 | 1,673.28 | 1,313.42 | 1,519.51 | |
| Least Bell's vireo | Nesting: MIR, OTR, PFW | Direct Permanent | 1.49 | 1.21 | 2.11 | 1.15 | |
| | | Direct Temporary | 0.43 | 0.39 | 0.86 | 0.38 | |
| | | <i>Subtotal</i> | 1.92 | 1.60 | 2.97 | 1.53 | |
| | Direct Permanent | 6.34 | 7.83 | 5.02 | 4.73 | | |

| Species Group and Species | Associated Land Cover Type | Impact Type | Alternative | | | | |
|----------------------------------------------------|---------------------------------------------------------------|--------------------------------------------------------------------|-------------------------------|-------------------------------|--------------------------|-------------------------------|----------|
| | | | SR 152 (North) to Road 13 Wye | SR 152 (North) to Road 19 Wye | Avenue 21 to Road 13 Wye | SR 152 (North) to Road 11 Wye | |
| | Foraging: MIR, NAW, OTR, PFW | Direct Temporary | 3.72 | 4.26 | 4.95 | 3.01 | |
| | | <i>Subtotal</i> | 10.06 | 12.09 | 9.97 | 7.74 | |
| | Total | | 11.99 | 13.69 | 12.93 | 9.28 | |
| Tricolored blackbird | Nesting: COW, NAW | Direct Permanent | 20.53 | 20.95 | 29.46 | 15.39 | |
| | | Direct Temporary | 9.29 | 9.37 | 8.94 | 6.74 | |
| | | <i>Subtotal</i> | 29.82 | 30.31 | 38.40 | 22.14 | |
| | Foraging: AGS, DAI, INA, MIR, OTR, PAS, VP | Direct Permanent | 212.88 | 173.12 | 129.68 | 158.47 | |
| | | Direct Temporary | 50.75 | 111.21 | 32.52 | 27.79 | |
| | | <i>Subtotal</i> | 263.63 | 284.33 | 162.20 | 186.25 | |
| | Nesting/Foraging: FIC, FRM, SEW | Direct Permanent | 1,018.06 | 913.76 | 795.75 | 1,026.30 | |
| | | Direct Temporary | 180.29 | 198.47 | 110.10 | 140.27 | |
| | | <i>Subtotal</i> | 1,198.35 | 1,112.23 | 905.85 | 1,166.56 | |
| | Total | | 1,491.80 | 1,426.87 | 1,106.45 | 1,374.96 | |
| | Western burrowing owl | Nesting/Foraging: BAR, AGS, COI, COW, INA, ORC, RUD, RUR, TRC, URB | Direct Permanent | 1,134.84 | 1,351.02 | 1,180.91 | 1,107.01 |
| | | | Direct Temporary | 386.15 | 887.98 | 281.92 | 332.68 |
| Total | | 1,520.99 | 2,239.00 | 1,462.82 | 1,439.70 | | |
| Special-status ground nesting bird species | Nesting/Foraging: BAR, AGS, FAF, FIC, INA, PAS, RUD, SEW, TRC | Direct Permanent | 1,433.66 | 1,309.20 | 1,056.99 | 1,373.83 | |
| | | Direct Temporary | 361.62 | 595.93 | 217.61 | 289.39 | |
| | Total | 1,795.28 | 1,905.13 | 1,274.60 | 1,663.22 | | |
| Special-status wading bird/shorebird/ duck species | Nesting: COB, COW, MIR, NAW, OTR, PFW, PAS, SEW | Direct Permanent | 53.52 | 41.48 | 61.18 | 42.32 | |
| | | Direct Temporary | 13.37 | 54.85 | 14.87 | 10.54 | |
| | | <i>Subtotal</i> | 66.89 | 96.33 | 76.06 | 52.87 | |
| | | Direct Permanent | 1,330.44 | 1,191.88 | 1,073.05 | 1,261.55 | |

| Species Group and Species | Associated Land Cover Type | Impact Type | Alternative | | | | |
|------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-------------------------------|--------------------------|-------------------------------|----------|
| | | | SR 152 (North) to Road 13 Wye | SR 152 (North) to Road 19 Wye | Avenue 21 to Road 13 Wye | SR 152 (North) to Road 11 Wye | |
| | Foraging: BAR, AGS, COB, COW, FAF, FIC, INA, MIR, NAW, OTR, PFW, PAS, RIC, ROC, RUD, SEW, VP | Direct Temporary | 288.31 | 377.31 | 204.84 | 229.22 | |
| | | <i>Subtotal</i> | <i>1,618.75</i> | <i>1,569.18</i> | <i>1,277.88</i> | <i>1,490.77</i> | |
| | | Total | 1,685.64 | 1,665.51 | 1,353.94 | 1,543.63 | |
| Special-status tree-nesting bird species | Nesting: EUC, MIR, ORC, OTR, PFW, TRC | Direct Permanent | 894.66 | 1,018.22 | 1,095.45 | 920.11 | |
| | | Direct Temporary | 254.47 | 612.82 | 195.94 | 215.43 | |
| | | <i>Subtotal</i> | <i>1,149.12</i> | <i>1,631.04</i> | <i>1,291.38</i> | <i>1,135.55</i> | |
| | Foraging: AGS, FAF, FIC, INA, MIR, ORC, OTR, PFW, PAS, ROC, RUD, SEW, TRC, | Direct Permanent | 1,360.01 | 1,199.55 | 1,102.03 | 1,290.54 | |
| | | Direct Temporary | 250.52 | 356.57 | 169.59 | 192.37 | |
| | | <i>Subtotal</i> | <i>1,610.52</i> | <i>1,556.12</i> | <i>1,271.62</i> | <i>1,482.90</i> | |
| | Total | 2,759.65 | 3,187.16 | 2,563.00 | 2,618.45 | | |
| | Mammals | | | | | | |
| | Pallid bat | Roosting: MIR, OTR, PFW Foraging: BAR, AGS, COI, COB, COW, DAI, EUC, FAF, FIC, INA, MIR, NAW, ORC, OTR, PFW, PAS, ROC, RUD, SEW, TRC, URB, VP, VIN | Direct Permanent | 2,616.20 | 2,803.99 | 2,415.13 | 2,567.14 |
| Direct Temporary | | | 656.90 | 1,227.35 | 485.80 | 536.24 | |
| Total | | | 3,273.10 | 4,031.34 | 2,900.92 | 3,103.38 | |
| Western red bat | Roosting: MIR, OTR, PFW Foraging: BAR, AGS, COI, COB, COW, DAI, EUC, FAF, FIC, INA, MIR, NAW, ORC, OTR, PFW, PAS, ROC, RUD, SEW, TRC, URB, VP, VIN | Direct Permanent | 2,616.20 | 2,803.99 | 2,415.13 | 2,567.14 | |
| | | Direct Temporary | 656.90 | 1,227.35 | 485.80 | 536.24 | |
| | | Total | 3,273.10 | 4,031.34 | 2,900.92 | 3,103.38 | |

| Species Group and Species | Associated Land Cover Type | Impact Type | Alternative | | | |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------|------------------|-------------------------------|-------------------------------|--------------------------|-------------------------------|
| | | | SR 152 (North) to Road 13 Wye | SR 152 (North) to Road 19 Wye | Avenue 21 to Road 13 Wye | SR 152 (North) to Road 11 Wye |
| Western mastiff bat | Foraging: BAR, AGS, COI, COB, COW, DAI, EUC, FAF, FIC, INA, MIR, NAW, ORC, OTR, PFW, PAS, ROC, RUD, RUR, SEW, TRC, URB, VP, VIN | Direct Permanent | 2,616.20 | 2,802.78 | 2,415.13 | 2,567.14 |
| | | Direct Temporary | 656.90 | 1,226.96 | 485.80 | 536.24 |
| | | Total | 3,273.10 | 4,029.74 | 2,900.92 | 3,103.38 |
| Ringtail | MIR, OTR, PFW | Direct Permanent | 1.49 | 1.21 | 2.11 | 1.15 |
| | | Direct Temporary | 0.43 | 0.39 | 0.86 | 0.38 |
| | | Total | 1.92 | 1.60 | 2.97 | 1.53 |
| American badger | BAR, AGS, INA, MIR, OTR, PAS, RUD | Direct Permanent | 212.42 | 188.57 | 159.40 | 169.69 |
| | | Direct Temporary | 97.08 | 218.08 | 77.81 | 86.00 |
| | | Total | 309.50 | 406.65 | 237.21 | 255.69 |
| San Joaquin kit fox | Denning: COW | Direct Permanent | 14.74 | 13.67 | 25.77 | 11.18 |
| | | Direct Temporary | 5.80 | 6.03 | 4.46 | 3.99 |
| | | <i>Subtotal</i> | <i>20.54</i> | <i>19.70</i> | <i>30.23</i> | <i>15.17</i> |
| | Denning and Movement: AGS, COW, PAS, RUD | Direct Permanent | 112.65 | 103.76 | 47.62 | 87.69 |
| | | Direct Temporary | 16.40 | 86.34 | 16.20 | 15.25 |
| | | <i>Subtotal</i> | <i>129.06</i> | <i>190.10</i> | <i>63.82</i> | <i>102.94</i> |
| | Movement: BAR, INA, ORC, ROC, RUD | Direct Permanent | 832.94 | 996.76 | 1,164.61 | 827.50 |
| | | Direct Temporary | 269.17 | 618.46 | 252.72 | 233.28 |
| | | <i>Subtotal</i> | <i>1,102.12</i> | <i>1,615.23</i> | <i>1,417.33</i> | <i>1,060.77</i> |
| | Total | | 1,251.71 | 1,825.02 | 1,511.38 | 1,178.88 |

| Species Group and Species | Associated Land Cover Type | Impact Type | Alternative | | | |
|----------------------------|----------------------------|------------------|-------------------------------|-------------------------------|--------------------------|-------------------------------|
| | | | SR 152 (North) to Road 13 Wye | SR 152 (North) to Road 19 Wye | Avenue 21 to Road 13 Wye | SR 152 (North) to Road 11 Wye |
| Giant Kangaroo Rat | AGS within range | Direct Permanent | 0.00 | 0.00 | 0.00 | 0.00 |
| | | Direct Temporary | 0.06 | 0.06 | 0.06 | 0.06 |
| | Total | | 0.06 | 0.06 | 0.06 | 0.06 |
| Nelson's antelope squirrel | AGS, VSS within range | Direct Permanent | 0.00 | 0.00 | 0.00 | 0.00 |
| | | Direct Temporary | 4.26 | 4.26 | 4.26 | 4.26 |
| | Total | | 4.26 | 4.26 | 4.26 | 4.26 |
| Fresno Kangaroo Rat | AGS, VSS within range | Direct Permanent | 46.33 | 41.36 | 10.29 | 42.39 |
| | | Direct Temporary | 12.04 | 12.10 | 10.88 | 10.03 |
| | Total | | 58.37 | 53.46 | 21.17 | 52.42 |

Source: Author's compilation, 2018 Calculations generated using ESRI ArcGIS versions 10.1, 10.2, and 10.3 from data generated by field surveys and aerial photo interpretation during 2010–2018. Minor differences in the totals are the result of rounding.

¹ Direct effects on vernal pool invertebrates include both permanent and temporary effects because temporary effects on vernal pools are considered permanent. For all other species, direct permanent and direct temporary effect values reported separately. Indirect Bisected vernal pools occur both inside and outside of the project footprint. The portion outside the footprint is referred to as "indirect bisected," but is considered a permanent direct effect for purposes of calculating mitigation requirements.

² Direct effect numbers presented are the total of permanent and temporary effects within the Central Valley Wye alternatives project footprints. Actual permanent effects from placement of piers will be less depending on final designs, but will be less than the total numbers presented in this table.

- | | |
|-----------------------------------|-----------------------------------|
| SR = State Route | OTR = Other Riparian |
| BAR = Barren | PFW = Palustrine Forested Wetland |
| AGS = California Annual Grassland | PAS = Pasture |
| COI = Commercial/Industrial | RIC = Rice Field |
| COB = Constructed Basin | ROC = Row Crop |
| COW = Constructed Watercourse | RUD = Ruderal |
| DAI = Dairy | SEW = Seasonal Wetland |
| EUC = Eucalyptus | SLO = Slough |
| FAF = Fallow Field | TRC = Transportation Corridor |
| FIC = Field Crop | URB = Urban |
| INA = Inactive Agriculture | URW = Urban Woodland |
| MIR = Mixed Riparian | VP = Vernal Pool |
| NAW = Natural Watercourse | VPC = Vernal Pool Complex |
| ORC = Orchard | VIN = Vineyard |
| | VSS = Valley Sink Scrub |

6.1.4 Critical Habitat

Construction activities could result in direct and indirect impacts on federally designated critical habitat for San Joaquin Orcutt grass, vernal pool fairy shrimp, or vernal pool tadpole shrimp (Table 6-4). Construction activities are not likely to have direct impacts but could have indirect impacts on federally designated critical habitat for Conservancy fairy shrimp, central valley steelhead, Colusa grass, fleshy owl’s clover, and Greene’s tuctoria (Table 6-4).

Table 6-4 Critical Habitat within the Core Habitat Study Area by Central Valley Wye Alternatives (acres; designated critical habitat/actual aquatic habitat in designated critical habitat)

| Species with Critical Habitat | SR 152 (North) to Road 13 Wye | SR 152 (North) to Road 19 Wye | Avenue 21 to Road 13 Wye | SR 152 (North) to Road 11 Wye |
|-------------------------------|-------------------------------|-------------------------------|--------------------------|-------------------------------|
| San Joaquin Orcutt Grass | 0/0 | 367.46/4.72 | 0/0 | 0/0 |
| Vernal Pool Fairy Shrimp | 0/0 | 364.06/4.72 | 0/0 | 2.94/0.21 |
| Vernal Pool Tadpole Shrimp | 0/0 | 40.83/0.00 | 0/0 | 2.94/0.21 |
| Conservancy Fairy Shrimp | 0/0 | 345.34/4.72 | 0/0 | 0/0 |
| Central Valley steelhead | 0/0 | 0.81/0.81 | 0/0 | 0/0 |
| Colusa grass | 0/0 | 345.34/4.72 | 0/0 | 0/0 |
| Fleshy owl’s clover | 0/0 | 345.34/4.72 | 0/0 | 0/0 |
| Greene’s tuctoria | 0/0 | 345.34/4.72 | 0/0 | 0/0 |
| Range | 0/0 | 367.46/4.72 | 0/0 | 2.94/0.21 |

Source: USFWS, 2015
SR = State Route

Because critical habitat that could be directly affected by the Central Valley Wye alternatives are mostly designated for vernal pool species (except Central Valley steelhead), the direct effects on critical habitat during construction would be similar to direct effects on special-status vernal pool branchiopods described above. For vernal pool species, an analysis of the land cover mapping data conducted for this study indicates that there is no vernal pool habitat and very little seasonal wetland habitat within the areas designated as critical habitat (Table 6-4). Construction of the Central Valley Wye alternatives would result in the direct removal of a very small amount of these primary constituent elements. The design characteristics of the Central Valley Wye alternatives include effective measures to avoid and offset construction disturbance of vernal pool brachiopod critical habitat (BIO-IAMF#9).

All Central Valley Wye alternatives would stockpile soil, change the contour of landscape or disturb hardpan soils, have the potential for chemical spills or the introduction of invasive weeds, erect structures, and introduce construction-related dust. As part of the design of the Central Valley Wye alternatives, the Authority will prepare and implement a Weed Control Plan (BIO-IAMF#8) to minimize and avoid the spread of weeds during construction activities. The Weed Control Plan also includes delineation of environmentally restricted areas and would provide for identification of, contractor awareness of, and avoidance of sensitive biological resources adjacent to but outside the project footprint. The Central Valley Wye alternatives design will also minimize the spread of invasive plants outside the project footprint by confirming that vehicles are cleaned of mud and plant materials prior to working in new areas, thus making sure that invasive plant seeds are not carried between construction work areas (BIO-IAMF#19). Therefore, the design of the Central Valley Wye alternatives would minimize the impacts of habitat degradation, alteration of vernal pool and seasonal wetland hydrology, reduction of reproductive success and survival of invertebrate species, and water contamination.

The Site 7—Le Grand Junction/Sand Mush Road, Warnerville–Wilson 230 kV Transmission Line, associated with the SR 152 (North) to Road 19 Wye Alternative, could have indirect impacts on critical habitat for central valley steelhead within the Merced River and Tuolumne River. While the construction work areas associated with existing self-supporting lattice steel towers are not within the channel of the Merced and Tuolumne Rivers, they are located within 250 feet of both the rivers; therefore, indirect impacts on critical habitat due to increased erosion, sedimentation, and siltation as a result of ground disturbance during construction could result. However, as part of the design of the Central Valley Wye alternatives, the Authority will develop and implement a construction site BMP field manual that identifies BMPs for temporary soil stabilization and temporary sediment control, among other general site cleanliness measures (BIO-IAMF#24). Therefore, the design of the Central Valley Wye alternatives would minimize the impacts of sedimentation and siltation on critical habitat for central valley steelhead.

Mitigation Measures

Proposed mitigation measures including **BIO-MM#1, Conduct Protocol-Level Pre-construction Surveys for Special-Status Plant Species and Special-Status Plant Communities, BIO-MM#2, Prepare and Implement Plan for Salvage, Relocation, and/or Propagation of Special-status Plant Species, BIO-MM#5, Conduct Pre-Construction Sampling and Assessment for Vernal Pool Fauna, BIO-MM#6, Seasonal Vernal Pool Work Restriction, BIO-MM#7, Implement and Monitor Vernal Pool Protection, and BIO-MM#8, Implement Fish Rescue Plan inside Cofferdam** as well as mitigation measures which will compensate for unavoidable impacts such as **BIO-MM#45, Compensate for Impacts on Special-Status Plant Species, and BIO-MM#46, Compensate for Impacts on Vernal Pool Fairy Shrimp and Vernal Pool Tadpole Shrimp** will further limit impacts on this critical habitat.

Comparison of Alternatives

Two alternatives, the SR 152 (North) to Road 13 Wye Alternative and the Avenue 21 to Road 13 Wye Alternative, would have no effects on critical habitat. The SR 152 (North) to Road 11 Wye Alternative would affect critical habitat for two species, vernal pool fairy shrimp and vernal pool tadpole shrimp. The SR 152 (North) to Road 19 Wye Alternative would affect vernal pool fairy shrimp and vernal pool tadpole shrimp, as well as six other species; San Joaquin Orcutt grass, conservancy fairy shrimp, Central Valley steelhead, Colusa grass, fleshy owl's-clover, and Greene's tuctoria (Table 6-4). With the exception of Central Valley steelhead, each of these species requires vernal pool habitat. The Site 7—Le Grand Junction/Sand Mush Road, Warnerville–Wilson 230 kV Transmission Line, associated with the SR 152 (North) to Road 19 Wye Alternative could have indirect effects on critical habitat for Central Valley steelhead within the Merced River and Tuolumne River. The greatest extent of direct effect (367.46 acres of mapped critical habitat and 4.72 acres of aquatic habitat within that area) would result from construction of the SR 152 (North) to Road 19 Wye Alternative. The SR 152 (North) to Road 11 Alternative would have less direct effects (2.94 acres of mapped critical habitat and 0.21 acre of aquatic habitat within that area).

6.1.5 Habitat Linkages and Wildlife Movement Corridors

Known wildlife movement corridors were identified through a review of published technical reports, previous reports prepared for the Merced to Fresno Section, and information available from regulatory agencies. The Biological Resources and Wetlands Technical Report (Authority and FRA 2016b) includes a description of the sources of information reviewed to ascertain the location and species-specific requirements of the wildlife movement corridors that have been identified in the vicinity of the Central Valley Wye alternatives.

Central Valley Wye Effects

The construction and operation of the Central Valley Wye alternatives may result in direct effects and/or indirect effects on habitat types where linkages and movement corridors have been identified. Table 6-5 shows the distance in miles of designated wildlife movement corridors crossed by the Central Valley Wye alternatives. The Central Valley Wye alternatives incorporate

a number of engineering designs that would facilitate wildlife movement. At select locations, specific wildlife movement structures would be installed. However, implementation, including design and locations of these structures, vary across the Central Valley Wye alternatives due to existing adjacent infrastructure.

Table 6-5 Wildlife Movement Corridors Crossed and Affected by the Wye Alternatives (miles)

| Alternative | Eastman Lake-Bear Creek ECA | Ash Slough-Merced NWR ECA | Sandy Mush Road Area | Modeled Wildlife Corridors | Total |
|-------------------------------|-----------------------------|---------------------------|----------------------|----------------------------|--------------|
| SR 152 (North) to Road 13 Wye | 3.88 | 1.86 | 1.43 | 3.84 | 11.01 |
| SR 152 (North) to Road 19 Wye | 6.72 | 1.86 | 1.40 | 7.49 | 17.48 |
| Avenue 21 to Road 13 Wye | 3.88 | 2.30 | 1.43 | 4.23 | 11.84 |
| SR 152 (North) to Road 11 Wye | 2.98 | 1.87 | 1.81 | 3.77 | 10.42 |

Source: Author's compilation, 2016
 ECA = Essential Connectivity Area
 NWR = National Wildlife Refuge
 SR = State Route

Direct Construction Effects

The Eastman Lake-Bear Creek ECA, Ash Slough-Merced National Wildlife Refuge ECA, Sandy Mush Road Area, and modeled wildlife corridors are located within the project footprint. The HSR system has incorporated permeability features within the project design as a component of the project description. These permeability features allow wildlife access opportunities between the landscapes on both sides of the facility. These permeability features include elevated rail structures, wildlife-dedicated crossing structures, roadway overpasses, and cross culverts that, coupled with the viability of the hydraulic crossings, maintain permeability. Fencing of the at-grade alignment would lessen the potential for collisions along the Central Valley Wye alternatives. The impact analysis considers these engineering design features within the context of the biological resource effects regarding wildlife movement.

Existing linear facilities, including SR 99, the existing BNSF and the UPRR alignments, roadways and canals, and urban and certain agricultural land uses (e.g., vineyards) impede wildlife movement for free-ranging mammals (e.g., San Joaquin kit fox, coyote, badger, raccoon, skunk). As a result, the ability of wildlife species to move freely across the Central Valley is impaired. Natural dispersal corridors such as waterways have also become increasingly constrained due to adjacent land use conversion and infrastructure.

Fenced, at-grade track of the Central Valley Wye alternatives with wildlife-dedicated and other crossings (e.g., culverts, road crossings over the HSR track) would cross the ECAs, Sandy Mush Road Area, and modeled wildlife corridors. Modeled wildlife corridors occur within portions of the ECAs and occur at several locations outside the ECAs along the Central Valley Wye alternatives. Direct effects include the placement of temporary and permanent linear barriers to wildlife movement with restricted crossing opportunities. This could substantially degrade linkages, which may no longer provide food, cover, or ease of travel for many species. These shifts could also result increased competition for resources as well as the potential for isolation of populations. The severity of each Central Valley Wye alternative's impact is dependent on the permeability of the alternative (i.e. the presence of elevated structures, road crossings, and/or the availability of wildlife crossings), the amount of natural land within and adjacent to each alternative, and the presence of identified linkages.

Crossing features incorporated into the project design would facilitate the movement of wildlife between the landscapes on both sides of the facility. Elevated track sections are a fundamental project design feature. The elevated track provides permeability because there is no fencing or other barrier effect on local wildlife movement. Sections of the Central Valley Wye alternatives include elevated tracks, which would allow for unimpeded wildlife movement. For at-grade segments, the Central Valley Wye alternatives incorporate wildlife-dedicated crossings (BIO-IAMF#25). The final size and frequency of the wildlife-dedicated crossings will be determined in coordination with the USFWS and CDFW under their respective permitting processes that require that effects on movement by listed species are avoided or minimized to the extent feasible.

Construction activities in the ECAs, Sandy Mush Road Area, and modeled wildlife corridors are not likely to impair the habitat linkages between existing habitat blocks. Effects associated with construction activities may temporarily impede wildlife movement within the Central Valley Wye alternatives vicinity. Temporary and permanent effects from placement of barriers within natural lands and known linkages during construction activities may affect the ability of special-status species and other free-ranging animals to move freely within the ECAs, Sandy Mush Road Area, and modeled wildlife movement corridors (linkages).

Additionally, the Authority would implement the mitigation measures. With implementation of these measures, effects on wildlife movement corridors would be minimized.

Indirect Construction Effects

Construction of the Central Valley Wye alternatives would result in concentrated heavy vehicle and equipment use within existing agricultural and urban development areas. Construction activities occurring at or in the vicinity of wildlife movement corridors (linkages) or natural lands may result in indirect disruption of wildlife movement through lighting, noise, motion, and startle effects. With implementation of the mitigation measures, indirect effects on wildlife movement corridors would be minimized.

Indirect Operations Effects

In addition to high-speed trains passing over tracks through wildlife movement corridors, implementation of the Central Valley Wye alternatives would require ongoing operations and maintenance activities (e.g., routine inspection and maintenance of the HSR right-of-way). These operations activities occurring at or in the vicinity of wildlife movement corridors or natural lands may result in indirect disruption of wildlife movement through lighting, noise, motion, and startle effects. Some indirect disturbance, such as noise, of the habitats associated with a wildlife corridor may cause wildlife to avoid use of a linkage. The FRA has established noise exposure limits for wildlife (mammals and birds). Noise exposure limits for each are a sound exposure level (SEL) of 100 dBA from passing trains. It is assumed that noise exposure that exceeds the 100-dBA SEL threshold could elicit a negative response, such as avoidance of a linkage.

In at-grade crossings the screening distance (i.e., distance from the trackway centerline within which an effect could result) for a single-train pass-by SEL of 100 dBA would be approximately 100 feet from the track centerline (for a total width of 200 feet). In all areas that are at-grade where the right-of-way is less than a width of 200 feet and that are adjacent to substantive wildlife habitat (e.g., identified habitat linkages), the HSR could expose wildlife to noise levels that exceed the 100-dBA SEL threshold, and which may elicit a startle, avoidance, or negative behavior by wildlife species. No mitigation is required.

Mitigation Measures

The Authority will implement mitigation measures to minimize the impacts on wildlife movement corridors. **BIO-MM#39, Install Flashing or Slats within Security Fencing**, will install permanent security fencing along portions of the project that are adjacent to wildlife movement corridors and natural habitats, which will prevent injury to wildlife species attempting to cross the Central Valley Wye alternatives. **AVR-MM#2, Minimize Light Disturbance during Construction** will shield nighttime construction lighting and direct it downward in such a manner that the light source is not

visible offsite, and so that the light does not fall outside the boundaries of the project site. **N&V-MM#1, Construction Noise Mitigation** will require the contractor to monitor construction noise to verify compliance with noise limits. With implementation of **AVR-MM#2, N&V-MM#1**, and of **BIO-MM#39**, the adverse effects on habitat linkages and wildlife movement corridors would be reduced.

Comparison of Alternatives

The SR 152 (North) to Road 19 Wye Alternative would have the highest potential effects on wildlife movement corridors because it would affect more overall acres of land than the other three alternatives, especially the Eastman Lake-Bear Creek ECA (Table 6-5) and crosses the greatest distance (17.48 miles) relative to the other alternatives. The Avenue 21 to Road 13 Wye Alternative would affect a similar, but slightly greater amount of wildlife movement corridor acres than the SR 152 (North) to Road 13 Wye Alternative; however, the Avenue 21 to Road 13 Wye Alternative crosses about 0.44 mile more of the Ash Slough–Merced National Wildlife Refuge ECA than the other three alternatives. The SR 152 (North) to Road 11 Wye Alternative would affect the lowest amount of wildlife movement corridors acres overall, but would cross the greatest distance of the Sandy Mush Road Area as compared to the other alternatives.

6.2 Other Environmental Consequences

6.2.1 Environmental Factors Evaluated and Not Considered Further in this Summary Report

The following environmental factors evaluated in the Draft Supplemental EIR/EIS were considered by the Authority and FRA but are not included in this Summary Report, based on lack of findings of potentially adverse effects or the absence of differences among the alternatives:

- Hazardous Materials and Waste
- Safety and Security
- Socioeconomics
- Regional Growth
- Air Quality
- Land Use
- Electromagnetic Fields and Electromagnetic Interference
- Public Utilities and Energy
- Geology, Soils, Seismicity, and Paleontological Resources
- Hydrology and Water Resources

6.2.2 Transportation and Traffic

This section evaluates how the Central Valley Wye alternatives could affect transportation. Construction impacts include road closures and relocations; construction material hauling impacts on regional transportation; impacts on circulation and emergency access; transit conditions; and roadway operations. All construction impacts would be minimized or avoided and therefore no mitigation measures are required. Central Valley Wye alternatives operations would not result in any effects on transportation resources.

Road Closures and Relocations

Construction of any of the Central Valley Wye alternatives would affect major roadways through temporary and permanent road closures and relocations that would result in temporary or permanent diversion of traffic onto other roadways.

Construction adjacent to highways (e.g., SR 99 and SR 152) could result in temporary closure of traffic lanes, reduction of lane widths, reduced speed limits, temporary on- and off-ramp closures, detours, and temporary closure of the freeway for placement of structural elements of installation or removal of falsework. These closures and restrictions would increase average vehicle delay times on affected roads, increase average trip durations in the project area, and prompt some motorists to avoid traveling through the project area to the extent alternate routes are available.

Temporary roadway closures for construction would not substantially increase hazards because of minimization practices included in the construction transportation plan (CTP) (TR-IAMF#2, Construction Transportation Plan). Temporary road closures for construction also would not substantially increase incompatible uses (e.g., schools, day care centers, residences) after implementation of minimization practices included in the CTP (TR-IAMF#2).

Construction of any of the Central Valley Wye alternatives would result in permanent road closures from grade separations, which would result in permanent changes to vehicle movements in those areas affected by the closures. Construction of any of the Central Valley Wye alternatives would also result in the permanent closure or modification of some existing roadways. Traffic from permanently closed or modified roads would be diverted to other nearby streets.

Mitigation Measures

With implementation of the CTP (TR-IAMF#2), construction impacts resulting from road closures and relocations would be minimized or avoided. The CTP would ensure that traffic was not routed toward incompatible uses. Therefore, mitigation is not required.

Comparison of Alternatives

Permanent road closures would total 38 for the SR 152 (North) to Road 13 Wye Alternative, 36 for the SR 152 (North) to Road 19 Wye Alternative, 30 for the Avenue 21 to Road 13 Wye Alternative, and 33 for the SR 152 (North) to Road 11 Wye Alternative. Thus, the SR 152 (North) to Road 13 Alternative would have the most impacts on the existing traffic circulation patterns while the Avenue 21 to Road 13 Alternative would have the least impact; the SR 152 (North) to Road 19 Wye and SR 152 (North) to Road 11 Wye Alternatives would be intermediate in their impacts.

Additionally, depending on the alternative selected, portions of SR 152 may be rerouted and grade-separated interchanges may be introduced. Grade-separated interchanges proposed as part of the Central Valley Wye alternatives would reduce traffic delay at current at-grade intersections and improve the safety of the intersections for motorists, bicyclists, and pedestrians. New, permanent road crossings would total 24 for the SR 152 (North) to Road 13 Wye Alternative, 29 for the SR 152 (North) to Road 19 Wye Alternative, 28 for the Avenue 21 to Road 13 Wye Alternative, and 24 for the SR 152 to Road 11 Wye Alternative. Thus, the SR 152 (North) to Road 19 Wye and Avenue 21 to Road 13 Wye Alternatives would have the greatest impacts on traffic delay, and the SR 152 (North) to Road 13 Wye and SR 152 (North) to Road 11 Wye Alternatives would have the least impacts.

Considering both the changes in the traffic circulation patterns due to road closures and the impacts on traffic delays of constructing new grade-separated interchanges, the Avenue 21 to Road 13 Wye Alternative would have the least impact on traffic congestion on major roadways and the SR 152 (North) to Road 13 Wye Alternative would have the most impact.

Impacts on Circulation and Emergency Access

Project-related construction traffic could affect vehicle circulation and access by emergency vehicles in areas where construction activities are occurring, either through the temporary closure of traffic lanes or through heavy truck traffic because materials are brought to the construction sites and demolished or excavated materials are hauled away. This impact would be applicable to all Central Valley Wye alternatives, and would be minimized through the Authority's implementation of TR-IAMF#2. This measure would minimize the impact of construction and construction traffic on emergency access by establishing emergency access routes and providing for 24-hour access by emergency vehicles during construction.

Construction of the Central Valley Wye would also affect vehicle circulation on highways and local roadways and as a result of temporary lane or road closures, temporary realignment or rerouting of roadways, underground and aboveground utility work, and construction-related traffic. This could temporarily alter levels of service and traffic volumes for intersections and roadways, and

access to nearby and adjoining roadways. The Authority would implement IAMFs (TR-IAMF#1, Protection of Public Roadways during Construction; TR-IAMF#2; TR-IAMF#3, Off-Street Parking for Construction-Related Vehicles; TR-IAMF#6, Restriction on Construction Hours; TR-IAMF#7, Construction Truck Routes; and TR-IAMF#8, Construction during Special Events) to maintain acceptable levels of service and traffic volumes on intersections and roadways during construction, reduce conflicts between vehicles and construction-related traffic, and make sure access is maintained.

Mitigation Measures

With implementation of TR-IAMF#1, TR-IAMF#2 TR-IAMF#3, TR-IAMF#6, TR-IAMF#7, and TR-IAMF#8, construction impacts on circulation and emergency access would be minimized or avoided. Therefore, mitigation is not required.

Comparison of Alternatives

Temporary road closures from three of the four Central Valley Wye alternatives could affect traffic operations on SR 152. The impacts on traffic operations on SR 152 would be about the same for any of the three SR 152 alternatives. Construction of the Avenue 21 to Road 13 Wye Alternative would have the least impact on traffic operations on SR 152.

The Avenue 21 to Road 13 Wye Alternative is the only alternative that would include a HSR bridge over SR 152. The introduction of grade-separated interchanges along SR 152, where adjacent to the HSR, would improve the safety of existing motorists using SR 152 due to a reduction in conflicts with local intersecting roadways. New permanent road crossings would total 24 for the SR 152 (North) to Road 13 Wye Alternative, 29 for the SR 152 (North) to Road 19 Wye Alternative, 28 for the Avenue 21 to Road 13 Wye Alternative, and 24 for the SR 152 to Road 11 Wye Alternative. Thus, the SR 152 (North) to Road 19 Wye and Avenue 21 to Road 13 Wye Alternatives would have the greatest effects on traffic delay, and the SR 152 (North) to Road 13 Wye and SR 152 (North) to Road 11 Wye Alternatives would have the smallest impacts.

Permanent road closures would total 38 for the SR 152 (North) to Road 13 Wye Alternative, 36 for the SR 152 (North) to Road 19 Wye Alternative, 30 for the Avenue 21 to Road 13 Wye Alternative, and 33 for the SR 152 (North) to Road 11 Wye Alternative. Thus, the SR 152 (North) to Road 13 Alternative would have the most impacts on rural roadway operations while the Avenue 21 to Road 13 Alternative would have the least impact; the SR 152 (North) to Road 19 Wye and SR 152 (North) to Road 11 Wye Alternatives would be intermediate in their impacts.

Roadway Operations

For all of the Central Valley Wye alternatives, construction staging plans include temporary roadway detours during the construction phase (Authority 2016b). All Central Valley Wye alternatives would require varying numbers of temporary and permanent road closures. Temporary closures and restrictions would increase average vehicle delay times on affected roads, increase average trip durations in the project area, and prompt some motorists to avoid traveling through the project area to the extent alternative routes are available. Traffic rerouting due to permanent road closures and relocations, as well as grade separations, could lead to additional traffic on some roadways.

Mitigation Measures

Despite temporary and permanent road closures resulting from all Central Valley Wye alternatives, local roads would continue to operate at LOS A (uncongested conditions). Therefore, mitigation is not required.

Comparison of Alternatives

Temporary and permanent road closures would predominately affect local roads in the Central Valley Wye alternatives area. Even with the addition of the permanently rerouted traffic, all roadway segments would continue to operate at LOS A (uncongested conditions). This effect would be the same for all Central Valley Wye alternatives.

6.2.3 Noise and Vibration

This section addresses construction- and operations-related noise and vibration effects that have the potential to differentiate between the alternatives, including the exposure of sensitive receivers to construction noise and vibration and exposure of sensitive receivers to operational noise.

Temporary Exposure of Sensitive Receivers to Construction Noise

Construction of the Central Valley Wye alternatives and associated electrical interconnect would require the use of mechanical equipment that could generate temporary increases in noise. These activities would result in the transmission of construction noise on a periodic and temporary basis, and an increase in ambient noise levels, in locations where construction of the Central Valley Wye alternatives is in close proximity to sensitive receivers. As part of the Central Valley Wye alternatives design, the Authority will incorporate NV-IAMF#1, Noise and Vibration, which includes measures for constructing temporary sound barriers between noise generating activities and noise-sensitive receivers among other measures.

By complying with these guidelines, noise impacts would be minimized for sensitive receivers during construction. However, even with incorporation of this feature, noise generated by construction activities could annoy nearby sensitive receivers because construction noise would be above levels the FRA determines cause annoyance. These noise levels would be considered impacts on nearby sensitive receivers. All of the sensitive receivers where there would be impacts are single-family residences. Because of their distance from the HSR project footprint, there would not be impacts at other sensitive receiver types (e.g. schools, churches, cemeteries) under any of the Central Valley Wye alternatives.

As shown in Table 6-6, depending on the construction phase and the alternative selected, construction of the Central Valley Wye alternatives would temporarily affect between 57 and 106 sensitive receivers during daytime construction and between 80 and 314 sensitive receivers due to nighttime construction.

Table 6-6 Noise Effects on Sensitive Receivers

| Construction Activity | Daytime Effects Number of Sensitive Receivers Affected Per Alternative | | | | Nighttime ² Effects Number of Sensitive Receivers Affected Per Alternative | | | |
|---------------------------------------------------------------|---------------------------------------------------------------------------|-------------------------------|--------------------------|-------------------------------|------------------------------------------------------------------------------------------|-------------------------------|--------------------------|-------------------------------|
| | SR 152 (North) to Road 13 Wye | SR 152 (North) to Road 19 Wye | Avenue 21 to Road 13 Wye | SR 152 (North) to Road 11 Wye | SR 152 (North) to Road 13 Wye | SR 152 (North) to Road 19 Wye | Avenue 21 to Road 13 Wye | SR 152 (North) to Road 11 Wye |
| Lay Track | 35 | 41 | 33 | 33 | - | - | - | - |
| Electrical Interconnections and Network Upgrades ¹ | 11 | 48 | 11 | 11 | 25 | 216 ³ | 25 | 25 |
| Other Activities ⁴ | 19 | 17 | 27 | 13 | 82 | 98 | 55 | 76 |
| Total Impacts ⁵ | 65 | 106 | 71 | 57 | 107 | 314 | 80 | 101 |

Source: Authority and FRA, 2016c

¹ Impact data is from Appendix 2-D Electrical Interconnections and Network Upgrades construction impacts

² $L_{eq}(night) = L_{eq}(h)|_{v=vn}$

³ The number of sensitive receivers is substantially higher because one of the network upgrades associated with this alternative, Site 7 – Le Grand Junction/Sand Mush Road, Warnerville – Wilson 230 kV Transmission Line, passes through three communities whereas the other EINU are located in more rural locations with far fewer sensitive receivers present.

⁴ Other Activities might include heavy earthmoving equipment, use of power tools and construction traffic.

⁵ Total may include multiple impacts on the same sensitive receiver location if it is affected by more than one construction activity

Mitigation Measures

These impacts would be greatly reduced through implementation of **N&V-MM#1**. This mitigation requires the contractor to conduct construction noise monitoring and provides them with the flexibility to implement different tools to meet FRA standards for limiting both daytime and nighttime noise during construction.

Comparison of Alternatives

For both daytime and nighttime impacts, the SR 152 (North) to Road 19 Wye alternative would result in a much greater number of impacts at sensitive receivers than the other alternatives. For nighttime impacts, this alternative would result in impacts at three to four times as many sensitive receivers. For daytime impacts, the SR 152 (North) to Road 11 Wye alternative would have the fewest impacts and the Avenue 21 to Road 13 Wye alternative would have the fewest nighttime construction impacts with the SR 152 (North) to Road 11 Wye alternative second.

Temporary Exposure of Sensitive Receivers and Buildings to Vibration from Construction

Construction of the Central Valley Wye alternatives would generate temporary and periodic ground-borne vibration that has the potential to result in building damage and human annoyance. Human annoyance occurs when construction vibration levels rise above the threshold of human perception for extended periods. Building damage occurs when construction activities produce waves in the ground that are strong enough to cause cosmetic or structural damage.

The design of the Central Valley Wye alternatives would include measures to minimize construction vibration effects, such as NV-IAMF#1. Construction vibration would not cause human annoyance because the vibration impacts would occur predominately within the project footprint. Similarly, none of the vibration sources would be expected to produce sustained vibration levels that would cause structural damage beyond 37 feet from the construction activity, which would generally not fall outside of the project footprint at distances where sensitive receivers are found.

Mitigation Measures

The Central Valley Wye alternatives would include effective measures to minimize vibration impacts by reducing construction vibration and preventing it from causing damage to buildings and human annoyance. Therefore, mitigation is not required.

Comparison of Alternatives

Temporary construction-related vibration effects would be the same under each Central Valley Wye alternative.

Intermittent Permanent Exposure of Sensitive Receivers to Noise from Operations

Operations of any of the Central Valley Wye alternatives would generate noise levels above existing ambient levels. The level of operations noise would depend on the number of trains per day, speed of the trains, track configuration, and distance of receivers to the tracks.

Table 6-7 shows the number and type of noise-sensitive receivers that would be exposed to moderate or severe noise effects based on FRA guidance. Depending on the alternative, the Central Valley Wye alternatives could have severe noise effects on 23-39 single-family residences.

Table 6-7 Operational Noise Effects for the Central Valley Wye Alternatives

| Alternative | Train Speed Range, (mph) | Range of Existing Noise Level L _{dn} , (dBA) | Projected Noise Level Range from HSR Only L _{dn} , (dBA) | Number of Moderate Impacts | Number of Severe Impacts |
|-------------------------------|--------------------------|-------------------------------------------------------|-------------------------------------------------------------------|-----------------------------|-----------------------------|
| SR 152 (North) to Road 13 Wye | 150–220 | 51–73 | 45–72 | 65 single-family residences | 27 single-family residences |
| SR 152 (North) to Road 19 Wye | 150–220 | 48–73 | 46–80 | 58 single-family residences | 23 single-family residences |
| Avenue 21 to Road 13 Wye | 150–220 | 49–73 | 44–72 | 40 single-family residences | 39 single-family residences |
| SR 152 (North) to Road 11 Wye | 150–220 | 51–73 | 45–72 | 61 single-family residences | 35 single-family residences |

Source: Calculated based on Merced to Fresno Project Section: Central Valley Wye Design Baseline Engineering Report Record Set Design; Authority 2016b.

mph = miles per hour
L_{dn} = day-night sound level
dBA = A-weighted decibels

The Central Valley Wye alternatives could have moderate and severe noise impacts on 79 to 96 single-family residences, depending on the alternative. All of the sensitive receivers affected are single-family residences and no other sensitive receiver types (e.g. schools, churches, cemeteries) would be affected because they are of sufficient distance from the centerline that noise levels would not exceed the moderate and severe noise impact threshold.

Mitigation Measures

The Authority would implement mitigation measures to minimize the impacts on operational noise. **N&V-MM#2, Additional Noise Analysis during Final Design**, would implement HSR noise guidelines, and conduct additional noise analysis during final design. However, **N&V-MM#2** would not avoid all severe operational noise impacts on sensitive receivers.

Comparison of Alternatives

The SR 152 (North) to Road 13 Wye Alternative would have the most moderate noise impacts (65), followed by the SR 152 (North) to Road 11 Wye Alternative (61), and then the SR 152 (North) to Road 19 Wye Alternative (58). The Avenue 21 to Road 13 Wye Alternative would have the fewest moderate noise impacts (40). However, for severe noise impacts, the Avenue 21 to Road 13 Wye Alternative would have the most severe noise impacts (39), followed by the SR 152 (North) to Road 11 Wye Alternative (35), and then the SR 152 (North) to Road 13 Wye Alternative (27). The SR 152 (North) to Road 19 Wye Alternative would have the fewest severe noise impacts (23).

6.2.4 Agricultural Lands

This section addresses the temporary use of Important Farmland, permanent conversion of Important Farmland to nonagricultural use, and effects on protected farmlands including lands under Williamson Act or FSZ Contracts, Local Zoning, or Conservation Easement Lands as a result of construction of the Central Valley Wye and the associated electrical interconnections and network upgrades.

The context in which agricultural land effects would occur is the San Joaquin Valley, one of the most productive agricultural centers of the United States and California. The San Joaquin Valley relies heavily on agriculture as its primary economic base. The San Joaquin Valley is subject to

ongoing substantial conversions of agricultural land for urban, suburban, and transportation (road) projects, and relies on farmland protection mechanisms to maintain feasibility for operating agricultural lands as farmland. Anticipated future growth in the region through 2040 would result in the continued conversion of agricultural land to nonagricultural land uses.

Temporary Use of Important Farmland

Construction of all four of the Central Valley Wye alternatives would require the temporary use of Important Farmland, for construction staging areas and other construction-related activities. This land would be leased from the landowner and temporarily removed from agricultural use for the duration of construction. Table 6-8 lists the acres of Important Farmland that would be temporarily unavailable for agricultural use as a result of construction of the Central Valley Wye alternatives.

Table 6-8 Important Farmland Temporarily Used for Construction of the Central Valley Wye Alternatives (acres)¹

| Alternative | Prime Farmland | Farmland of Statewide Importance | Unique Farmland | Farmland of Local Importance | Total |
|-------------------------------|----------------|----------------------------------|-----------------|------------------------------|-------|
| SR 152 (North) to Road 13 Wye | 225 | 100 | 132 | 36 | 493 |
| SR 152 (North) to Road 19 Wye | 220 | 68 | 275 | 27 | 590 |
| Avenue 21 to Road 13 Wye | 157 | 102 | 121 | 32 | 412 |
| SR 152 (North) to Road 11 Wye | 161 | 83 | 91 | 27 | 362 |

Source: DOC, 2014

¹ Acreages are rounded to the nearest whole number.

SR = State Route

Although construction of the Central Valley Wye alternatives would temporarily use Important Farmland, the land would be restored following the cessation of construction activities under all alternatives. The Central Valley Wye alternatives incorporate IAMFs to minimize impacts on Important Farmland. AG-IAMF#1, Restoration of Important Farmland Used for Temporary Staging Areas, would require affected Important Farmland to be restored after construction to as close to the pre-construction condition as possible, with the goal that parcels remain available for long-term agricultural use. As a result, Important Farmland temporarily used for construction purposes would be restored to agricultural use and would not be subject to permanent conversion to nonagricultural use under any of the Central Valley Wye alternatives.

Mitigation Measures

The temporary use of Important Farmland during construction would not permanently convert Important Farmland to nonagricultural use. The IAMFs incorporated into the Central Valley Wye alternatives include effective measures to restore Important Farmland following the cessation of construction activities. Therefore, no mitigation is required.

Comparison of Alternatives

The State Route (SR) 152 (North) to Road 19 Wye Alternative would temporarily use the largest area of Important Farmland (590 acres) compared to the other alternatives, and the SR 152 (North) to Road 11 Wye Alternative would temporarily use the smallest area of Important Farmland (362 acres).

Permanent Conversion of Important Farmland to Nonagricultural Use

Direct, permanent conversion of Important Farmland to nonagricultural use would occur where the permanent impact area of the project footprint of each Central Valley Wye alternative and associated facilities overlaps Important Farmland. The Authority would purchase and use the land within the permanent impact area of the project footprint for the HSR right-of-way and related facilities.

Mitigation Measures

AG-MM#1, Conserve Important Farmland (Prime Farmland, Farmland of Statewide Importance, Farmland of Local Importance, and Unique Farmland) would offset impacts by preserving Important Farmland in an amount commensurate with the quantity and quality of converted farmlands. However, because implementation of **AG-MM#1** would not avoid the permanent conversion of Important Farmland to nonagricultural use or the permanent conversion of Important Farmland to nonagricultural use as a result of parcel severance; therefore, the adverse effects from the Central Valley Wye alternatives would be significant and unavoidable.

Comparison of Alternatives

The potential permanent conversion of Important Farmland directly associated with construction of the Central Valley Wye alternatives is shown in Table 6-9.

Table 6-9 Maximum Amount of Important Farmland Permanently Converted by Central Valley Wye Alternative (acres)¹

| Alternative | Important Farmland | | | | |
|-------------------------------|--------------------|----------------------------------|-----------------|------------------------------|-------|
| | Prime Farmland | Farmland of Statewide Importance | Unique Farmland | Farmland of Local Importance | Total |
| SR 152 (North) to Road 13 Wye | 816 | 572 | 693 | 101 | 2,182 |
| SR 152 (North) to Road 19 Wye | 835 | 489 | 888 | 93 | 2,305 |
| Avenue 21 to Road 13 Wye | 763 | 674 | 711 | 115 | 2,263 |
| SR 152 (North) to Road 11 Wye | 831 | 581 | 644 | 88 | 2,144 |

Source: DOC, 2014

¹ Acreages are rounded to the nearest whole number.

SR = State Route

Agricultural farmland conversion to nonagricultural use associated with the Central Valley Wye alternatives would be greatest under the SR 152 (North) to Road 19 Wye Alternative (2,305 acres) and least under the SR 152 (North) to Road 11 Wye Alternative (2,144 acres). Once converted, this land would be permanently removed from agricultural use.

6.2.5 Parks, Water-Related Recreation, and Open Space

Construction and operations of the Central Valley Wye alternatives and associated electrical interconnections and network upgrades could result in temporary and permanent effects on parks, recreation, and open space resources. Effects that have notable differences between alternatives are limited to potential disruption to future trail development near the Ash Slough and Berenda Slough Open-Space Corridors. There would be no impacts on parks, water-related recreation, and open space as a result of the Avenue 21 to Road 13 Wye Alternative.

Permanent Impacts on Future Development of Recreational Trail Open-Space Corridors

Construction of the Central Valley Wye alternatives have the potential to impact development and planned use of planned recreational trail corridors at Berenda Slough and Ash Slough. Central Valley Wye alternatives cross these sloughs in different locations and therefore have varying degrees of potential impacts on future recreational trail development.

Mitigation Measures

The SR 152 (North) to Road 19 Wye Alternative would be designed to provide access to parks and recreational facilities that would minimize but would not avoid all the potential impacts on the development and use of the planned recreational trail corridor. The Authority would implement mitigation measure **PK-MM#1, Design Features to Allow for Future Development of Trails at the Slough Crossings**, which would involve installation of an undercrossing below HSR tracks at Berenda and Ash Sloughs. The undercrossing would be designed with a minimum clearance of 14.5 feet and width of 12 feet, which would be sufficient to allow for development of future recreational trails.

Comparison of Alternatives

The SR 152 (North) to Road 13 Wye Alternative, SR 152 (North) to Road 19 Wye Alternative, and SR 152 (North) to Road 11 Wye Alternative would cross Berenda Slough at the same location approximately 1 mile south of the city of Chowchilla. The SR 152 (North) to Road 19 Wye Alternative would cross Berenda Slough a second time approximately 1 mile east of Chowchilla. The Avenue 21 to Road 13 Wye Alternative would not cross Berenda Slough. The SR 152 (North) to Road 13 Wye Alternative, Avenue 21 to Road 13 Wye Alternative, and SR 152 (North) to Road 11 Wye Alternative would cross Ash Slough west of the city of Chowchilla, and the SR 152 (North) to Road 19 Wye Alternative would cross Ash Slough to the east of the city of Chowchilla. Additionally, a network upgrade to an existing power line associated with the SR 152 (North) to Road 19 Wye Alternative would continue to span Ash Slough southwest of the city of Chowchilla.

The crossings of Berenda Slough south of the city and Ash Slough to the west of the city by the SR 152 (North) to Road 13 Wye Alternative, SR 152 (North) to Road 19 Wye Alternative, and SR 152 (North) to Road 11 Wye Alternative would have limited potential to disrupt the continuity of a future trails between the city and the reservoir. Because these crossings would be constructed south and west of the city of Chowchilla, they would result in only minor diminished capacity to develop these corridor and would not substantially reduce the value of the open-space resource. In addition to the crossing south of the city, the SR 152 (North) to Road 19 Wye Alternative would cross Berenda Slough between the city of Chowchilla and Berenda Reservoir, east of the city. The potential impact on the future development and use of the planned trail corridor would be more severe than the crossings south of the city because the SR 152 (North) to Road 19 Wye Alternative would bisect the necessary connection between the city and the reservoir. Furthermore, the SR 152 (North) to Road 19 Wye Alternative, which would cross Ash Slough to the east of the city of Chowchilla, could block development of the future trail connection to Berenda Reservoir. This could pose greater impacts than those associated with the crossing of Ash Slough west of Chowchilla because the SR 152 (North) to Road 19 Wye Alternative would be constructed between the city and Berenda Reservoir.

As a result, the SR 152 (North) to Road 19 Wye Alternative could affect the future development and use of the planned trail corridors along Berenda and Ash Sloughs by blocking the trail system's development between the two primary destinations.

6.2.6 Aesthetics and Visual Resources

Construction and operation of any of the Central Valley Wye alternatives would result in temporary and permanent changes to the existing visual character and visual quality of the RSA.

Degraded Visual Quality for Residential Viewers during Construction

All Central Valley Wye alternatives would pass within 0.25 mile of residential viewers, as residences are found in various locations along each alternative. Construction activities for any of the four Central Valley Wye alternatives would create visual nuisances at locations where highly visually responsive residential views are present.

Nighttime construction lighting could result in glare and light spillover, affecting nighttime views of residences. Where these temporary construction activities occur in residential areas where highly

visually responsive residential viewers are present and along scenic highways where moderately highly responsive travelers are present, the activities would degrade the existing visual quality.

Mitigation Measures

The Authority would implement mitigation measure **AVR-MM#1**, which would minimize visual disruption from construction activities by limiting preconstruction clearance of vegetation and buildings, preserve vegetation that may help screen views, restore and revegetate land cleared once construction is complete, locate construction staging sites away from residential viewers whenever feasible, and to screen staging areas from sensitive receivers. **AVR-MM#2** would minimize disturbance from construction lighting by requiring contractors to shield and direct it downward to limit spillover from the construction site. These measures will limit the temporary degradation of visual quality, reducing the impacts.

Comparison of Alternatives

The SR 152 (North) to Road 13 would pass the greatest concentrations of residences, as it crosses Robertson Boulevard twice north of SR 152 and passes near Fairmead. The SR 152 (North) to Road 19, and SR 152 (North) to Road 11 Wye alternatives would pass concentrations of residences as they cross Robertson Boulevard and near Fairmead. The Avenue 21 to Road 13 Wye Alternative would avoid concentrations of residential views, resulting in fewer instances of impacts on residential viewers. The southernmost 2.3 miles of the existing Site 7—Le Grand Junction/Sandy Mush Road, Warnerville–Wilson 230 kV Transmission Line, associated with the SR 152 (North) to Road 19 Wye Alternative, also would traverse concentrations of residences within the City of Merced. All other EINU components would be located in areas with few residences.

The SR 152 (North) to Road 13 Wye Alternative would affect the most residential viewers. The SR 152 (North) to Road 19 and SR 152 (North) to Road 11 Wye Alternatives would each affect a similar number of residential viewers, while the Avenue 21 to Road 13 Wye alternative would affect the fewest residential viewers.

Visual Quality in the Robertson Boulevard Landscape Unit

All Central Valley Wye alternatives would cross Robertson Boulevard and require the permanent alteration of the Historic Robertson Boulevard Tree Row, including removal of multiple palm trees from the tree row. These alterations would affect long views of the roadway, parallel tree rows would be partially blocked in some locations, and the visual strength of the tree rows lining the roadway would be permanently diminished.

Mitigation Measures

The Authority would implement mitigation measures to limit the degradation to visual quality. **AVR-MM#3, Incorporate Design Criteria for Elevated Guideways and Station Elements That Can Adapt to Local Context**, will adapt the design of the HSR structures and SR 152 Robertson Boulevard interchange through incorporating design features and landscaping to reinforce Robertson Boulevard as a gateway to Chowchilla. **AVR-MM#4, Provide Vegetation Screening along At-Grade and Elevated Guideways Adjacent to Residential Areas**, will provide landscaping to screen the HSR from residential areas, reducing views to the contrasting HSR infrastructure. **AVR-MM#5, Replant Unused Portions of Land Acquired for the HSR**, will replant unused portions of land acquired for the HSR project, providing replacement palms where possible to reduce gaps in the historic tree row created during HSR construction. **AVR-MM#6, Landscape Treatments along HSR Overcrossings and Retained Fill Elements**, will provide landscaping for HSR and highway overcrossing and retained fills, softening the contrast with the existing landscape. These mitigation measures will reduce the degradation to visual quality and would help reinforce Robertson Boulevard as a gateway to Chowchilla, but they would not restore views blocked by HSR infrastructure, nor would they fill in all the gaps in the tree row at the interchange or the HSR crossing of Robertson Boulevard adjacent to SR 152. Even with implementation of these mitigation measures, the visual presence of the tree row would be diminished and impacts would be unavoidable.

Comparison of Alternatives

Because the SR 152 (North) to Road 13 Wye Alternative would cross Robertson Boulevard twice, and in an area where both travelers and residents with a moderately high to high viewer response are present, it would have the greatest number of viewer groups and this alternative would substantially damage the Robertson Boulevard Tree Row by resulting in the disturbance of approximately 4,516 linear feet of the tree row at the SR 152 interchange and where the Merced to Fresno leg of the wye would cross the roadway. This tree row is identified as an important visual resource in the Madera County and Chowchilla General Plans and an eligible historic property. The HSR viaduct would also block views along Robertson Boulevard, diminishing the visual presence of the tree row and contrasting with the scale and context of residential areas.

The SR 152 (North) to Road 19 Wye Alternative would disrupt the continuous line of palm trees along Robertson Boulevard where the San Jose to Fresno leg would pass beneath Robertson Boulevard north of SR 152, and at the SR 152/Robertson Boulevard interchange. Because the SR 152 (North) to Road 19 Wye Alternative would cross Robertson Boulevard only once in an area where both travelers and residents with a moderately high to high viewer response are present, resulting in the disturbance of approximately 4,428 linear feet of the tree row, it would have the second greatest impact on visual resources.

The SR 152 (North) to Road 11 Wye Alternative would cross Robertson Boulevard only once in an area where both travelers and residents with a moderately high to high viewer response are present, resulting in the disturbance of approximately 4,088 linear feet of the tree row; therefore, this alternative would have the third greatest impact on visual resources.

The Avenue 21 to Road 13 Wye Alternative would disrupt the continuous line of palm trees along Robertson Boulevard, resulting in the removal of approximately 5,590 linear feet of the tree row where the tree row is relatively intact. The HSR viaduct would also block views along Robertson Boulevard, diminishing the visual presence of the tree row. Because of the lower viewer response where the Avenue 21 to Road 13 Wye Alternative would cross Robertson Boulevard, the impact on visual resources would be the least of all Central Valley Wye alternatives.

Visual Quality in the Fairmead Landscape Unit

HSR infrastructure would introduce permanent changes to the aesthetic and visual quality of existing residential views that would contrast with the rural and agricultural setting. Neatly fenced HSR tracks, lines of overhead catenary system, berms and embankments rising from the flat landscape, and overcrossings and viaducts for HSR and roadways would impart an industrial or urban aesthetic to the landscape.

Mitigation Measures

The Authority would implement mitigation measures to minimize the impacts on residential views. As part of **AVR-MM#4**, the Authority or its contractors would provide landscape screening to obscure HSR infrastructure from residential viewers. As part of **AVR-MM#5**, lands acquired that are not used for the HSR will be replanted or replaced with similar vegetation that, upon maturity, will be similar in size and character to the removed vegetation. This will minimize the aesthetic and visual impacts of land made fallow because it will replace vegetation removed during construction and enhance the visual appeal of areas in proximity to HSR infrastructure, thereby reducing the resulting area, scale, and exposure to decreased visual quality. As part of **AVR-MM#6**, the Authority or its contractors, prior to the commencement of HSR operations, would provide landscaping along overcrossings and retained fill elements of the HSR. These mitigation measures would soften and obscure the conflicting aesthetic of the HSR infrastructure, but they would not return views blocked by the Central Valley Wye alternatives. Therefore, impacts would be unavoidable.

Comparison of Alternatives

The SR 152 (North) to Road 19 Alternative would have similar impacts on visual resources as the SR 152 (North) to Road 13 Wye Alternative, but as this alternative would be in the Fairmead Landscape Unit, there would be a greater distance of the alternative passing through the

landscape unit, with more subsequent impacts on visual resources. Therefore, the SR 152 (North) to Road 19 Wye Alternative would have the greatest impact of the Central Valley Wye alternatives.

The SR 152 (North) to Road 13 Wye Alternative would affect visual resources through an area where many residents with a high viewer response are present, it would have a greater impact on visual resources than the SR 152 (North) to Road 11 Wye and Avenue 21 to Road 13 Wye alternatives, but less of an impact than the SR 152 (North) to Road 19 Wye Alternative.

The SR 152 (North) to Road 11 Wye Alternative would follow the same alignment as the SR 152 (North) to Road 13 Wye Alternative through the Fairmead Landscape Unit, resulting in the same impacts on visual resources.

The Avenue 21 to Road 13 Wye Alternative would not pass through the Fairmead Landscape Unit; therefore, it would have no impact, the least impact of the Central Valley Wye alternatives.

6.2.7 Cultural Resources

This section describes the potential direct effects of construction and operation of the Central Valley Wye alternatives on cultural resources, including archaeological resources and historic architectural resources. There is no potential for substantial indirect effects from the Central Valley Wye alternatives.

Permanent Disturbance of Unknown Archaeological Sites

Construction of the Central Valley Wye alternatives could potentially affect unknown archaeological deposits from ground-disturbing construction associated with the Central Valley Wye alternatives. The design would allow for the relocation of access areas and laydown sites if the selected Central Valley Wye alternative has the potential to affect newly discovered archaeological sites or historic architectural resources

Mitigation Measures

The Authority would implement **CUL-MM#1, Amend Archaeological and Built Environment Treatment Plans**, which requires preparation or amendments to the previously prepared ATP and BETP, and **CUL-MM#2, Mitigate Adverse Impacts on Archaeological and Built Environment Resources Identified During Phased Identification; Comply with the Stipulations Regarding the Treatment of Archaeological and Historic Built Resources in the PA and MOA**, for newly identified eligible properties that are identified once parcels are accessible and that may be adversely affected. The contractor would follow appropriate schedule restrictions and halt work during any ground-disturbing activities should there be an unanticipated archaeological discovery with implementation of **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**. With implementation of **CUL-MM#1, CUL-MM#2, and CUL-MM#3**, the impact would be reduced because the potential for ground-disturbing activities to affect archaeological resources would be reduced.

Comparison of Alternatives

The potential for encountering archaeological resources would be the same for all Central Valley Wye alternatives. As all the Central Valley Wye alternatives would be constructed in the same general geography and have the same amount of ground disturbance, survey coverage, and cultural sensitivity within that geography; therefore, each alternative has the same potential to encounter, disturb, or damage unknown archaeological resources during construction.

Ground-disturbing construction activities could permanently affect unknown or unrecorded archaeological resources. Construction-related ground disturbance for the Central Valley Wye alternatives in areas that could contain unknown archaeological resources or historic properties could cause substantial changes in the significance of archaeological resources pursuant to the National Historic Preservation Act (36 C.F.R. § 800.5). The design of the Central Valley Wye

alternatives would include surveys, testing, and data collection protocols, and monitoring requirements would avoid or minimize impacts on archaeological resources.

Historic Architectural Resources

Construction activities that may affect historic architectural resources include excavation, staging, heavy-equipment usage and movement, drilling, demolition, or the need to relocate historic properties. Surveys identified one newly identified historic architectural resource within the APE, the Chowchilla Canal. All of the Central Valley Wye alternatives would be constructed near the Chowchilla Canal and would require its modification. All alternatives would result in removal of an existing culvert where an existing road crosses the Chowchilla Canal, and installation of a new culvert that would carry the Chowchilla Canal under both the new HSR alignment and the existing road. However, for all alternatives, the alignment and character-defining features of the Chowchilla Canal would be retained and the canal would continue to function as it has historically by conveying water.

The Delta Mendota Canal and California Aqueduct are also considered to be historic architectural resources and are located within the expanded historic architecture APE. The Delta Mendota Canal is crossed twice by the existing Site 6—El Nido, Los Banos—Oro Loma—Canal 70 kV Power Line and the existing Site 6—El Nido, Oro Loma—Panoche Junction 115 kV Power Line crosses the California Aqueduct once. Both lines are proposed to be reconductored for all Central Valley Wye Alternatives. These linear built resources are already spanned by existing power lines and would continue to be spanned by power lines. The proposed reconductoring would not impact the alignments or appearances of these built resources and they would retain their character-defining features that enable the resources to convey their historic or potentially historic significance.

The Authority has incorporated the following IAMFs as part of the design and construction of the Central Valley Wye that minimize and/or avoid substantial adverse changes to the significance a cultural resource: CUL-IAMF#4; CUL-IAMF#7, Pre-Construction Conditions Assessment, Plan for Protection of Historic Built Resources, and Repair of Inadvertent Damage; CUL-IAMF#8, Built Environment Monitoring Plan; and CUL-IAMF#9, Implement Protection and/or Stabilization Measures. These surveys, plans, and documentation measures would reduce the potential for inadvertent effects on as-yet undiscovered historic architectural resources.

Operations activities that could affect historic architectural resources would be limited to operations-related noise and vibration and new visuals from the periodic passing of HSR trains. The types of operations activities are the same among the four alternatives, and the locations of the canal crossings are generally the same, with the exception of the Avenue 21 to Road 13 Wye Alternative. Both segments of the canal have been modified previously; therefore, vibration of passing trains would not cause the canal to become structurally unstable.

Trees along the Robertson Boulevard tree row would be removed and therefore would not be affected by vibration or associated soil compaction in the areas where the Central Valley Wye alternatives cross the Robertson Boulevard tree row. Ground-borne vibration effects dissipate quickly over distance and it is not anticipated that trees remaining in the row outside the project footprint would be adversely affected by construction in the footprint.

New intermittent visual or noise elements resulting from trains passing periodically would not result in changes to the Chowchilla Canal's historic alignment or prevent the canal from conveying water. Consequently, operations would not result in alteration of the canal, and the canal would still be able to convey its historic significance. In addition, the introduction of intermittent trains passing through the tree row would not detract from the ability of the tree row to convey its historical significance, since the view of the trees would not be permanently obscured by the passing trains.

Mitigation Measures

The Authority would implement the same mitigation measures identified for the resource as outlined in the 2013 Merced to Fresno Amended Memorandum of Agreement MOA). These mitigation measures (**CUL-MM#4, Mitigation for Permanent Demolition, Destruction,**

Relocation, or Alteration of Historic Architectural Resources or Setting—Robertson Boulevard Tree Row) would help reduce impacts but they would not fill in all the gaps in the tree row at the interchange and where the selected alternative would cross Robertson Boulevard or where subsequent road improvements are proposed.

Comparison of Alternatives

Construction of the SR 152 (North) to Road 13 Wye Alternative, SR 152 (North) to Road 19 Wye Alternative and SR 152 (North) to Road 11 Wye Alternative would result in the removal of the existing culvert under SR 152 and installation of a new culvert to carry the Chowchilla Canal segment under both the road and the proposed adjacent rail alignment. The proposed rail alignment would parallel the existing road and the reconfiguration of the canal would simply be a reconfiguration of the existing culverted section. Therefore, the Chowchilla Canal would retain its character-defining features that enable the resource to convey its historic significance including its historic alignment and its ability to transport water. The Avenue 21 to Road 13 Wye Alternative, which would involve the reconfiguration of a culvert that currently conveys the Chowchilla Canal under Avenue 21 to accommodate both the road and the proposed rail alignment. The impacts would be approximately the same as those for the SR 152 (North) to Road 13 Wye Alternative because the same activities would occur, although in a different location.

Construction of all Central Valley Wye alternatives would result in the removal of the existing culvert under SR 152 and installation of a new culvert to carry the Chowchilla Canal segment under both the road and the proposed adjacent rail alignment. The Chowchilla Canal would not be realigned, but rather the existing culverted section would be reconfigured to accommodate the HSR and would continue to convey water along its historic alignment. Although the location would vary slightly between alternatives, the effects on the Chowchilla Canal would be the same.

The Avenue 21 to Road 13 Wye Alternative would result in the disturbance of approximately 5,590 linear feet of the tree row where the tree row is relatively intact. The SR 152 (North) to Road 13 Wye Alternative would result in the disturbance of approximately 4,516 linear feet of the tree row. The SR 152 (North) to Road 19 Wye Alternative would result in the disturbance of approximately 4,428 linear feet of the tree row. The SR 152 (North) to Road 11 Wye Alternative would result in the disturbance of approximately 4,088 linear feet of the tree row.

Under each of the alternatives a portion of the Robertson Boulevard Tree Row would be destroyed, and even with the implementation of mitigation measures, impacts on the Robertson Boulevard Tree Row would be unavoidable.

6.2.8 Environmental Justice Effects

This section describes the potential effects of construction and operation of the Central Valley Wye alternatives on community resources and low-income and minority populations.

Summary of Disproportionate Effects

Construction and operation of the Central Valley Wye alternatives would have adverse and beneficial effects on low-income and minority populations within the RSA. The greatest effects on low-income and minority populations would occur within the low-income and minority community of Fairmead under the SR 152 (North) to Road 19 Wye Alternative, followed by the SR 152 (North) to Road 13 Wye and SR 152 (North) to Road 11 Wye Alternatives. Under these three alternatives, the community of Fairmead would experience adverse effects associated with community cohesion, aesthetics and visual quality, and operational noise. The Avenue 21 to Road 13 Wye Alternative would mostly avoid the community of Fairmead, resulting in few direct or indirect impacts on that community. The Authority has committed to resource-specific mitigation measures that would reduce but not eliminate most of the adverse effects on low-income and minority populations in Fairmead. Specific community improvements are proposed as mitigation under the SR 152 alternatives that would reduce community cohesion impacts on Fairmead through the provision of roadway improvements and a multiuse trail that would ensure access is maintained within the community, improve pedestrian and bicycle safety, and revitalize the community aesthetically through landscaping and streetscaping.

The Central Valley Wye alternatives would also result in local and regional benefits to the low-income and minority populations that constitute a large percentage of the region. These benefits would include improvements in mobility within the region, air quality improvements, and new employment opportunities during construction and operations. Because low-income and minority populations comprise the majority of the population within the area, these project benefits are likely to accrue to a greater degree to low-income and minority populations.

Mitigation Measures

The Authority has conducted extensive coordination 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 operations of the SR 152 alternatives and offset the HSR contribution to stressors on the community. 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. For example, the Chowchilla Elementary School District's long-range master plan involves the closure of the community's only public school and facility—Fairmead Elementary School. As part of **EJ-MM#1, Provide a Community Center for the Community of Fairmead**, the Authority is pursuing purchasing this facility after closure, retrofitting it as a community center to maintain a permanent meeting place for community gatherings and events, and transferring it back to Madera County of operation and maintenance. Through mitigation measure **EJ-MM#2, Provide Water and Sewer Service for the Community of Fairmead**, the Authority proposes to 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. These mitigation measures, which would be applied only with construction and operation of the SR 152 alternatives would reduce the negative effect of existing stressors in the community, improve the quality of life of Fairmead residents, and remove a constraint to development in Fairmead. With the beneficial effect of the mitigation proposed for the SR 152 alternatives, there would be no disproportionately high and adverse effects on the community of Fairmead from construction and operations of any of the Central Valley Wye alternatives.

The Authority has also identified mitigation measures to reduce the adverse impact of community cohesion of the three SR 152 alternatives on Fairmead. As part of **SO-MM#1, Implement Measures to Reduce Impacts Associated with the Division of Residential Neighborhoods**, the Authority would conduct outreach to affected owners and residents within the community of Fairmead to determine in more detail their specific relocation needs. The Authority would assist these displaced residents with finding new suitable housing within the communities they currently reside in, if desired, and would work with them through community workshops to support long-term neighborhood cohesion.

The Authority also would implement specific mitigation to address community cohesion within Fairmead. As part of **SO-MM#2, Implement Measures to Reduce Impacts Associated with the Division of Communities**, the Authority conducted extensive coordination with the Fairmead Community and Friends stakeholder group, the Chowchilla School District, and the County of Madera to identify the following features that would be incorporated 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 to maintain pedestrian and bicycle access between the northern and southern portions of Fairmead (1.25 mile)
- Street repairs and sidewalk installations at Avenue 22 3/4 (0.75 mile), Yates Avenue (0.3 mile), Road 19 1/2 (0.25 mile) and Elm Street (0.3 mile)
- Grading of Sycamore Street between Avenue 22 1/2 and Avenue 22 3/4 (0.75 mile)
- Roadway improvements, sidewalk installations and landscaping at Fairmead Boulevard (1.65 mile), 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 (2.6 mile)

These mitigation measures would be applied consistent with **SO-MM#5, Continue Outreach to Disproportionately and Negatively Affected Environmental Justice Communities of Concern**, from the Merced to Fresno Final EIR/EIS, which entails continued outreach to low-income and minority populations to solicit input on potential refinements of project features during the design phase (Authority and FRA 2012b).

Consistent with **SO-MM#8, Provide Access Modifications to Affected Farmland**, from the Merced to Fresno Final EIR/EIS, the Authority would also provide access modifications to affected farmlands in coordination with property owners, to allow for continued use of the maximum amount of agricultural lands and facilities (Authority and FRA 2012b: page 12-69). These measures would minimize impacts on the agricultural economy and agricultural employment.

Comparison of Alternatives

With implementation of mitigation (**EJ-MM#1** and **EJ-MM#2**) under the SR 152 (North) to Road 19 Wye, SR 152 (North) to Road 13 Wye, and SR 152 (North) to Road 11 Wye Alternatives, there would be no disproportionately high and adverse effects on the community of Fairmead. The Avenue 21 to Road 13 Wye Alternative would mostly avoid the community of Fairmead, and would not require mitigation. There would no disproportionately high and adverse effects on the community of Fairmead under the Avenue 21 to Road 13 Wye Alternative.

7 PRACTICABILITY ANALYSIS

Pursuant to the Section 404(b)(1) Guidelines, an alternative is practicable if it is “available and capable of being done after taking into consideration cost, existing technology, and logistics in light of the overall project purposes.” (40 C.F.R. §§ 230.10(a)(2)). This chapter analyzes the consistency of the four project alternatives and the No-Fill Alternative with the overall project purpose, as well as the practicability of each alternative.

In summary, the practicability analysis concludes all four action alternatives are consistent with the overall project purpose, though to varying degrees. Each action alternative is also available and capable of being implemented in light of cost, existing technology, and logistical considerations. The no fill alternative is made impracticable by both cost and logistics considerations.

7.1 Consistency with Overall Project Purpose

The following discussion summarizes the consistency of the four Central Valley Wye action alternatives and the No-Fill Alternative with the overall project purpose. The Authority and FRA have determined all action alternatives and the No-Fill Alternative are consistent.

As described in Section 2.1.2, Overall Project Purpose of the Merced to Fresno Section:

[t]he overall project purpose of the Merced to Fresno Section is to construct a reliable, high-speed, lower emissions transit system within the Central Valley, while providing predictable and consistent travel times between major urban centers, and connectivity to airports, mass transit systems, and the highway network through the San Joaquin Valley. The Central Valley Wye portion of the Merced to Fresno Section would implement the critical segment of the HSR system that connects the San Francisco Bay Area (Bay Area) to the Central Valley HSR sections, specifically the San Jose to Merced (west to east) and the Merced to Fresno (north to south) sections, consistent with Proposition 1A, the Safe, Reliable High-Speed Passenger Train Bond Act for the 21st Century (California Streets & Highways Code § 2704 et seq.).

7.1.1 Action Alternatives

The four Central Valley Wye action alternatives are consistent with the overall project purpose. However, the Avenue 21 to Road 13 Wye Alternative is less marginally consistent with a key directive of Prop 1A than are the SR 152 alternatives. That directive states:

In order to reduce effects on communities and the environment, the alignment for the HSR system shall follow existing transportation or utility corridors to the extent feasible and shall be financially viable, as determined by the Authority [Cal. Streets & Highways Code § 2704.09(g)].

The directive of Prop 1A that the HSR be located adjacent to existing transportation or utility corridors to the extent feasible reflects the statutory intent that efforts be taken to contain the effects of the project to areas that have previously been affected by existing linear infrastructure. Although the alignments of the alternatives identified for the Central Valley Wye each generally follow existing transportation corridors, the SR 152 and the Avenue 21 corridors are appreciably different in function, usage, and type. Based on these factors, SR 152 better meets the intent of the Prop 1A directive than Avenue 21; consequently, the SR 152 alternatives are more closely in line with the overall project purpose than is the Avenue 21 alternative.

The SR 152 corridor is reflective of the type of existing transportation corridor envisioned by Prop 1A. SR 152 is a four-lane divided expressway, “a major roadway with a mix of controlled and uncontrolled access, linking freeways with arterials and providing access to major destinations” (Authority and FRA 2016d). It serves as a primary access route from the central San Joaquin Valley to Monterey and Santa Clara Counties. It also functions as an important agricultural, commercial, and recreational access route (MCTC 2014).

Because of SR 152's regional importance and because it is the only major east-west transportation corridor between Merced and Fresno connecting SR 99 to Interstate 5 and to the San Francisco Bay Area, both Caltrans and Merced County have developed long-range transportation plans that propose significant improvements to SR 152, including construction of interchange connections consistent with the Central Valley Wye SR 152 alternatives (AADT 17,000) (MCAG 2014; Caltrans 2016). Caltrans has over time contemplated these improvements to better support movement for interregional commercial, commuter, and recreational traffic connecting the South San Francisco Bay Area, North Central Coast, and Central Valley regions (Caltrans 2012). In 2012, Caltrans published a Project Study Report to request funding for a suite of improvements proposed for the Route 152 Trade Corridor Project (Route 152 TCP) (Caltrans 2012). The Project Study Report included improvements on SR 152 from US 101 to SR 99. Within the RSA of the Central Valley Wye, Route 152 TCP improvements include interchange improvements, overcrossings, and a frontage road. Of the improvements proposed as part of the Route 152 TCP, the first segments that are currently funded are to build a bypass of SR 152 around Los Banos, west of the Central Valley Wye.

Avenue 21, on the other hand, is a two-lane, non-continuous rural road currently used principally for agricultural transport and access (Caltrans 2013) and includes a break between Road 16 and Road 18. It serves as a county collector that "collects and distributes traffic to and from arterials and provides access primarily to and from adjacent properties" (Authority and FRA 2016d). As such, Avenue 21 is a minor roadway in relationship to SR 152.

Based on the foregoing, alternatives that are aligned with SR152, the more substantial of the existing and planned transportation corridors, are substantially more consistent with Prop 1A than alternatives that are aligned with Avenue 21.

7.1.2 No-Fill Alternative

A No-Fill Alternative is the alternative under which the project would be implemented without the discharge of dredged or fill material into waters of the United States. To potentially avoid all impacts on jurisdictional waters, the HSR alignments would need to be modified both horizontally and vertically. In the event that the avoidance of impacts on waters could be accomplished through a horizontal shift in the HSR alignment, such a shift would not be consistent with the overall project purpose. A horizontal shift would involve moving track alignments away from existing transportation corridors and into agricultural areas, which would be contrary to the directives of Prop 1A. However, if avoidance of waters could be accommodated solely through a vertical shift of the HSR alignment, such an alternative would meet the overall project purpose.

7.2 Capability Factors Analysis

The following discussion summarizes capability of carrying out the four Central Valley Wye action alternatives (fill alternatives) and the No-Fill Alternative, taking into consideration cost, existing technology, and logistics. The Authority and FRA have determined that all action alternatives are practicable from a cost, existing technology, and logistics standpoint. The No-Fill Alternative, however, is not practicable on the basis of cost and logistical considerations.

7.2.1 Cost Considerations

Table 7-1 shows cost estimates for each of the Central Valley Wye action alternatives. Based on this information, all action alternatives are practicable from a cost standpoint. As discussed below, the No-Fill Alternative's reliance on elevated structures would result in an unreasonable increase in the cost of construction, rendering the approach impracticable from a cost perspective.

The Authority and FRA have emphasized the need to maximize the use of at-grade construction taking into account that the HSR system (including the Central Valley Wye) is currently publically funded. There is also a legal requirement that the HSR project be "financially viable"; however, in locations where effects on aquatic features would result from an at-grade design or where system design dictates (e.g., to meet public safety requirements), it would be appropriate to investigate whether an elevated structure would be a feasible alternative to an at-grade design.

Conceptual cost estimates prepared for each of the action alternatives were developed by utilizing recent bid data from large transportation projects in the western U.S. and by developing specific, bottom-up unit pricing to reflect common HSR elements and construction methods with an adjustment for Central Valley labor and material costs. All material quantities are estimated based on a preliminary level of design for the Central Valley Wye alternatives. This level of design has generally defined at-grade or elevated profiles, structure types, placement of retaining walls, and earth fill. Roadway and utility relocations have been identified, and power substations have been sized and located.

Table 7-1 Central Valley Wye Alternative Cost Estimates

| FRA Standard Cost Categories | SR 152 (North) to Road 13 Wye | SR 152 (North) to Road 19 Wye | Avenue 21 to Road 13 Wye | SR 152 (North) to Road 11 Wye |
|--------------------------------------------------------|--------------------------------------------------------------------------------------------|-------------------------------|--------------------------|-------------------------------|
| 10 Track structures and track | \$1,502,092,932 | \$1,760,395,952 | \$1,600,956,061 | \$1,370,524,356 |
| 20 Stations, terminals, intermodal | \$238,016,390 | \$241,909,693 | \$128,942,464 | \$222,165,148 |
| 30 Support facilities: yards, shops, admin. bldgs. | \$0 | \$0 | \$0 | \$0 |
| 40 Sitework, right-of-way, land, existing improvements | \$1,155,334,487 | \$1,192,485,438 | \$1,100,568,502 | \$1,122,158,790 |
| 50 Communications and signaling | \$89,956,308 | \$89,235,648 | \$90,059,091 | \$88,874,509 |
| 60 Electric traction | \$265,982,297 | \$284,666,391 | \$270,548,146 | \$261,065,313 |
| 70 Vehicles | Considered a systemwide cost and not included as part of individual WYE study alternatives | | | |
| 80 Professional services (applies to Cats. 10-60) | \$420,232,383 | \$460,991,321 | \$414,079,309 | \$395,042,924 |
| 90 Unallocated contingency | \$165,566,083 | \$178,431,673 | \$159,550,493 | \$153,236,654 |
| 100 Finance charges | Estimate to be developed prior to project construction | | | |
| Total | \$3,837,180,880 | \$4,208,116,117 | \$3,764,704,065 | \$3,613,067,696 |

Source: Authority and FRA, 2016e

In evaluating the cost of a No-Fill alternative, consideration was given to the many geometric constraints on the configuration of the special track that would be needed to fully avoid impacts to waters of the U.S. These constraints limit the potential to change relative horizontal or relative vertical alignments. Estimates of costs are dependent on specific variations related to the location and design demands for a particular segment of track. Construction costs for an elevated track structure, for instance, are substantially greater than track at-grade. For the action alternatives, the construction cost of the Central Valley Wye is estimated to be in the range of \$3.6–4.2 billion, of which approximately \$1.3 billion to \$1.7 billion of this estimate is for track structures and track (Table 7-1). Using the SR 152 (North) to Road 11 alternative for comparative purposes, this alternative includes approximately 7 miles of elevated structure at a cost of \$1.3 billion. If the approximately 51 miles of the Central Valley Wye were constructed on viaduct, the cost of the track structures would increase to approximately \$4.3 billion, which is almost 3.5 times the planned cost. Due to the exceedingly high costs associated with such an alternative, the elevated No-Fill alternative would not be practicable.

7.2.2 Existing Technology Considerations

All project alternatives, including the No-Fill Alternative, are capable of being constructed with respect to existing technology.

The design of the Central Valley Wye alternatives includes at-grade, below-grade, and above-grade (elevated) segments. Most of the anticipated construction methods that would be used to construct the four action alternatives are the same conventional means and methods employed by contractors who build roads, bridges, railway tracks, and other transportation infrastructure, using common industry equipment, readily available labor and tools, and industry-standard operations.

Under a No-Fill Alternative, portions of the Central Valley Wye that cross aquatic features would need to be built on elevated structures. Spanning all aquatic resource areas would require cast-in-place or balanced cantilever crossing structures. Use of less conventional methods for the largest spans would be needed, as balanced cantilever construction is not recommended for spans longer than 350 feet. Avoidance of larger jurisdictional waters may require additional engineering beyond the preliminary engineering for project definition design criteria (Parsons 2016). While this approach would be less conventional, sufficient design and construction means and methods exist to facilitate the implementation of the No-Fill Alternative.

7.2.3 Logistical Considerations

The logistics criteria generally refer to the feasibility of project construction in light of any constraints to development, such as location, access, and topography, and existing infrastructure. The logistical requirements for each of the action alternatives would be generally the same and, therefore, each of the alternatives would be practicable.

Under a No-Fill Alternative, the two primary design methods that could potentially be used to avoid jurisdictional waters involve a horizontal shift, a vertical shift, or a combination thereof. With respect to potential alignment changes, the engineering design criteria require track alignments that are mostly straight (tangent alignment) and, when required, use a large curve radius of up to 5 miles to safely achieve necessary speeds. This engineering requirement necessitates a rigid system (i.e., the design of the track alignments cannot readily accommodate vertical or horizontal deviations to avoid specific resources). A horizontal change in the track alignment to avoid one location, for instance, would result in a shift in track alignment for the entire Central Valley Wye, thereby almost certainly foreclosing the opportunity to fully avoid impacts on waters of the U.S. As such, a No-Fill Alternative would not be logistically practicable.

Specifically, under a horizontal approach, efforts would be made to shift the wye horizontally to avoid impacts on aquatic resources associated with the action alternatives. Any such horizontal shift in track alignment necessary to avoid impacts at one location, however, would require a corresponding shift for the entire Central Valley Wye because of the interrelated features comprising the wye. Such a horizontal shift would affect a large geographic area, approximately 25 square miles that contains widely distributed aquatic resources. Efforts to position the entire Central Valley Wye in a manner that would avoid all jurisdictional waters would not be practicable.

With respect to vertical shifts to avoid all jurisdictional waters, any portion of the project that crossed jurisdictional waters that could not otherwise be avoided would need to be built on elevated structures. Constructing the entire Central Valley Wye on viaducts to avoid jurisdictional waters would not be practicable (see Section 7.2.1, Cost Considerations). A vertical shift would require far more expansive infrastructure to support viaducts. The structural components associated with the viaducts would include large foundations (3,600–4,900 square feet) that would cause extensive ground disturbance. These foundations would be spaced at intervals of 120 feet as dictated by engineering requirements, leaving no flexibility to avoid aquatic features that may be encountered. In light of the level of ground disturbance associated with the vertical shift and the wide distribution of aquatic resources in the area, avoidance of these resources would not be possible. Consequently, the No Fill Alternative would not be practicable from a logistical standpoint.

8 PRELIMINARY LEAST ENVIRONMENTALLY DAMAGING PRACTICABLE ALTERNATIVE AND THE PREFERRED ALTERNATIVE

This chapter describes the basis for the identification of the Preliminary LEDPA and the Preferred Alternative for the Central Valley Wye.

8.1 Summary of Preliminary LEDPA Determination

Consistent with the Section 404(b)(1) Guidelines, the Authority has identified the SR 152 (North) to Road 11 Wye Alternative, illustrated on Figure 8-1, as the Preliminary LEDPA. The Preliminary LEDPA has a less adverse impact on jurisdictional waters than the other action alternatives, as shown in Chapter 4, Effects on Jurisdictional Waters. The alternative is consistent with the overall project purpose and is available and capable of being done, as described in Chapter 7, Practicability Analysis. Lastly, while the other environmental consequences associated with each action alternative vary somewhat among the alternatives in type and intensity, the differences between them are not significant. These effects are summarized below, and described in greater detail in Chapter 6, Comparative Analysis of Effects on Other Environmental Resources for Central Valley Wye Alternatives.

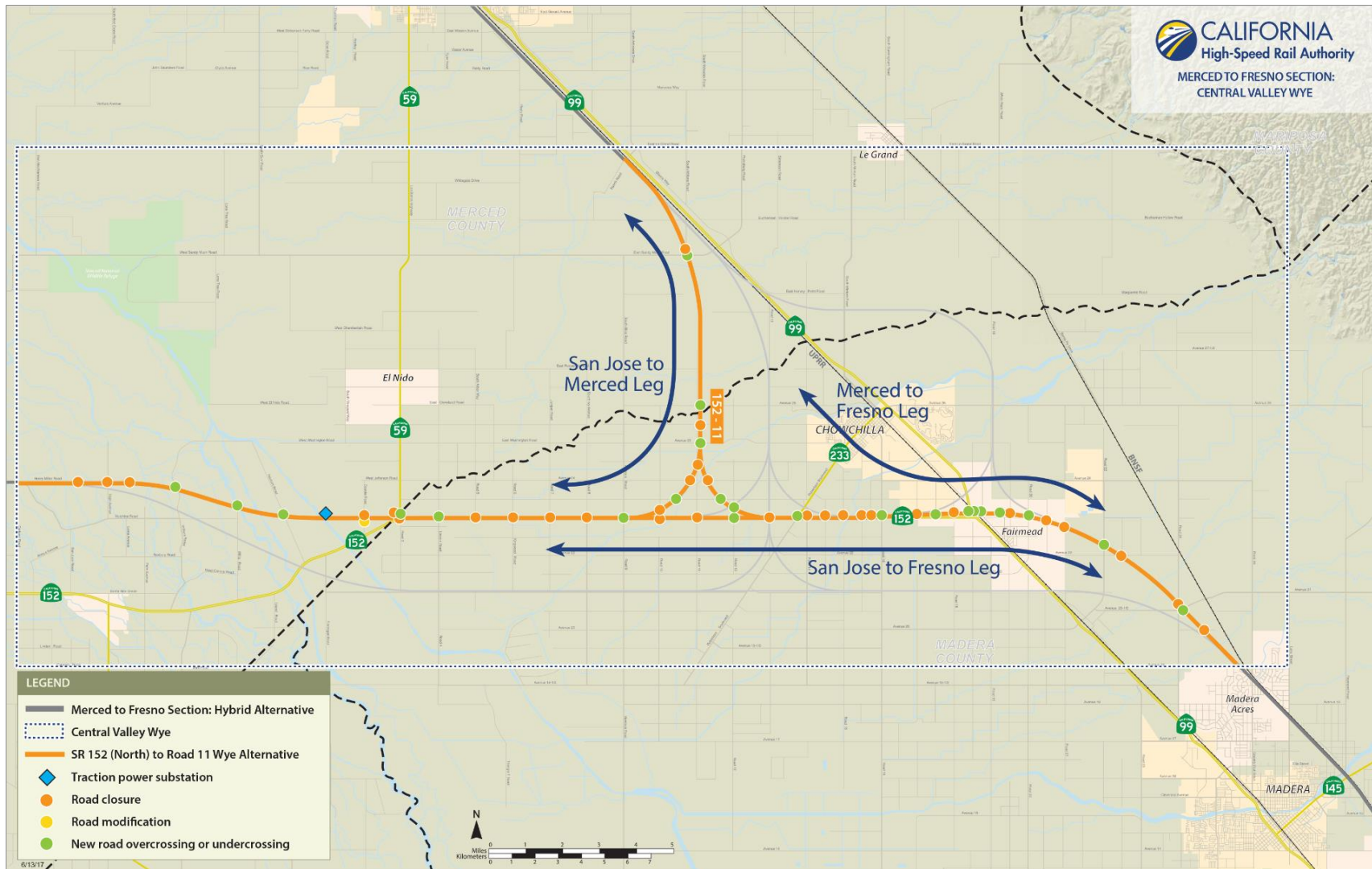
8.2 Basis of Selection of Preliminary LEDPA

The Authority and FRA have identified the SR 152 (North) to Road 11 Wye Alternative as the Preliminary LEDPA.

The Authority and FRA request concurrence with the SR 152 (North) to Road 11 Wye Alternative as the Preliminary LEDPA. The determination is based on the following considerations:

- Effect on jurisdictional waters
- Effect on other environmental resources
- Practicability as defined in the Section 404(b)(1) Guidelines, including consistency with the overall project purpose

Table 8-1 shows a summary of all permanent direct effects on jurisdictional waters for the CWA § 404(b)(1) analysis for the Central Valley Wye alternatives. The acreages presented in the tables reflect the quantities that are reported in tables in Chapter 4, Effects on Jurisdictional Waters.



Source: Authority and FRA, 2018a; ESRI, 2013; CAL FIRE, 2004; ESRI/National Geographic, 2015

FINAL – JUNE 13, 2017

Figure 8-1 SR 152 (North) to Road 11 Wye Alternative Alignment and Key Design Features

Table 8-1 404(b)(1) Comparison of Permanent Effects on Jurisdictional Waters (acres) Parameter

| | Alternatives | | | |
|------------------------------------------|-------------------------------|-------------------------------|--------------------------|-------------------------------|
| | SR 152 (North) to Road 13 Wye | SR 152 (North) to Road 19 Wye | Avenue 21 to Road 13 Wye | SR 152 (North) to Road 11 Wye |
| Jurisdictional Waters Effects | | | | |
| Vernal pool | 0.18 | 0.19 | 0.10 | 0.19 |
| Indirect bisected vernal pools | 0.04 | 0.04 | 0.64 | 0.04 |
| Seasonal wetland | 0.69 | 1.46 | 0.94 | 0.39 |
| Palustrine forested wetland | 0.08 | 0.00 | 0.08 | 0.00 |
| Constructed basin | 7.73 | 4.76 | 4.73 | 6.71 |
| Constructed watercourse | 14.19 | 13.11 | 24.45 | 10.67 |
| Natural watercourse | 6.34 | 7.83 | 5.02 | 4.73 |
| Natural waters | 7.34 | 9.53 | 6.78 | 5.34 |
| Constructed waters | 21.92 | 17.87 | 29.18 | 17.38 |
| Grand Total Jurisdictional Waters | 29.26 | 27.40 | 35.96 | 22.72 |

Source: Author's compilation, 2018

8.2.1 Summary of Jurisdictional Waters Effects

This section summarizes the effects of each alternative on waters of the U.S. based on the analysis of the Central Valley Wye alternatives contained in this Summary Report. The alternative with the fewest total permanent direct effects on all waters of the U.S. is the SR 152 (North) to Road 11 Wye Alternative with 22.72 acres of impact, which is approximately 17 percent less impact than the alternative with the second fewest permanent direct effects on waters of the U.S., the SR 152 (North) to Road 19 Wye Alternative with 27.40 acres of impact. The SR 152 (North) to Road 11 Wye Alternative also has the fewest effects on waters of the U.S. for other impact categories including temporary and permanent direct effects on wetlands, temporary and permanent direct effects on other waters of the U.S., temporary and permanent direct effects on natural waterbodies, and temporary and permanent direct effects on constructed waterbodies. The Avenue 21 to Road 13 Wye Alternative has the greatest permanent direct effects on waters of the U.S. with 35.96 acres of impact. The SR 152 (North) to Road 13 Wye Alternative has the second greatest permanent direct effects on waters of the U.S. with 29.26 acres of impact.

Summary of Effects on Wetlands

The alternative with the fewest total permanent effects on wetlands is the SR 152 (North) to Road 11 Wye Alternative with 0.62 acres of impact. The SR 152 (North) to Road 13 Wye Alternative has the next fewest permanent effects on wetlands at approximately 1.00 acres, which is approximately 38 percent higher than the SR 152 (North) to Road 11 Wye Alternative. The SR 152 (North) to Road 19 Wye Alternative would result in the next highest permanent effect at approximately 1.69 acres of impact, and the Avenue 21 to Road 13 Wye Alternative would result in the greatest permanent effect on wetlands at approximately 1.76 acres of impact.

The primary difference in permanent effects on wetlands across alternatives is the result of the lower impact on seasonal wetlands by the SR 152 (North) to Road 11 Wye Alternative. The SR 152 (North) to Road 11 Wye Alternative would result in only 0.39 acre of permanent effect on seasonal wetlands, whereas the next lowest impact on seasonal wetlands would be 0.69 acres by the SR 152 (North) to Road 13 Wye Alternative.

Permanent impacts on wetlands would be lowest under the SR 152 (North) to Road 11 Wye Alternative, thereby supporting the determination that this alternative is the preliminary LEDPA.

Summary of Effects on Other Waters of the U.S.

The alternative with the fewest total permanent effects on other waters of the U.S. is the SR 152 (North) to Road 11 Wye Alternative with 22.11 acres of impact. The SR 152 (North) to Road 19 Wye Alternative would result in the second fewest permanent effects on other waters of the U.S. with 25.71 acres of impact. The SR 152 (North) to Road 13 Wye Alternative would result in the second greatest permanent effects on other waters of the U.S. with 28.26 acres of impact, and the Avenue 21 to Road 13 Wye Alternative would result in the greatest permanent effects on other waters of the U.S. with 34.19 acres of impact.

The differences in effects on other waters of the U.S. vary depending on the waters of the U.S. feature type. The SR 152 (North) to Road 11 Wye Alternative would result in the fewest direct permanent effects on natural watercourse features with 4.73 acres of impact, and the fewest direct permanent effects on constructed waterbodies with 17.38 acres of impact. The Avenue 21 to Road 13 Wye Alternative would result in the second fewest permanent direct effects on natural watercourse features with 5.02 acres of impact. The SR 152 (North) to Road 19 Wye Alternative would result in the greatest permanent direct effects on natural waterbodies with 7.83 acres of impact and the second fewest permanent direct effects on constructed waterbodies with 17.87 acres of impact. The SR 152 (North) to Road 11 Wye Alternative results in the fewest direct permanent effects on other waters of the U.S.

Permanent effects on other waters of the U.S. would be lowest under the SR 152 (North) to Road 11 Wye Alternative thereby supporting the determination that the alternative is the preliminary LEDPA.

8.2.2 Summary of Other Adverse Environmental Consequences

Under the Section 404(b)(1) Guidelines, USACE may not permit a proposed discharge if there is a practical alternative that would have less adverse impact on the aquatic ecosystem, provided the alternative does not have other significant adverse environmental consequences. The preliminary LEDPA (SR152 [North] to Road 11 Wye Alternative) has the least adverse impact on the aquatic ecosystem relative to the other three alternatives. Nevertheless, an analysis of other environmental effects has been conducted to confirm that the preliminary LEDPA does not have significant adverse environmental consequences that would be avoided by one or more of the other alternatives.

A summary of other adverse environmental consequences is only included for those resources where there is a notable variation in the level of impact between the Central Valley Wye alternatives. No summary is included for effects that would be the same or very similar for all Central Valley Wye alternatives. A more detailed comparison is provided and organized by resource type in Chapter 6, Comparative Analysis of Effects on Other Environmental Resources for Central Valley Wye Alternatives, of this Summary Report.

Biological Resources

This section summarizes effects on biological resources that would occur from construction of the Central Valley Wye alternatives where there is a clear distinction in the level of impact between the alternatives. Effects from operations and maintenance activities are not discussed because they would be identical or very similar for all of the Central Valley Wye alternatives.

Special-Status Plant Communities

The SR 152 (North) to Road 11 Wye Alternative would have the least potential for direct and indirect effects on seasonal wetland plant communities. Three of the Central Valley Wye alternatives (SR 152 [North] to Road 13 Wye, SR 152 [North] to Road 19 Wye, and SR 152 [North] to Road 11 Wye) would have equal potential for direct effects on valley sink scrub. The SR 152 (North) to Road 13 Wye Alternative would have the greatest potential for effects on the “other riparian” plant communities. The SR 152 (North) to Road 19 Wye Alternative would have the greatest potential for effects on the mixed riparian, and seasonal wetland plant communities. The Avenue 21 to Road 13 Wye Alternative would have the greatest potential for effects on vernal pool plant communities.

Taken as a whole, the SR 152 (North) to Road 11 Wye Alternative would have the least overall potential effect on special-status plant communities thereby supporting the determination that the alternative is the preliminary LEDPA.

Special-Status Plant Species Habitat

There are 42 special-status plant species associated with seven land cover types that may potentially be directly and/or indirectly affected by the Central Valley Wye alternatives. The SR 152 (North) to Road 11 Wye Alternative would have the least potential effect on three species associated with freshwater marsh, natural watercourses, open water, or seasonal wetlands. The Avenue 21 to Road 13 Wye Alternative would have the greatest potential effect on nine special-status plant species associated and the least potential effect on palmate-bracted bird’s-beak. The Avenue 21 to Road 13 Wye Alternative would have the greatest potential effect on two special-status plant species associated with other riparian vegetation. The SR 152 (North) to Road 19 Wye Alternative would have the greatest potential effect on 22 special-status plant species associated with California annual grassland and three special-status plant species associated with freshwater marsh, natural watercourses, open water, and seasonal wetlands. The SR 152 (North) to Road 19 Wye Alternative also would have the greatest potential effect on San Joaquin woollythreads and palmate-bracted bird’s-beak, both of which are associated with the valley sink scrub community and some California annual grassland.

The potential effect of the SR 152 (North) to Road 11 Wye Alternative on special-status plant species would be commensurate with the effect of other alternatives on the range of special status plant species in the area. The alternative would not cause a significant adverse effect to any of these plant species.

Special-Status Wildlife Species Habitat

A total of 64 special-status wildlife species have moderate to high potential to occur in the habitat study area. The SR 152 (North) to Road 11 Wye Alternative has the least adverse effects on the aquatic habitats and associated aquatic organisms as compared to the other alternatives. For terrestrial habitats and organisms, all alternatives are generally comparable; however the Avenue 21 to Road 13 Wye Alternative has the least adverse effects, followed closely by the SR 152 (North) to Road 11 Wye Alternative. The SR 152 (North) to Road 11 Wye Alternative would have the least potential for impacts on special-status invertebrates and amphibians. The Avenue 21 to Road 13 Wye Alternative would generally have the least potential for effects on special-status fish species, reptiles, birds, and mammals. While the Avenue 21 to Road 13 Wye Alternative would have the fewest effects on the habitat of most special-status wildlife species, the SR 152 (North) to Road 11 Wye Alternative would have the second fewest effects on most special-status species.

Effects on special-status wildlife species under the SR 152 (North) to Road 11 Alternative would be second fewest overall, thereby neither supporting nor eliminating identification of this alternative as the preliminary LEDPA.

Critical Habitat

The SR 152 (North) to Road 13 Wye Alternative and the Avenue 21 to Road 13 Wye Alternative would have no effects on critical habitat. The SR 152 (North) to Road 11 Wye Alternative would have effects on designated critical habitat of two vernal pool species. The SR 152 (North) to Road 19 Alternative would have the greatest effects on designated critical habitat for all eight species. While the SR 152 (North) to Road 11 Alternative includes 2.94 acres of mapped critical habitat, the actual aquatic habitat affected would be only 0.21 acre of aquatic habitat for the vernal pool species.

Habitat Linkages and Wildlife Movement Corridors

The SR 152 (North) to Road 11 Wye Alternative would have the fewest potential effects on wildlife movement corridors. Relative to one another, the SR 152 (North) to Road 13 Wye Alternative and the Avenue 21 to Road 13 Wye Alternative would have similar potential effects on wildlife movement corridors. The SR 152 (North) to Road 19 Wye Alternative would have the greatest potential effects on wildlife movement corridors because it would impact the greatest area of land compared to the other three alternatives, especially within the Eastman Lake–Bear Creek ECA.

Effects on habitat linkages and movement corridors would be lowest under the SR 152 (North) to Road 11 Alternative, thereby supporting identification of this alternative as the preliminary LEDPA.

Transportation and Traffic

All of the Central Valley Wye alternatives would result in similar construction-related effects on transportation and traffic. These transportation and traffic effects would be temporary construction and would not be severe enough to warrant mitigation. Furthermore, operations of the Central Valley Wye alternatives would not result in effects to transportation and traffic. The effects on transportation and traffic would not be significant and are similar between alternatives, therefore they do not support or eliminate the SR 152 (North) to Road 11 Wye Alternative as the preliminary LEDPA.

Noise

Construction and operations of the Central Valley Wye alternatives would result in temporary and permanent noise effects. Operations associated with all four of the Central Valley Wye alternatives would have moderate and severe noise effects on single-family residences. Even with the implementation of mitigation, moderate and severe effects on sensitive receivers would be unavoidable for all Central Valley Wye alternatives. Therefore noise effects from construction and operations do not support or eliminate the SR 152 (North) to Road 11 Wye Alternative as the preliminary LEDPA.

Agriculture

Construction of all four Central Valley Wye alternatives would require the temporary use of Important Farmland for construction staging areas and other construction-related activities, and temporarily used Important Farmland would be restored to agricultural use following completion of construction. The SR 152 (North) to Road 11 Wye Alternative would result in the fewest temporary effects on Important Farmland. Each of the Central Valley Wye alternatives would also result in permanent conversion of Important Farmland. In total, permanent direct and indirect conversion of Important Farmland to nonagricultural use under the Central Valley Wye alternatives would range from 2,336 acres for the SR 152 (North) to Road 11 Wye Alternative to 2,537 acres for the SR 152 (North) to Road 19 Wye Alternative. Even with the implementation of mitigation this impact would be unavoidable. Other potential effects on agricultural farmland include utility interruptions, road closures, vertical structures interfering with aerial spraying, creation of small remnant parcels, and wind impacts from passing trains; however, these effects are similar under all alternatives and therefore not a critical factor in identification of the preliminary LEDPA.

Temporary use of Important Farmland for construction and permanent conversion of Important Farmland for use as a part of the Central Valley Wye would be least under the SR 152 (North) to Road 11 Wye Alternative thereby supporting the identification of this alternative as the preliminary LEDPA.

Parks and Recreation

Construction of the Central Valley Wye alternatives has the potential to affect access and use of existing parks and recreational facilities and future development opportunities of planned recreational improvements, including along the Ash and Berenda Sloughs. All four Central Valley Wye alternatives would cross Berenda and Ash slough, although only the SR 152 (North) to Road 19 Wye Alternative would cross the sloughs to the east of the City of Chowchilla where the trail connection to Berenda Reservoir has been proposed. Construction of this alternative would block the development and use of these future trail corridors, and the Authority has identified mitigation to minimize the effect of this impact. There are no notable differences between alternatives regarding impacts from noise and dust on recreational activity, access to recreational facilities, operations noise on open-space corridors, and changes to the setting near parks and recreational areas and therefore these factors were not useful in identifying the preliminary LEDPA.

Impacts on parks and recreation would be greatest under the SR 152 (North) to Road 19 Wye Alternative and similar under the other three alternatives, thereby neither supporting nor eliminating the SR 152 (North) to Road 11 Wye Alternative as the preliminary LEDPA.

Aesthetics and Visuals

Implementing the Central Valley Wye alternatives could result in permanent and temporary effects on aesthetic and visual resources as a result of blocking the views of residents and other highly responsive viewers during construction and operations of all alternatives. During construction, the Avenue 21 to Road 13 Wye Alternative would affect the fewest residential viewers. All Central Valley Wye alternatives would introduce permanent changes to the aesthetic and visual quality of rural and agricultural settings, affecting sensitive viewers such as residential viewers in the Robertson Boulevard and Fairmead Landscape Units. The Avenue 21 to Road 13 Wye Alternative has the fewest effects in the Robertson Boulevard Landscape Unit and no effects

in the Fairmead Landscape Unit. The SR 152 (North) to Road 11 Wye Alternative would cross Robertson Boulevard only once in an area where both travelers and residents with a moderately high to high viewer response are present, removing 160 palms; therefore, this alternative would have the second fewest effects on visual resources in the Robertson Boulevard Landscape Unit. The SR 152 (North) to Road 19 Wye Alternative would have the greatest effects on the Fairmead Landscape Unit, and the SR 152 (North) to Road 13 Wye Alternative and SR 152 (North) to Road 11 Wye Alternative would have the second fewest effects. Mitigation measures would be implemented to reduce effects associated with decreased visual quality; however, these effects would persist and would be unavoidable after mitigation (with the exception of the Avenue 21 to Road 13 Wye Alternative where it avoids the Fairmead Landscape Unit).

While the effects on aesthetics and visual resources would be least under the Avenue 21 to Road 13 Wye Alternative, all of the alternatives would have unavoidable effects to visual resources. The intermediate effects under the SR 152 (North) to Road 11 Wye Alternative, thereby would not be a basis for eliminating the SR 152 (North) to Road 11 Wye Alternative as the preliminary LEDPA.

Cultural Resources

The Central Valley Wye alternatives could result in construction-related effects on cultural resources due to temporary and permanent disturbance of land within the project footprints of the Central Valley Wye alternatives. Unknown archaeological sites could be subject to disturbance-related effects from construction activities involving soil excavation or compaction resulting from the use of heavy machinery on the construction site itself or in staging areas. Cultural resources, including subsurface buried archaeological deposits, may exist but are currently unidentified. Construction of all Central Valley Wye alternatives would not result in higher potential for public access to archaeological sites because the new right-of-way would be access controlled and no new public access to previously inaccessible areas would be provided. Mitigation measures would reduce the effects for all Central Valley Wye alternatives. All alternatives would have similar minor effects on the Chowchilla Canal. While all alternatives would result in similar significant and unavoidable effects on the Robertson Boulevard Tree Row, the SR 152 (North) to Road 11 Wye Alternative would result in the fewest effects of all the Central Valley Wye alternatives with approximately 4,088 linear feet of disturbance to the tree row, and the Avenue 21 to Road 13 Wye Alternative would result in the greatest effects with approximately 5,590 linear feet of disturbance to the tree row in an area where the tree row is relatively intact.

The SR 152 (North) to Road 11 Wye Alternative would result in the fewest impacts on the Robertson Boulevard Tree Row, thereby supporting the identification of this alternative as the preliminary LEDPA.

Environmental Justice

The Central Valley Wye alternatives would require construction activities and the use of equipment that would result in temporary increases in construction-related noise and dust, visual disruption of residential views, and temporary construction-related traffic and detours that would affect residents and community resources in close proximity to the Central Valley Wye alternatives. These temporary construction-related effects would last 1 to 3 years at any given location and would be experienced by individuals along the entire alignment. These effects would be greatest under the SR 152 alternatives due to the proximity and greater density of sensitive receivers associated with their alignment through the community of Fairmead and would occur to a lesser degree under the Avenue 21 to Road 13 Wye Alternative.

Construction of the Central Valley Wye alternatives would result in permanent changes to visual quality, roadway access, and community cohesion, which would predominately affect low-income and minority populations. While these effects would occur along the entire alignment, the greatest effects would occur within the community of Fairmead as a result of construction of the SR 152 alternatives. The SR 152 alternatives would affect community cohesion because, while some roads would be grade separated and remain open to travel across the HSR system, others would be closed and would therefore impede travel between residences in the northern part of the

community and the residences and community facilities (e.g., Fairmead Elementary School) to the south. The SR 152 (North) to Road 19 Wye Alternative would have the greatest effects on the community character and cohesion of Fairmead due to the greater length of alignment that bisects the community and displaces a greater number of residences that due to the limited available replacement properties within the community may be unable to relocate within Fairmead. The SR 152 (North) to Road 13 Wye and SR 152 (North) to Road 11 Wye Alternatives would have similar types of effects, but of lesser magnitude than the effects that would occur under the SR 152 (North) to Road 19 Wye Alternative. The Avenue 21 to Road 13 Wye Alternative would have some effects on individuals within the southern portion of Fairmead, but its alignment south of the population center would avoid these community cohesion impacts.

With the implementation of mitigation, the only significant adverse effects on low-income and minority populations would be associated with permanent aesthetics and visual quality and operations noise effects. Although these effects would be borne predominantly by low-income and minority populations, they would not be disproportionately high and adverse because mitigation would avoid and minimize the adverse effects on low-income and minority populations such that these effects would not be appreciably more severe or greater in magnitude than those that would be incurred by the general population.

With mitigation and offsetting beneficial effects of the proposed mitigation, no adverse effects on low-income and minority populations would occur associated with socioeconomic effects (community cohesion, school district funding, displacements and relocations, and employment); transportation; air quality; hazardous materials and wastes; cultural resources; and parks, recreation, and open space.

Effects on the community of Fairmead would be least under the Avenue 21 to Road 13 Wye Alternative and intermediate under the SR 152 (North) to Road 11 Wye Alternative. However, there would be no disproportionately high and adverse effects from construction and operations of any of the Central Valley Wye alternatives, thereby neither supporting nor eliminating the SR 152 (North) to Road 11 Wye Alternative from consideration as the preliminary LEDPA.

8.2.3 Summary of Practicability Analysis

The practicability analysis described in Chapter 7 found that the SR 152 (North) to Road 11 Wye Alternative is both consistent with the overall project purpose and capable of being done in light of cost, existing technology, and logistical considerations.

All four action alternatives were determined to be practicable. The no fill alternative is available and capable of being done from a logistics and existing technology standpoint, but is made impracticable by cost considerations.

8.3 Conclusion

With respect to impacts on waters of the U.S., the SR 152 (North) to Road 11 Wye Alternative has the fewest direct permanent effects on jurisdictional waters at 22.72 acres of impact, including to both wetlands and other waters of the U.S. The SR 152 (North) to Road 19 Wye Alternative has the second fewest effects with 27.40 acres of impact, approximately 17 percent higher than the SR 152 (North) to Road 11 Wye Alternative. There is, therefore, no “practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem.” (40 C.F.R. § 230.10(a)).

Evaluating the effects of the action and No-Fill alternatives on other environmental resources further supports identification of the LEDPA, as neither the SR 152 (North) to Road 11 Wye Alternative nor other practicable alternatives result in other distinguishing significant adverse environmental consequences. Biological resources are central to this evaluation and the SR 152 (North) to Road 11 Wye Alternative generally results in low to intermediate impacts on special-status species and their habitats relative to the other practicable alternatives. Other environmental resources such as transportation and traffic, noise, parks and recreation, and cultural resources were considered but generally did not result in notable distinguishing factors to support or reject alternatives from identification as the LEDPA. Furthermore, while the Avenue 21

to Road 13 Wye Alternative may result in the least environmental impacts to aesthetics and environmental justice, this alternative has a substantially higher direct permanent effect on waters of the U.S. as compared to the SR 152 (North) to Road 11 Wye Alternative (35.96 acres versus 22.72 acres), thereby eliminating the alternative from consideration as the LEDPA. The SR 152 (North) to Road 11 Wye Alternative did not result in any environmental consequences that were substantially greater as compared to other alternatives and typically ranked as having the fewest or second fewest impacts in each resource area evaluated.

Based on the foregoing, the SR 152 (North) to Road 11 Wye Alternative has been identified as the preliminary LEDPA.

9 CONCEPTUAL MITIGATION OF EFFECTS ON JURISDICTIONAL WATERS

Final compensatory mitigation has been determined for the Merced to Fresno Section of the HSR; however, there will be a new supplementary compensatory mitigation plan for the Central Valley Wye portion of the Merced to Fresno section. Final mitigation acreage for jurisdictional water effects will be determined in consultation with the USACE and will be determined in part through the assessment of functions and values that would be lost or impaired through construction and operation of the Central Valley Wye of the Merced to Fresno Section and the proposed functions and values that will be preserved, created, restored, and enhanced by the proposed mitigation package for the Central Valley Wye.

A pCMP (Authority and FRA 2018c) was created to integrate the requirements of all permit agencies into a comprehensive plan for mitigating direct effects on jurisdictional waters and on special-status species for the Central Valley Wye portion of the Merced to Fresno Section. Consistent with the regulatory and resource agency priorities and policies described herein, the pCMP utilizes a watershed-based approach to identify mitigation sites exhibiting high conservation values, as well as opportunities to restore, enhance, establish, and preserve jurisdictional waters and special-status species habitats. In particular circumstances (e.g., listed species ranges), the pCMP considered ecoregions beyond the affected watersheds (e.g., Great Valley ecoregion, southern Sierra Nevada foothills ecoregion) in order to evaluate potential mitigation opportunities that may be environmentally preferable for a particular resource.

9.1 Watershed Approach

To compensate for unavoidable losses of aquatic resources, the Authority will follow the mitigation hierarchy in the 2008 mitigation rule. The pCMP focuses on purchasing credits at approved mitigation banks, followed by purchasing credits through the approved NFWF In-Lieu Fee (ILF) program, or securing one or more permittee responsible mitigation (PRM) sites, if necessary, to meet residual mitigation needs.

With the exception of three conservation banks (French Camp Conservation Bank, River Ranch Conservation Bank, and Sand Creek Conservation Bank) and the National Fish and Wildlife Foundation (NFWF) ILF Program, the proposed compensatory mitigation options described in this pCMP comply with the watershed approach to mitigation site selection. The French Camp and River Ranch conservation banks are included in the pCMP because these banks fall within the same general ecoregion as the Central Valley Wye (Great Valley ecoregion) as well as designated critical habitat for valley elderberry longhorn beetle; they are the only conservation banks within this ecoregion offering credits for effects on valley elderberry longhorn beetle. The Sand Creek Conservation Bank is included because this bank falls within the same general ecoregion as the Central Valley Wye (Great Valley ecoregion) as well as an adjacent (non-contiguous) watershed (Upper Kaweah [HUC 18030007]), and is one of only two conservation banks in the region offering credits for effects on San Joaquin kit fox. Consistent with 33 C.F.R. Part 332.3(e), in-kind mitigation is given preference unless it is determined under the watershed approach and through consultation with the USACE that out-of-kind mitigation is more appropriate. Lastly, the NFWF ILF Program was included in the pCMP because the program currently has available advance credits for effects on jurisdictional waters (i.e., waters of the U.S. and state) within the larger San Joaquin River watershed that extend beyond the affected watersheds into adjacent watersheds (Upper San Joaquin [HUC 18040006] and Panoche-San Luis Reservoir [18040014]), as well as available advance credits for effects on vernal pools and associated species within the southern Sierra Nevada foothills ecoregion. The NFWF ILF Program managers are currently investigating restoration, enhancement, and preservation opportunities within the subject watersheds (Middle San Joaquin-Lower Chowchilla and Upper Chowchilla-Upper Fresno) and ecoregions (Great Valley and southern Sierra Nevada foothills); accordingly, additional opportunities for watershed mitigation under the ILF program may also become available in the future.

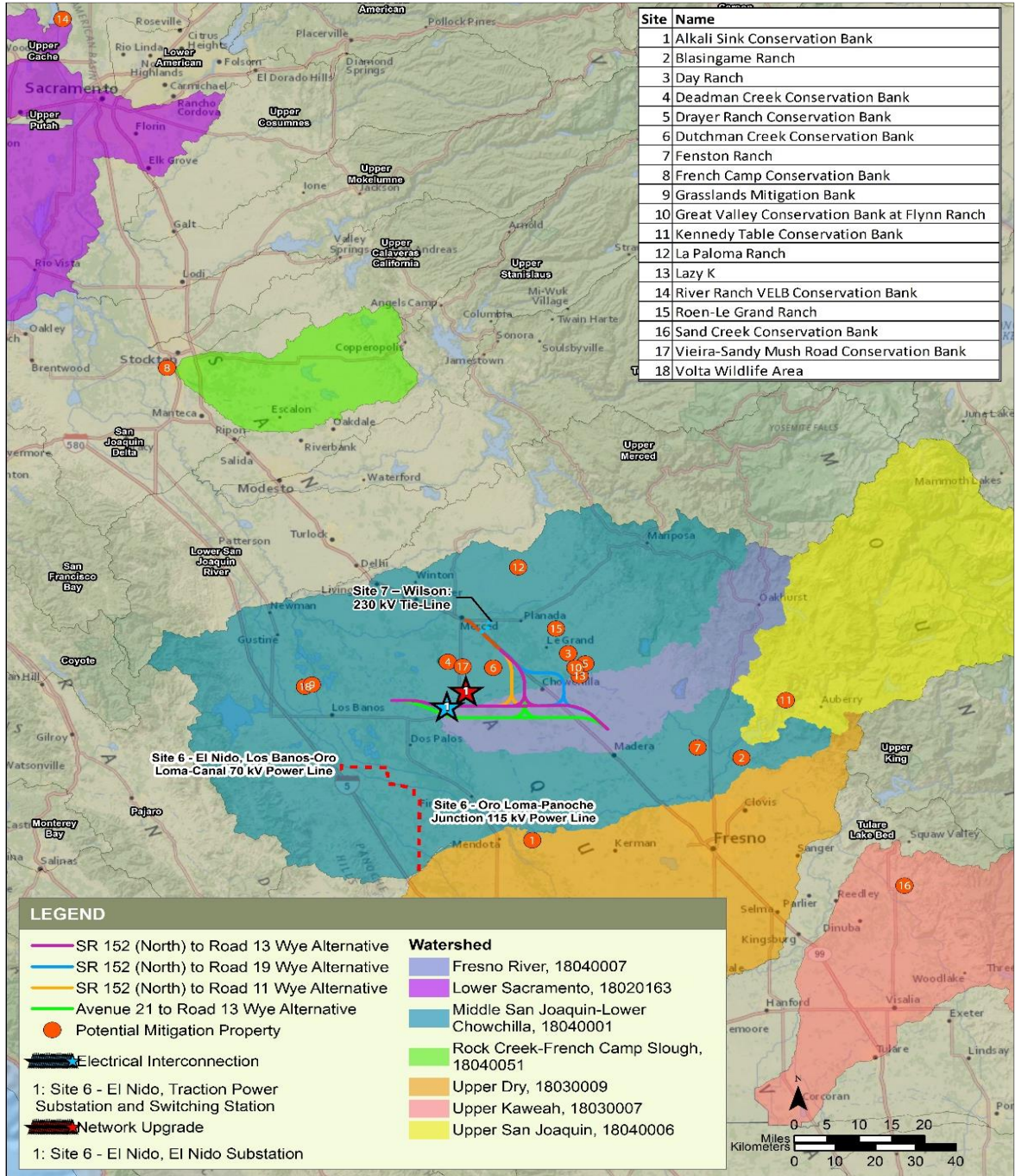
9.2 Mitigation Options

The mitigation options evaluated in the pCMP were identified through the following sources:

- GIS analysis of sites that retain natural habitat and jurisdictional water features and that have been identified by the resource agencies as high priorities for conservation
- Interviews with regional mitigation and planning specialists
- Interviews with third party mitigation providers (mitigation banks, ILF programs, and conservation banks)
- Outreach with interested landowners
- The Merced to Fresno Mitigation Strategy Implementation Plan (Authority and FRA 2012e)
- USACE/USEPA Regulatory In-Lieu Fee and Banking Internet Tracking System
- USFWS Sacramento office's conservation bank database (USFWS 2015)

This effort identified the following potential compensatory mitigation options, described in detail in Section 6 of the pCMP (Appendix E), Proposed Compensatory Mitigation (Figure 9-1 shows the vicinity map):

- One mitigation bank
- Nine conservation banks
- One ILF program
- Eight potential PRM sites (including Lazy K Ranch (existing) and Lazy K Ranch (potential) PRM sites)



Sources: ESRI ArcGIS versions 10.1, 10.2, 10.3 and from data generated by field surveys and aerial photo interpretation during 2010-2015

FINAL - MARCH 10, 2016

Figure 9-1 Vicinity Map of Potential Compensatory Mitigation Sites

10 FACTUAL DETERMINATIONS REGARDING EFFECTS OF THE PRELIMINARY LEDPA (40 C.F.R. § 230.11 AND SUBPARTS C, D, E, AND F)

Appendix F provides a detailed description of the factual determinations for the Preliminary LEDPA, pursuant to the CWA Section 404(b)(1) Guidelines, including findings of compliance with the discharge restrictions, potential effects on biological characteristics of the aquatic ecosystem, potential effects on human use characteristics, and other environmental resource effects.

11 SECTION 4(f) RESOURCES

Projects undertaken by an operating administration of the U.S. Department of Transportation or that may receive federal funding or discretionary approvals from an operating administration of U.S. Department of Transportation must demonstrate compliance with Section 4(f). Section 4(f) protects publicly owned land of parks, recreational areas, and wildlife refuges. Section 4(f) also protects historic sites of national, state, or local significance located on public or private land. The FRA's Procedures for Considering Environmental Effects (64 C.F.R. § 25445) contains FRA processes and protocols for analyzing the potential use of Section 4(f) resources. In addition, although not subject to the Title 23 U.S.C. Section 774 regulations regarding Section 4(f) for highways and transit projects, the FRA uses these regulations as additional guidance when applying the requirements established in Section 4(f).

The FRA may not approve the use of a Section 4(f) property unless it determines that there is no feasible and prudent alternative to avoid the use of the property and the action includes all possible planning to minimize harm resulting from such use, or the project has a *de minimis* impact consistent with the requirements of Title 49 U.S.C. Section 303(d).

An alternative is not feasible if it cannot be built as a matter of sound engineering judgment. In determining whether an alternative is prudent, the FRA may consider if the alternative would result in any of the following:

- Compromise the project to a degree that is unreasonable for proceeding with the project in light of its stated Purpose and Need.
- Unacceptable safety or operational problems.
- After reasonable mitigation, the project results in severe social, economic, or environmental effects; severe disruption to established communities; severe disproportionate effects on minority or low-income populations; or severe effects on environmental resources protected under other federal statutes.
- Additional construction, maintenance, or operational costs of an extraordinary magnitude.
- Other unique problems or unusual factors.
- Multiple factors that, while individually minor, cumulatively cause unique problems or effects of extraordinary magnitude.

If the FRA determines there is both the use of a Section 4(f) property and that there is no prudent and feasible alternative to the use of a Section 4(f) property, then the project must include all possible planning to minimize harm to the property, which includes all reasonable measures to minimize harm or mitigate effects (49 U.S.C. § 303(c)(2)).

If there is more than one alternative that results in the use of a Section 4(f) property, the FRA 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. The least overall harm may be determined by balancing the following factors:

- The ability to mitigate adverse effects on each Section 4(f) property (including any measures that result in benefits to the property).
- The relative severity of the remaining harm—after mitigation—to the protected activities, attributes, or features that qualify each Section 4(f) property for protection.
- The relative significance of each Section 4(f) property.
- The views of the official(s) with jurisdiction over each Section 4(f) property.
- The degree to which each alternative meets the Purpose and Need for the project.
- After reasonable mitigation, the magnitude of any adverse effects on resources not protected by Section 4(f).

- Substantial differences in costs among the alternatives.

The first four factors relate to the net harm that each alternative would cause to Section 4(f) property; the remaining three factors take into account concerns with the alternatives that are not specific to Section 4(f).

11.1 Planning Measures to Minimize Harm

Measures to minimize harm include measures that were taken during project planning to avoid or minimize effects as well as mitigation and enhancement measures to compensate for unavoidable effects. Measures identified by the FRA and the Authority to minimize harm, as required by 49 U.S.C. Section 303(c)(2), that will be incorporated into the Central Valley Wye alternatives to address the effects of the alternatives are listed below. The FRA and the Authority are continuing coordination, as appropriate, with the State Historic Preservation Officer (SHPO); during the FRA's consideration of its decision and during final design, additional measures may be agreed on to further reduce potential effects on Section 4(f) properties.

11.2 Preliminary Section 4(f) Least Harm Analysis for the Central Valley Wye Alternatives

When there is no feasible and prudent avoidance alternative to using Section 4(f) resources, the FRA must approve the alternative that causes the least overall harm to Section 4(f) resources, taking into consideration the preservation purpose of the statute. All the Central Valley Wye alternatives would affect the Robertson Boulevard Tree Row with varying degrees of severity. Though each alternative would affect the Robertson Boulevard Tree Row, the impact would differ in terms of numbers of trees that would need to be removed and in which locations would be affected. Based on the analysis of all the factors and in light of the preservationist purpose of Section 4(f), the FRA has preliminarily determined that the SR 152 (North) to Road 11 Wye Alternative would result in the least overall harm to properties protected by Section 4(f).

12 PUBLIC INVOLVEMENT

This chapter summarizes the comments received from the public on the Merced to Fresno Section Final EIR/EIS and the Authority's outreach to local stakeholders

12.1 Summary of Outreach to Stakeholders

The following is a general timeline for the publication of the Final EIR/EIS for the Merced to Fresno Section and the opportunity for public comment:

- The final Checkpoint A submittal was received in December 2010 and the USACE agreed with the project purpose on February 2011.
- The final Checkpoint B submittal was received in April 2011 and the USACE partially agreed in June 2011 while disagreeing with the elimination of the Western Madera Alternative. The Authority responded with additional information in January 2012 and the USACE agreed in February 2012
- In August 2011, a Draft EIS was issued by the FRA and Authority. A Notice of Availability was published in the Federal Register on August 12, 2011 (76 FR 156). The public review period was extended to 60 days, ending October 13, 2011. The FRA and Authority received 894 comment submittals on the Draft EIS.
- The final Checkpoint C submittal was received in February 2012 and the USACE concurred with the preliminary LEDPA in March 2012.
- The FRA and Authority issued a Final EIS on April 2012 and a Notice of Availability was published in the Federal Register on April 20, 2012 (77 FR 77). The FRA and Authority received 38 comment submittals on the Final EIS. The FRA released an addendum and errata to the Final EIS on April 27, 2012.
- The FRA signed a ROD and a General Conformity Determination on September 18, 2012. The General Conformity Determination was noticed in the Federal Register on October 18, 2012 (77 FR 202). The FRA ROD did not make a decision on the Wye or the HMF alternatives. The Final EIS and FRA ROD identified the Hybrid Alternative with the Downtown Merced Station and the Downtown Fresno Mariposa Street Station Alternative as the selected alternative and the Environmentally Preferable Alternative.
- Following completion of the Draft EIS, the Authority submitted a new complete application for Permit Phase 1 which was posted for a 30-day public notice on April 18, 2013

Stakeholder input is a critical component of the Authority's process in identifying the reasonable range of alternatives for further evaluation in the CEQA and NEPA environmental process, and the Authority has been closely coordinating with a variety of individuals, local governments, and organizations to obtain input on which Central Valley Wye alternatives are preferred by local agency and public stakeholders. The Supplemental Alternatives Analysis Report and the Supplemental Checkpoint B and Addenda summarize this stakeholder and public feedback, and input from regulatory agencies.

Following the approval of the Merced to Fresno Section in 2012, the Authority and FRA held a series of open houses, formal presentations, and question and comment sessions to present information and provide opportunities for input by local agency and public stakeholders regarding the wye connection. In addition to the five public information meetings held in Chowchilla and Fairmead in March 2013, January 2015, and December 2016, 138 meetings (listed below) were held with public stakeholders and agencies between June 2012 and September 2017:

- California Department of Corrections and Rehabilitation (2 meetings)
- Caltrans District 10 (2 meetings) and District 6 (3 meetings)
- Central California Irrigation District (1 meeting)

- Central Valley Flood Protection Board (CVFPB) (1 meeting)
- Central Valley Rails to Trails Meeting (1 meeting)
- Chowchilla School District (6 meetings)
- Chowchilla Water District (2 meetings)
- City of Chowchilla (10 meetings)
- City of Chowchilla and Caltrans District 7 (1 meeting)
- City of Chowchilla, Caltrans District 6, and Private Developer (1 meeting)
- City of Chowchilla and Friends of Fairmead (1 meeting)
- City of Madera (1 meeting)
- City of Merced (1 meeting)
- Congressman Costa's staff, Merced College President Taylor, Madera County Supervisor Farinelli (1 meeting)
- Fagundes Ranch, Preserve our Heritage, and Fagundes Brothers (2 meetings)
- Fairmead Community and Friends (12 meetings)
- Fred Fagundes, Judge Brigby, Madera County Planning and Roads Department (1 meeting)
- Fred Fagundes, Preserve Our Heritage, and Merced County Farm Bureau (1 meeting)
- Fresno-Madera Fire and Life Safety (1 meeting)
- Elected officials (4 meetings)
- Greenhills Estates Property Owners, Chowchilla City Manager Lewis, Chowchilla Mayor Walker, and Madera County Supervisor Rogers (1 meeting)
- Henry Miller Reclamation District (2 meetings)
- Landowners, developers, farmers, and businesses (10 meetings)
- Lower San Joaquin Levee District (2 meetings)
- Madera County (9 meetings)
- Madera County Supervisor and Lazy K Ranch (1 meeting)
- Madera County Farm Bureau, Merced County Farm Bureau, and Kole Upton (1 meeting)
- Madera County Farm Bureau (3 meetings)
- Merced County (6 meetings)
- Merced County Association of Governments (1 meeting)
- Merced County Farm Bureau (3 meetings)
- Merced County Supervisor Pedrozo and Marchini Farms (1 meeting)
- Merced County Supervisor Pedrozo, Minturn Nut Company, and Marchini Farms (1 meeting)
- PG&E (1 meeting)
- Preserve Our Heritage (2 meetings)
- Preserve Our Heritage, Fagundes Brothers, and Greenhills Homeowners Association (1 meeting)
- San Luis Canal Company (1 meeting)

- Tribal Coordination Meetings (4 meetings)
- UPRR (2 meetings)
- Technical Working Group meetings included the following:
 - Central Valley Rail Policy Working Group and San Joaquin Regional Conservation Corps (1 meeting)
 - Farm Bureau Working Group
 - Madera County Farm Bureau and Merced County Farm Bureau (15 meetings)
 - Madera County Farm Bureau, Merced County Farm Bureau, Preserve Our Heritage, and Chowchilla Water District (2 meetings)
 - Madera County Farm Bureau, Merced County Farm Bureau, Preserve Our Heritage Members, Chowchilla Water District staff, and Alview Dairyland Union School District staff (1 meeting)
- Resource agency meetings included the following:
 - Coordination meetings with the U.S. Environmental Protection Agency (USEPA) and USACE (3 meetings)
 - Coordination meeting with the USACE, USEPA, U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), U.S. Bureau of Reclamation (USBR), California Department of Fish and Wildlife (CDFW), State Water Resources Control Board (SWRCB), and CVFPB (1 meeting)
 - Environmental Justice Outreach meeting with USEPA (1 meeting)
 - Permitting meetings with USACE (4 meetings)
 - Central Valley Regional Coordination Meetings
 - USACE, USEPA, CDFW, NMFS, and SWRCB (1 meeting)
 - USACE, USEPA, USFWS, USBR, CDFW, SWRCB, and NMFS (1 meeting)
 - USACE, CDFW, USFWS, NMFS, and U.S. Forest Service (1 meeting)

13 COMPLIANCE WITH FEDERAL AND STATE LAWS

The NEPA/Section 404 Integration MOU includes a request to provide a status of the FRA and the Authority's compliance with applicable federal and state laws, regulations, and executive orders, including, but not limited to:

- Sections 404, 401, and 402 of the CWA
- Section 14 of the Rivers and Harbors Act (Section 408)
- Section 4(f) of the U.S. Transportation Act of 1966
- Section 106 of the National Historic Preservation Act
- Section 307(c) General Conformity Determination of the Clean Air Act
- Section 7 of the FESA
- Fish and Wildlife Coordination Act
- U.S. Presidential Executive Order 12989 (Environmental Justice)
- Section 2081(b) of the CESA

Table 13-1 shows a status update for the permitting efforts required under the applicable federal and state environmental laws. The Authority and FRA have completed fieldwork, and have initiated coordination and preparation of various permitting documents in accordance to the agreements including the NEPA/404/408 MOU (Authority and FRA 2010a) and the *Section 106 Programmatic Agreement* (Authority and FRA 2011) established with environmental resource agencies to facilitate the environmental permitting required during final design and construction. Consultation with the relevant federal and state agencies as part of NEPA and the associated permitting processes would also meet the Fish and Wildlife Coordination Act requirements.

Table 13-1 Status of Permitting for Federal and State Environmental Laws and Regulations

| Agency | Permits/Regulations/Executive Orders | Status | Next Steps |
|--------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal | | | |
| U.S. Army Corps of Engineers (USACE) | Section 404 of the Clean Water Act (CWA) Permit for Discharge of Dredge or Fill Materials into Waters of the U.S., including wetlands (including Section 401, Certification, and Section 402, National Pollutant Discharge Elimination System) | The Authority is scheduled to submit applications for a Section 404 individual permit and Section 401 water quality certification in spring 2019. The design/build contractor is responsible for obtaining a Section 402 NPDES permit, consistent with the SWRCB NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (Construction General Permit, Order No. 2009-0009-DWQ as modified by 2010-0014-DWQ). | USACE concurrence on the Preliminary LEDPA, in support of future permit applications, followed by agency pre-application meetings. |
| U.S. Army Corps of Engineers (USACE) | Section 14 of the Rivers and Harbors Act (Section 408) for alteration, use, or occupation of federal facilities and additional features subject to Section 408 jurisdiction | Coordination with USACE Sacramento District Engineering Division is ongoing. Section 408 Preliminary Determination Hydraulics Analysis Report has been prepared and submitted to HSR. The design/build contractor is responsible for obtaining Section 408 permission/approval for proposed alterations of federal facilities. | Submittal of Section 408 Preliminary Determination Hydraulics Analysis Report to USACE Sacramento District. USACE will then issue a preliminary determination letter to the Authority, in support of Checkpoint C. |
| Federal Railroad Administration (FRA) U.S. Department of the Interior | Section 4(f) of the U.S. Transportation Act of 1966 | The Section 4(f) chapter (Chapter 4) of the Draft Supplemental EIR/EIS is in the process of revision. | Coordinate with agencies with jurisdiction over Section 4(f) properties on use determinations. Respond to comments in the Draft Supplemental EIR/EIS. Make least harm determinations in Final Supplemental EIR/EIS. |
| FRA U.S. Advisory Council on Historic Preservation via the SHPO | Section 106 of the National Historic Preservation Act of 1966 | SHPO concurred with the identification of historic properties for the Central Valley Wye alternatives in the HASR and ASR on November 18, 2016. | SHPO concurred with the Finding of Effect (FOE) for the Preferred Alternative on April 6, 2018, no further action required. |

| Agency | Permits/Regulations/Executive Orders | Status | Next Steps |
|---------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FRA USEPA | Section 307(c) General Conformity Determination (Clean Air Act), which includes the six major air pollutants under National Ambient Air Quality Standards | Section 3.3, Air Quality, of the Draft Supplemental EIR/EIS is in the process of revision. | Coordinate with agencies with jurisdiction over the CAA. Respond to comments in the Draft Supplemental EIR/EIS. Continue outreach to Environmental Justice populations. |
| National Marine Fisheries Service (NMFS) | Section 7 Consultation, FESA | Technical assistance and formal consultation with USFWS and NMFS is in the process of being initiated with the submittal of a draft Biological Assessment. | The Biological Assessment was updated in March, 2018. Guidance from NMFS comments received during an information meeting on June 16, 2016 were incorporated. |
| U.S. Fish and Wildlife Service (USFWS) | Fish and Wildlife Coordination Act | Ongoing coordination with agencies | Consultation with the federal and state resource agencies as part of NEPA and the associated permitting processes are expected to demonstrate compliance with the Fish and Wildlife Coordination Act requirements. |
| Office of Environmental Justice (OEJ) | U.S. Presidential Executive Order 12898 Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations | Chapter 5, Environmental Justice, of the Draft Supplemental EIR/EIS is in the process of revision. | Continue agency coordination and engagement of environmental justice populations. Respond to comments in the Draft Supplemental EIR/EIS. |
| State | | | |
| California Department of Fish and Wildlife (CDFW) | Section 2081(b) Incidental Take Permit (California Endangered Species Act) | The draft 2081 permit will not be submitted until completion of NEPA/CEQA documents, which are still in progress. | Continue coordination with CDFW. |

Source: Author's compilation, 2018
USEPA = U.S. Environmental Protection Agency

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15 LIST OF PREPARERS AND REVIEWERS

15.1 California High-Speed Rail Authority and Federal Railroad Administration

| Project Role | Name, Registration | Years Experience, Qualifications |
|--------------------------------------------------------------------------------------|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| Federal Railroad Administration | | |
| Chief, Environmental and Corridor Planning | Marlys Osterhues | 18 years experience B.A., Environmental Studies, University of California, Santa Barbara |
| Environmental Protection Specialist | Stephanie B. Perez-Arrieta, PG | 25 years experience B.S., Geology, Virginia Polytechnic Institute and State University |
| California High Speed Rail Authority | | |
| Chief Executive Officer | Brian P. Kelly | 23 years experience BA, Government-Journalism, California State University, Sacramento |
| Former Chief Executive Officer | Jeff Morales | 31 years experience B.S., Biology, George Washington University, Washington D.C. |
| Chief Counsel | Thomas Fellenz, P.E. | 34 years experience. J.D., McGeorge School of Law, University of the Pacific; B.S., Civil Engineering, University of California, Davis |
| Area Program Manager | Diana Gomez | 27 years experience B.S., Electrical Engineering, California State University, Fresno |
| Director of Planning and Integration | Melissa Elefante DuMond, AICP | 16 years experience B.S., Environmental Studies, UNC Wilmington; M.P.A., NC State University |
| Supervising Environmental Planner, Cultural Resources Program Manager/Tribal Liaison | Sarah Allred | 26 years experience B.A., Anthropology, California State University, Sacramento |
| Supervising Transportation Engineer | Joyce Brenner, PE | 31 years experience B.S., Civil Engineering, Cal State University at Chico |
| Director of Environmental Services | Mark Mc Loughlin | 33 years experience B.S. Ornamental Horticulture, Landscape Construction, California Polytechnic State University, San Luis Obispo |

15.2 List of Consultants

| Project Role | Name, Registration | Years Experience, Qualifications |
|-----------------------------------------------------------|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Rail Delivery Partners | | |
| Former Regional Environmental Manager | Kitty Barkley | 30+ years experience Master of Urban and Regional Planning, Clemson University |
| Former Environmental Manager | Karin Lilienbecker | 25 years experience M.S., Biology, University of San Francisco |
| Environmental Manager | Ryan Greenway | 9 years experience B.S., Urban and Regional Planning, California State Polytechnic University, Pomona |
| Environmental Planner | Carla D. Burrell, LEED AP | 3 years experience M.S., Urban and Regional Planning, University of Texas at San Antonio |
| Biological Resources and Wetlands | Serge Stanich | 20 years experience B.A., Environmental Studies, California State University, Sacramento |
| Regional Consultant Environmental Team | | |
| Environmental Lead | Maggie Townsley | 28 years experience MS, Community and Regional Planning, University of Texas, Austin BS, Geological Sciences, University of Texas, Austin BA, French, University of Texas, Austin |
| Deputy Environmental Lead | Aaron Carter | 11 years experience BA, Geography (emphasis in Environmental Analysis), California State University, Fullerton |
| Environmental Manager | Jared Goldfine | 30 years experience BA Economics; University of Massachusetts, Amherst |
| Lead Document Manager and CEQA Review, Cumulative Impacts | Antero (Terry) Rivasplata | 38 years experience B.S.; Environmental Planning and Management; University of California, Davis |
| Engineering manager | Chad Lemley, P.E. | 16 years experience BS Civil Engineering; University of Arizona |
| Bridge Hydraulic Design Lead | Stanley D. Polasik, P.E. | 42 years experience BS Civil Engineering; Illinois Institute of Technology |
| Project Engineer | Corinna Goodwin, P.E., C.F.M. | 15 years experience BS Civil Engineering; Montana State University |

| Project Role | Name, Registration | Years Experience, Qualifications |
|----------------------------------------------------|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Senior Technical Review | Josh Channell | 25 years experience MA, Urban and Environmental Planning and Policy, Tufts University, Medford BA, History (focus on Resource and Land Conservation), University of Southern Maine, Portland |
| Deputy Project Manager | Vicki Heron | 15 years experience MSc, Soils and Environmental Pollution, University of Reading BSc, Geography, Liverpool John Moores University |
| Former Deputy Project Manager | Meghan Edwards | 11 years experience M.A.; Natural Resources; Virginia Polytechnic Institute and State University BA, Environmental Studies, Hollins University, Roanoke |
| Document Control Manager and Coordinator | Kimberly Stevens | 13 years experience B.S.; Geography; University of Utah, Salt Lake City |
| Document Control and Coordinator | Matilda Evoy-Mount | 7 years experience BA, Environmental Studies, University of California, Santa Barbara |
| Document Control and Coordinator | Erin Pace | 11 years experience BA, Environmental Policy, San Diego State University, San Diego, California |
| Transportation Planner and Technical Report | Sandi Domingue | 26 years experience BA, Industrial Psychology, San Jose State University Master's in Urban and Regional Planning, San Jose State University |
| Biological Resources and Wetlands Lead | Brad Schafer | 20 years experience BS, Biology, Western Illinois University, Macomb |
| Biological Resources and Wetlands Technical Report | Matt Ricketts | 19 years experience MS, Biology/Applied Ecology, Eastern Kentucky University, Richmond, Kentucky BS (with honors), Natural Resource and Environmental Sciences, University of Illinois at Urbana-Champaign |
| Biological Resources and Wetlands | Leslie Allen | 25 years experience MS, Biology, Western Washington University |

| Project Role | Name, Registration | Years Experience, Qualifications |
|------------------------------------------------------------------|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Checkpoint C, Senior Technical Review | Megan Smith | 20 years experience JD, University of California, Davis, School of Law, 2002 BA, English (minor in Political Science), University of California, Davis, 1997 |
| Checkpoint C Lead Coordinator, Biological Resources and Wetlands | Kristin Salamack | 12 years experience MS, Biology, University of Denver, Colorado BS, Wildlife Management, University of New Hampshire, Durham, New Hampshire |
| Technical Review and Environmental Generalist | Alex Hunt | 6 years experience. BS, Environmental Science, UC Davis MS, Environmental Management, University of San Francisco |
| Technical Review and Environmental Generalist | Laura Johnson | 6 years experience MESc, Environmental Science, Yale University School of Forestry and Environmental Studies, New Haven, Connecticut BS (summa cum laude), Environmental Technology and Management (minor in Environmental Toxicology and Chemistry), North Carolina State University, Raleigh, North Carolina |
| Hydrology and Water Resources Technical Report | Katrina Sukola | 12 years experience MSc, Chemistry, University of Manitoba BSc, Environmental Chemistry, University of Waterloo |
| Wetlands Delineation Report | Joel Butterworth | 29 years experience MS, Geography (minor in Soil Science), Oregon State University, Corvallis BA, Geography, University of California, Santa Barbara |
| Wetlands Delineation Report | Katherine Carpenter | 15 of years experience BA, Plant Biology (minor in Soil Science), University of California, Davis |
| Geographic Information Systems (GIS) Manager | William C. Parker | 7 years experience MA (in progress), Geography, San Francisco State University BA, Anthropology, University of California, Berkeley GIS Certification of Completion, Diablo Valley College |

| Project Role | Name, Registration | Years Experience, Qualifications |
|------------------------------------------------------------------------------------------------|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Geographic Information Systems (GIS) | Matt Wood | 13 years experience MS, Geography, Portland State University, Portland, Oregon BS, Environmental Biology/ Zoology, Michigan State University |
| Environmental Generalist, Socio Economics and Environmental Justice | Anne Winslow | 5 years experience MS, Environmental Science, Stanford University BS, Environmental Science, Stanford University |
| Geology, Soils, and Seismicity, Agricultural Farmlands | Diana Roberts | 19 years experience MS, Environmental Studies coursework, San Jose State University (in progress) MA, Linguistics, Cornell University BS, Applied Psychology, Georgia Institute of Technology |
| Land Use, Parks and Recreation, Technical Review and Environmental Generalist | Randall Coleman | 11 years experience MURP, Urban and Regional Planning, University of Colorado BA (cum laude), History and Spanish, Trinity University |
| Noise and Vibration, Socioeconomics, Communities, Geographic Information Systems (GIS) Manager | Craig Richey | 15 years experience. BA, English California State University, San Bernardino; Certificate in Geographic Information Systems, San Francisco State University |
| Aesthetics and Visual Quality Resources Technical Report, EIR/EIS Graphics | Michael Kiesling | 8 years experience BA, Architecture, University of California, Berkeley |
| EIR/EIS Graphics | Cindy Potter | 20 years experience BA, Photography, University of Iowa |
| Cultural Resources Lead | Susan Lassell | 22 years experience MA, Historic Preservation Planning, Cornell University BS, Environmental Design, University of California, Davis |
| Cultural Resources, Archaeological Resources | Jenifer Rogers | 24 years experience MA, Historic Preservation, Savannah College of Art and Design, In Progress MA Candidate, Anthropology, California State University, Sacramento BA, Anthropology, California State University, Sacramento |

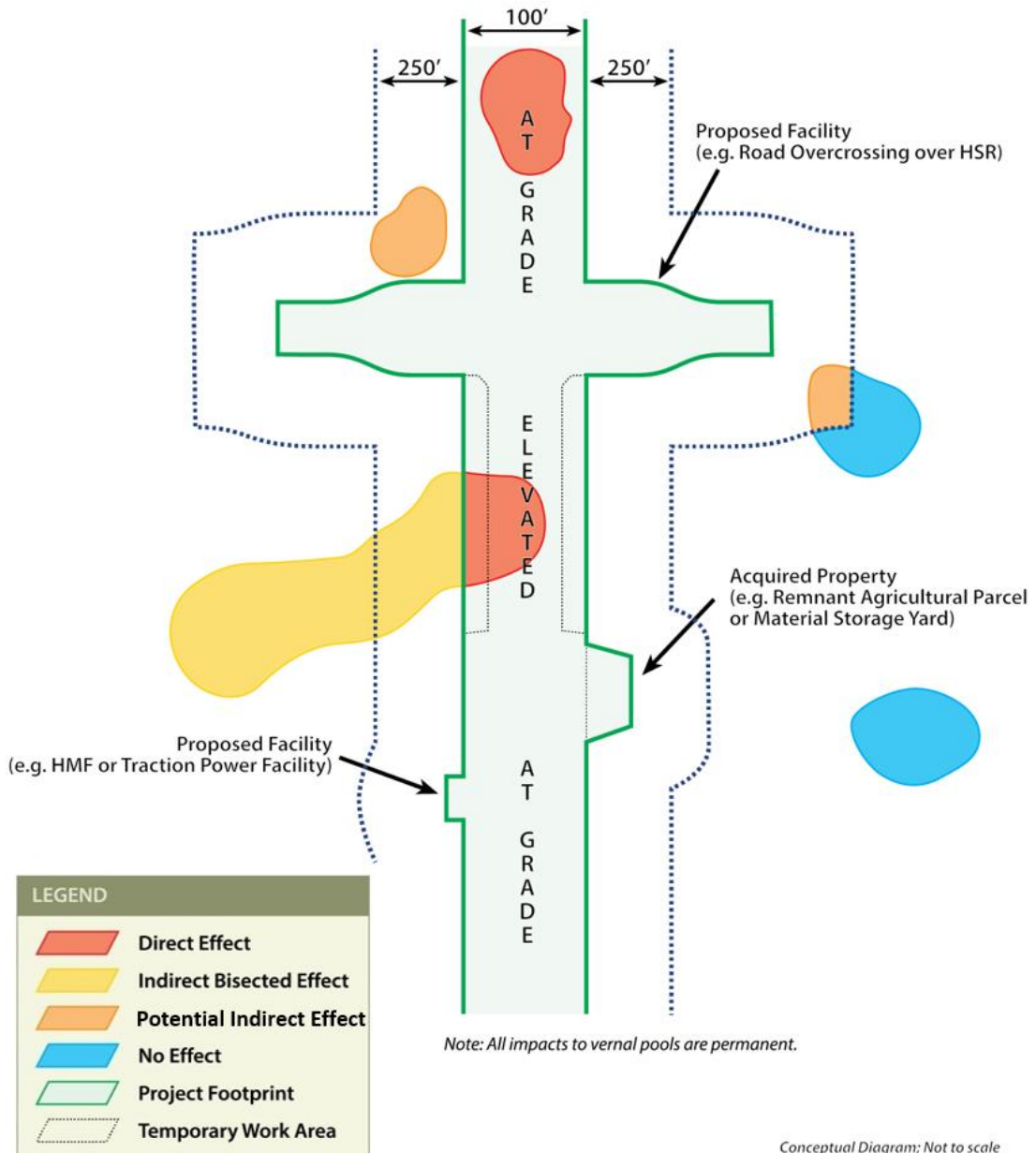
| Project Role | Name, Registration | Years Experience, Qualifications |
|---------------------------------------------------------------------------------|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cultural Resources | Jenna Wheaton | 4 years experience BA, Anthropology (concentration in Archaeology), Mercyhurst University BA, History (concentration in Public History), Mercyhurst University |
| Cultural Resources, Historic Architectural Survey Report | Kathryn Haley | 13 years experience MA, History (Public History), California State University, Sacramento BA, History, California State University, Sacramento |
| Section 4(f) and Section 6(f) Evaluations, Parks, Recreation, and Open Space | Peter Feldman | 7 years experience BA, Political Science (American Politics), University of California, Irvine |
| Public and Agency Involvement | Ben Strumwasser | 29 years experience MS, Political Science, Graduate Faculty at the New School for Social Research BA, Law and Society, University of California, Santa Barbara |
| Lead Editor, Editing Coordinator for EIR/EIS and Technical Reports | Brent Bouldin | 40 years experience MA, Communications, Louisiana State University, Baton Rouge BA (magna cum laude), Communications, University of Texas, Austin |
| Lead Editor, Editing Coordinator for EIR/EIS | Lawrence B. Goral | 22 years experience |
| Editor, Editing Coordinator for EIR/EIS and Technical Reports | Tami Mihm | 28 years experience BS, Environmental Policy Analysis and Planning, University of California, Davis |
| Document Coordinator for EIR/EIS and Technical Reports | Ryan Sharpe | 2 years experience BA, Government, California State University, Sacramento |
| Technical Editor for multiple sections and reports | Christine McCrory | 14 years experience PhD Candidate, Germanic Languages and Literatures, Washington University in St. Louis, Missouri MPhil (with distinction), European Literature, Oxford University, Lincoln College BA (with distinction), Anthropology and German, University of California at Berkeley |
| Word Processing and Formatting Specialist for EIR/EIS and Technical Reports | Corrine Ortega | 28 years experience AA, Communications, Cosumnes River College |

| Project Role | Name, Registration | Years Experience, Qualifications |
|----------------------------------------------------------------------------------|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Word Processing and Formatting Specialist for EIR/EIS and Technical Reports | Anthony Ha | 16 years experience BA, English, Saint Mary's College of California |
| Electrical Interconnection and Network Upgrades | | |
| Former Project Manager | Jennifer Johnson, J.D. | 15 years experience. J.D., Environmental Law, Vermont Law School B.S., Environmental Policy, Juniata College |
| Geological and Paleontological Resources; Hydrology and Water Resources Analysis | Tiffany Lunday | 8 years experience. M.Phil., Geography, University of Cambridge B.A., Geography, University of British Columbia |
| Environmental Planner | Zack Miller | 6 years experience. M.S., City and Regional Planning, Environmental Planning Emphasis, California Polytechnic State University, San Luis Obispo M.S., Engineering, Transportation Planning, California Polytechnic State University, San Luis Obispo B.A., Urban Studies and Planning, University of California, San Diego |
| Biological Resources Technical Reports | Ted Thayer | 13 years experience. M.S., Biology, University of Nevada, Reno B.S., Biology, California State University Fresno |
| Biological Resources Technical Reports | Shannon Hickey | 12 years experience. B.S., Ecology and Environmental Policy, University of California, Berkeley |
| Biological Resources Technical Reports | Mike Eng | 12 years experience. M.B.A., (Emphasis in Organizational Behavior and Development), California State University, Sacramento B.S., Ecology, UC Davis B.A., English, UC Davis |

| Project Role | Name, Registration | Years Experience, Qualifications |
|----------------------------------------------|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Environmental Planner | Lily Gilbert | 5 years experience. M.S., Environmental Science and Management, University of San Francisco B.S., Marine Biology, University of California, Santa Cruz |
| Environmental Planner | Angela Xiong | 3 years experience. M.A. Sustainability, School of Sustainability, Arizona State University, Tempe, AZ B.A. English Literature and Religious Studies, Wellesley College, Wellesley, MA |
| Geographic Information Systems (GIS) | Lisa Merry | 6 years experience. M.S., Environmental Science and Management, Conservation Planning Specialization, UC Santa Barbara B.S., Environmental Biology and Management, Minors in GIS and Psychology, UC Davis |
| Historic Architecture Survey Report Addendum | Rebecca Meta Bunse | 22 years experience. B.A., Women's Studies and Italian Language, University of California, Davis; M.A., History/Public History, California State University, Sacramento |
| Cultural Resources Survey Report Addendum | John Holson, RPA | 30 years experience. M.A., Cultural Resource Management, Sonoma State University B.A., Anthropology, Sonoma State University |
| Cultural Resources Survey Report Addendum | Lisa Holm | 20 years experience. Ph.D., Anthropology, University of California, Berkeley M.S., Computer Applications in Archaeology, University of Southampton B.A., Anthropology, University of California, Berkeley |

16 ATTACHMENTS

16.1 Impact Evaluation Schematics



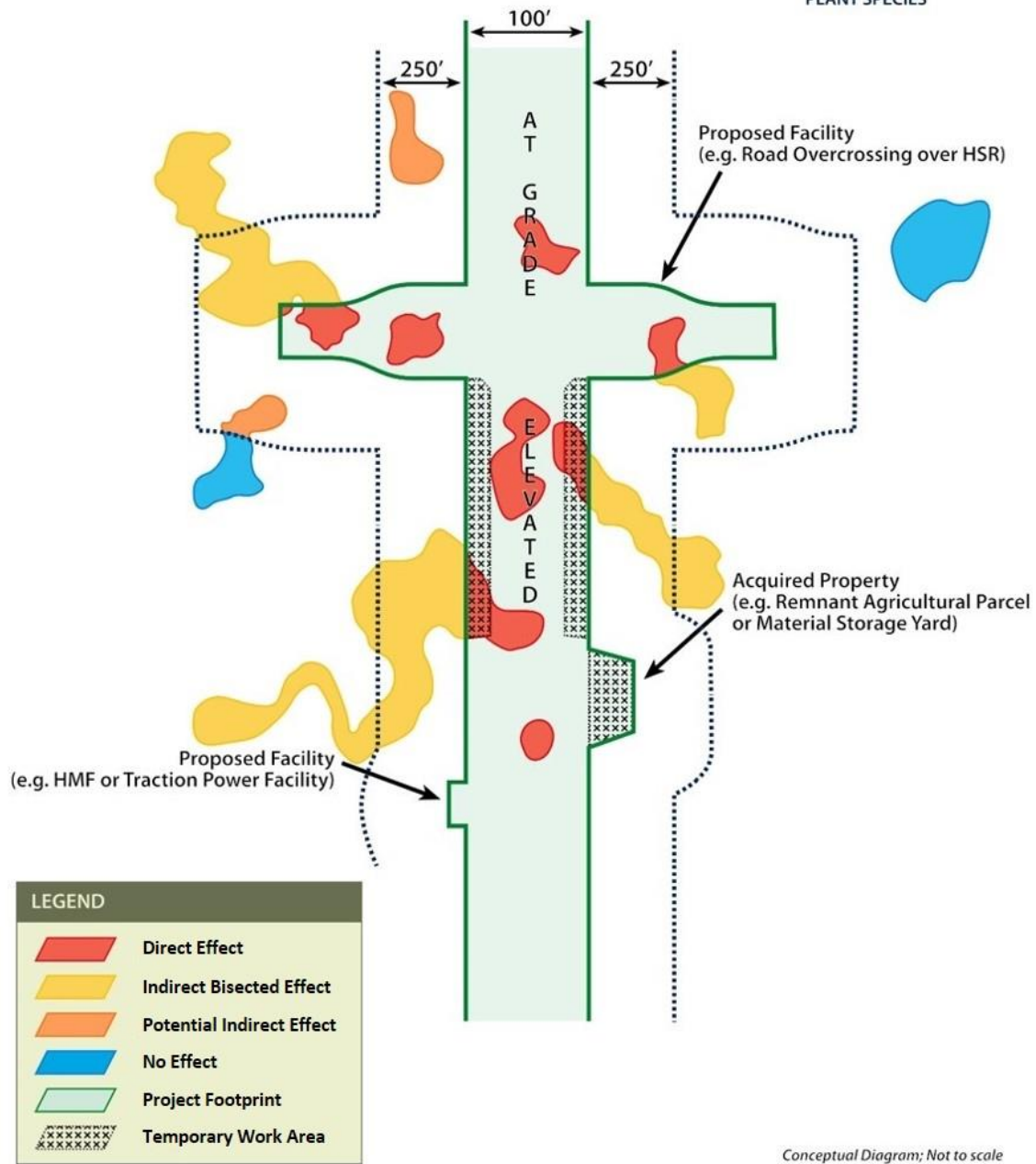
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Source: Authority and FRA, 2018c

FINAL- MARCH 10, 2017



ESA (SECTION 7) VERNAL POOL
BRANCHIOPODS AND VERNAL POOL
PLANT SPECIES

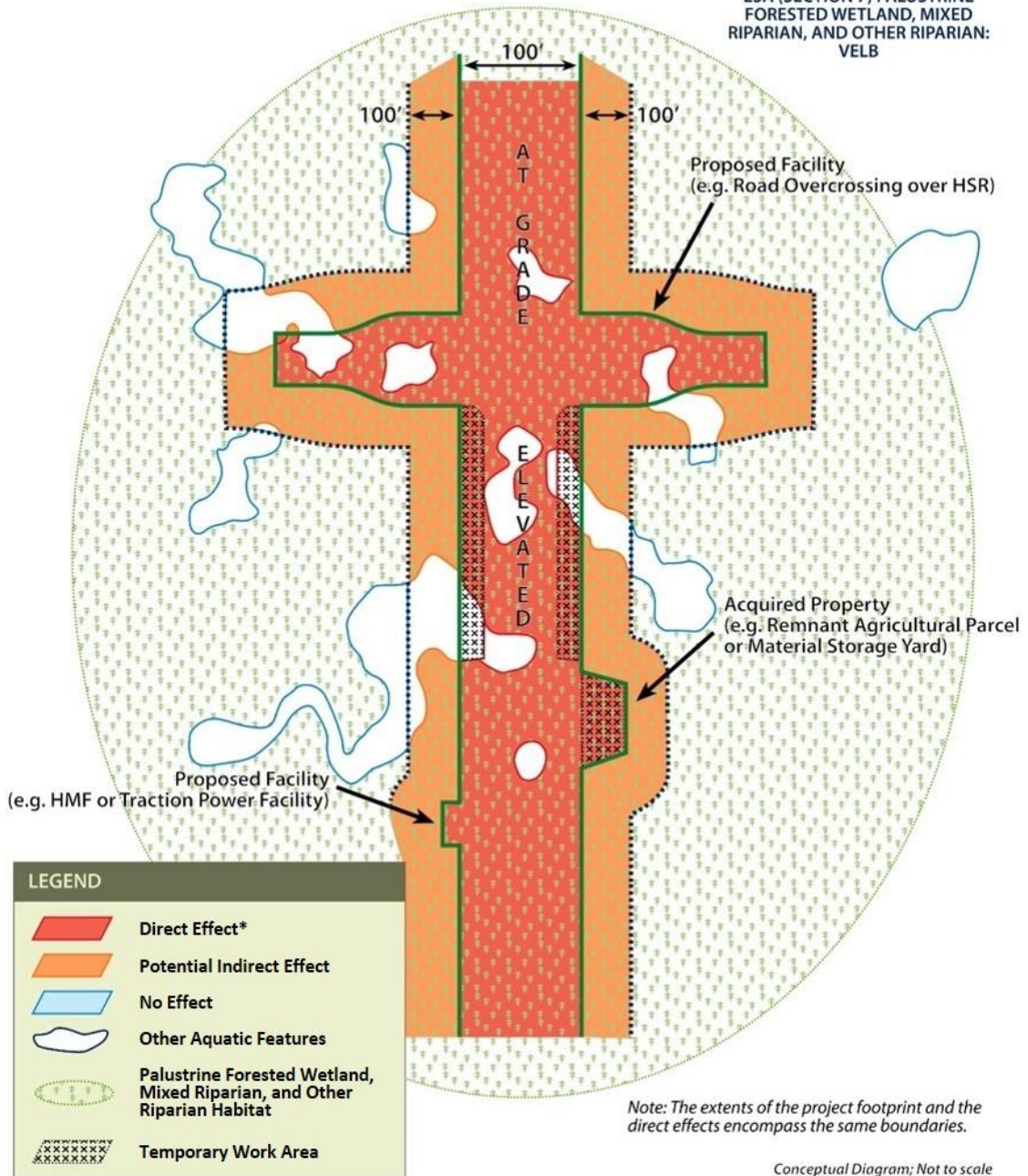


Source: Authority and FRA, 2018c

FINAL- MARCH 10, 2017



ESA (SECTION 7) PALUSTRINE FORESTED WETLAND, MIXED RIPARIAN, AND OTHER RIPARIAN: VELB



Conceptual Diagram; Not to scale

Source: Authority and FRA 2018c

FINAL – MARCH 17, 2017

APPENDIX A: MERCED TO FRESNO SECTION WATERSHED EVALUATION REPORT

A watershed-level analysis of aquatic resources was conducted for the Merced to Fresno Section, in conformance with the USACE and USEPA April 10, 2008 *Final Rule for Compensatory Mitigation for Losses of Aquatic Resources* (Final Rule) (33 C.F.R. §§ 325 and 332 and 40 C.F.R. § 230) and California's Level 1-2-3 framework for wetland monitoring and assessment (Watershed Evaluation Report [Authority and FRA 2012f]).

The Watershed Evaluation Report (Authority and FRA 2012f) consisted of the following:

- Data layers of land use types that represent disturbance categories
- Inventories of aquatic resources within Hydrologic Unit Code-8 watershed units (per land use type)
- Estimates of the type, amount, and relative condition of aquatic resources within the watershed units and within the project footprints of the HSR alternatives in the Merced to Fresno Section. This included the use of California Rapid Assessment Method (CRAM), described below and in Appendix B.
- Evaluation of the relative impact on aquatic resources of the Merced to Fresno Section alternatives within the watershed context
- Potential mitigation opportunities falling within the vicinity of Central Valley Wye alternatives project footprints

The watershed study area evaluated in the Watershed Evaluation Report (Authority and FRA 2012f) includes the Middle San Joaquin-Lower Merced-Lower Stanislaus, Upper Merced, Middle San Joaquin-Lower Chowchilla, Upper Fresno, Upper Chowchilla-Upper Fresno, and Upper Dry (Hydrologic Unit Code-8) watersheds. The Central Valley Wye lies within the Middle San Joaquin-Lower Chowchilla and Upper Chowchilla-Upper Fresno watersheds. The Central Valley Wye watershed area, which defines the geographic limits of the preliminary impact analysis conducted for the Watershed Evaluation Report, covers the vast majority of the Central Valley Wye footprint(s), with the exception of a segment on the western terminus running along Henry Miller Road from Carlucci Road east for approximately 2.3 miles. Land cover types within this segment consist predominantly of agricultural lands, but also include roads (e.g., SR 152) and 15 constructed watercourses (e.g., irrigation canals). These land cover types are entirely consistent with land cover types evaluated in the Watershed Evaluation Report. The baseline information contained in the Watershed Evaluation Report (Authority and FRA 2012f) remains accurate, because the location, extent, and condition of aquatic resources have not changed appreciably since submission of the report (e.g., land uses, aquatic resources, listed species, soil types).

As described in Appendix B, Evaluation of Wetland Condition Using the California Rapid Assessment Method, Merced to Fresno Section: Central Valley Wye (Authority and FRA 2016f), the Authority and FRA prepared CRAM evaluations within the SR 152 (North) to Road 13, SR 152 (North) to Road 19, and Avenue 21 to Road 13 Wye Alternative footprints (temporary and permanent), or adjacent areas for inaccessible properties.

The CRAM report includes extrapolation of scores derived from accessible aquatic features, grouped into scoring "bins" (excellent, good, fair, poor), in order to account for inaccessible aquatic features. Scores for inaccessible features were based on the type of wetland features and the landscape context of the wetland features (CRAM Report Supplement [Authority and FRA 2012f]). In these reports, a comparative evaluation is presented by the type of aquatic resource (wetlands, other waters of the U.S.), the feature type (riverine, seasonal wetlands, vernal pools), and by relative condition class regardless of aquatic resource type. The relative conditions of aquatic resources (excellent, good, fair, poor) allow for an evaluation of the quality of the aquatic resource affected by the wye alternatives for both accessible and inaccessible parcels.

APPENDIX B: MERCED TO FRESNO SECTION: CENTRAL VALLEY WYE EVALUATION OF WETLAND CONDITION USING THE CALIFORNIA RAPID ASSESSMENT METHOD REPORT

APPENDIX C: SEQUENCED SEARCH FOR LESS ENVIRONMENTALLY DAMAGING ALTERNATIVE

APPENDIX D: USACE SECTION 408 PRELIMINARY DETERMINATION HYDRAULICS ANALYSIS SUMMARY REPORT

APPENDIX E: PRELIMINARY COMPENSATORY MITIGATION PLAN

APPENDIX F: CLEAN WATER ACT 404(B)(1) GUIDELINES: FACTUAL DETERMINATIONS

APPENDIX G: IMPACT AVOIDANCE AND MINIMIZATION FEATURES AND MITIGATION MEASURES

APPENDIX H: PLANT COMMUNITIES AND LAND COVER TYPES WITHIN THE HABITAT STUDY AREA