California High-Speed Rail Authority

San Jose to Merced Section

Checkpoint C Summary Report

February 2020

CALIFORNIA High-Speed Rail Authority

U.S. Department of Transportation Federal Railroad Administration

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Figures

LIST OF ABBREVIATIONS

2008 Final Rule	*Compensatory Mitigation for Losses of Aquatic Resources: Final Rule*
AMM	avoidance and minimization measure
APE	area of potential effects
APLIC	Avian Power Line Interaction Committee
ATC	automatic train control
ATP	Archaeological Treatment Plan
Authority	California High-Speed Rail Authority
BART	Bay Area Rapid Transit
BMP	best management practice
BRMP	Biological Resources Management Plan
CCC	Central California coast
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
Checkpoint B Addenda	San Jose to Merced Section Alternatives Checkpoint B Summary Report Addendum 3 and Addendum 4
CMP	Compensatory Mitigation Plan
CP	control point
CRAM	California Rapid Assessment Method
CRHR	California Register of Historical Resources
CTS	California tiger salamander
CWA	Clean Water Act
CWHR	California Wildlife Habitat Relationships
dbA	A-weighted decibels
DPS	distinct population segment
Draft EIR/EIS	Draft Environmental Impact Report/Environmental Impact Statement
EFH	essential fish habitat
EIR/EIS	environmental impact report/environmental impact statement
EPA	U.S. Environmental Protection Agency
ESA	Environmentally Sensitive Area
FESA	federal Endangered Species Act
FRA	Federal Railroad Administration

GEA	Grasslands Ecological Area
GIS	geographic information system
Guidelines	Section 404(b)(1) Guidelines
HSR	California High-Speed Rail
HUC	Hydrologic Unit Code
I	Interstate
IAMF	Impact Avoidance and Minimization Feature
IBA	Important Bird Area
ILF	in-lieu fee
Integration Process MOU	National Environmental Policy Act (NEPA, 42 U.S. Code [USC] 4321 et seq.)/Clean Water Act (CWA) Section 404 (33 USC 1344)/Rivers and Harbors Act Section 14 (33 USC 408) Integration Process Memorandum of Understanding (Integration Process MOU) for the California High-Speed Train Program between the California High-Speed Rail Authority (Authority), the Federal Railroad Administration (FRA), the U.S. Army Corps of Engineers (USACE), and the U.S. Environmental Protection Agency (EPA)
IOOF	Independent Order of Odd Fellows
kV	kilovolt
LEDPA	Least Environmentally Damaging Practicable Alternative
LiDAR	Light Detection and Ranging
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MOWF	maintenance of way facilities
mph	miles per hour
MT	Mainline Track
NEPA	National Environmental Policy Act
NEPA Assignment MOU	Memorandum of Understanding Between the Federal Railroad Administration and the State of California, Acting through its California State Transportation Agency and its California High-Speed Rail Authority, for the State of California's Participation in the Surface Transportation Project Delivery Program Pursuant to 23 USC 327
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
OCS	overhead contact system
OHWM	ordinary high-water mark

PA	Programmatic Agreement
pCMP	preliminary Compensatory Mitigation Plan
PEM	palustrine emergent wetlands
PEMC	palustrine emergent seasonally flooded
PFO	palustrine forested wetland
PG&E	Pacific Gas and Electric Company
PRM	permittee-responsible mitigation
PSS	palustrine emergent scrub-shrub
PTC	positive train control
PUB	palustrine unconsolidated bottom
RIBITS	Regulatory In-Lieu Fee & Bank Information Tracing System
RSA	resource study area
SCCC	south-central California coast
SHPO	State Historic Preservation Officer
SR	State Route
Statewide Program EIR/EIS	Tier 1 Final Program EIR/EIS for the Proposed California High-Speed Train System
Summary Report	Checkpoint C Summary Report
SWPPP	stormwater pollution prevention plan
SWRCB	State Water Resources Control Board
TCE	temporary construction easement
TPSS	traction power substation
UPR	Upper Pajaro River
UPRR	Union Pacific Railroad
US	U.S. Highway
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USFWS	U.S. Fish and Wildlife Service
VTA	Valley Transportation Authority
WCA	Wildlife Corridor Assessment
WEF	Wildlife Exclusion Fencing

1 AUTHORITY AND SCOPE OF ANALYSIS

1.1 Checkpoint C Purpose and Relationship to the Memorandum of Understanding

This Checkpoint C Summary Report (Summary Report) for the Scott Road to Carlucci Road extent of the San Jose to Merced Section of the proposed California High-Speed Rail (HSR) System was prepared pursuant to the National Environmental Policy Act (NEPA) (42 U.S. Code [USC] 4321 et seq.)/Clean Water Act (CWA) Section 404 (33 USC 1344)/Rivers and Harbors Act Section 14 (33 USC 408) Integration Process Memorandum of Understanding (Integration Process MOU) for the California High-Speed Train Program between the California High-Speed Rail Authority (Authority), the Federal Railroad Administration (FRA), the U.S. Army Corps of Engineers (USACE), and the U.S. Environmental Protection Agency (EPA) (Authority et al. 2010).

Information to support this Summary Report is provided in the following appendices:

- Appendix A: Preliminary Compensatory Mitigation Plan,
- Appendix B: San Jose to Merced Section Watershed Evaluation Report and Evaluation of Wetland Condition Using the California Rapid Assessment Method Report,
- Appendix C: Species Accounts and Land Cover Types within the Habitat Study Area, and
- Appendix D: Avoidance and Minimization Measures.

The alternatives evaluated in this Summary Report were identified in the *San Jose to Merced Section Alternatives Checkpoint B Summary Report Addendum 3* and *Addendum 4* (Authority and FRA 2017, 209) (Checkpoint B Addenda). A draft environmental impact report/environmental impact statement (EIR/EIS) is being prepared to address the San Jose to Merced Section alternatives (the *San Jose to Merced Section Draft Environmental Impact Report/Environmental Impact Statement* (Draft EIR/EIS)) (Authority 2020a). The environmental review, consultation, and other actions required by applicable federal environmental laws for this project are being or have been carried out by the State of California pursuant to 23 USC 327 and the *Memorandum of Understanding Between the Federal Railroad Administration and the State of California, Acting through its California State Transportation Agency and its California High-Speed Rail Authority, for the State of California's Participation in the Surface Transportation Project Delivery Program Pursuant to 23 U.S.C. 327*, dated July 23, 2019, and executed by FRA and the State of California[1] (NEPA Assignment MOU) under a program commonly known as NEPA Assignment. Pursuant to NEPA Assignment, the Authority is the lead agency for NEPA. The Authority is also 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 EIR/EIS and on technical studies and other information.

The Authority has carried forward the four alternatives from the Checkpoint B Addenda for the purposes of the CWA Section 404(b)(1) alternatives analysis. The alternative alignments cross Merced, Santa Clara, and San Benito counties. Each alternative consists of five legs or subsections: San Jose Diridon Station Approach, Monterey Corridor, Morgan Hill to Gilroy, Pacheco Pass, and the San Joaquin Valley. The four San Jose to Merced Section alternatives present different overall routes and characteristics; however, the alternatives also share common end points to allow for meaningful comparison of engineering and environmental considerations across all alternatives. The shared termini of the alternatives are at Scott Boulevard near Monroe Street in the City of Santa Clara on the west and Henry Miller Road/Carlucci Road in unincorporated Merced County on the east. The San Jose to Merced Section alternatives connect to the Central Valley Wye to the east and the San Francisco to San Jose Section to the west. Likewise, many features of the San Jose to Merced Section alternatives are common to all four

[1] *Memorandum of Understanding Between the Federal Railroad Administration and the State of California, Acting through its California State Transportation Agency and its California High-Speed Rail Authority, for the State of California's Participation in the Surface Transportation Project Delivery Program Pursuant to 23 U.S.C. 327*.

alternative alignments. Project design components, travel times, safety and security procedures, roadway modifications, and railroad modifications are also similar for all alternatives.

The alignment and guideway in the Pacheco Pass Subsection would be the same for all four alternatives, entailing a tunnel around the northern arm of the San Luis Reservoir and viaducts over the California Aqueduct, Delta-Mendota Canal, and Interstate (I) 5. The alignment and guideway in the San Joaquin Valley Subsection would similarly be common to all four alternatives. East of the I-5 overcrossing, the guideway would be predominantly on embankment along the south side of Henry Miller Road to Carlucci Road, traveling on viaduct over major watercourses and through the Grasslands Ecological Area (GEA). Several local roadways would be relocated on bridges over the HSR embankment. A maintenance of way facility (MOWF) would be located along the south side of Henry Miller Road near Turner Island Road. From that point, the alternatives have distinguishing characteristics, as described below:

- Alternative 1: Alternative 1 would incorporate the viaduct to I-880 design option, operating in blended service between Scott Boulevard and I-880 before transitioning to viaduct through most of the San Jose Diridon Station Approach Subsection. The alternative would continue predominantly on viaduct through the Monterey Corridor and Morgan Hill and Gilroy Subsections. This alternative is distinguished by an alignment around downtown Morgan Hill and a low viaduct approach to an aerial Downtown Gilroy Station. Alternative 1 would include an MOWF south of Gilroy. The alignment would continue predominantly on viaduct and embankment across the Soap Lake floodplain before entering a short tunnel (Tunnel 1) west of Casa De Fruta.
- Alternative 2: Alternative 2 most closely follows the existing Union Pacific Railroad (UPRR) and Monterey Road transportation corridor. The San Jose Diridon Station Approach Subsection under Alternative 2 would use a longer viaduct than Alternative 1, ascending to aerial structure near Scott Boulevard rather than ascending to aerial structure south of I-880. A result of the longer viaduct is that blended service with Caltrain would occur north of Scott Boulevard. The alignment would be at grade through the Monterey Corridor Subsection and through Morgan Hill, and on embankment on approach and through Gilroy, maintaining a lower profile than the viaduct structures under Alternatives 1 and 3 through these areas. Alternative 2 would operate on a dedicated viaduct from Scott Boulevard through the San Jose Diridon Station Approach Subsection. The alternative would be predominantly at grade east of the UPRR alignment through the Monterey Corridor Subsection, continuing at grade east of UPRR through Morgan Hill to an embankment approach to the downtown Gilroy station through the Morgan Hill and Gilroy Subsection. Alternative 2 would include a South Gilroy MOWF, continuing predominantly on viaduct and embankment across the Soap Lake floodplain before entering Tunnel 1 west of Casa De Fruta.
- Alternative 3: Alternative 3 would bypass downtown Gilroy to an East Gilroy Station, further minimizing interface with the UPRR corridor in comparison to Alternative 1. Like Alternative 2, Alternative 3 would use the viaduct to Scott Boulevard design option, requiring less disruption of UPRR track than the shorter viaduct to I-880 option. Alternative 3 would incorporate the same alignment and profile as Alternative 1 in the Monterey Corridor, Pacheco Pass, and San Joaquin Valley Subsections, and the same alignment and profile as Alternative 2 in the San Jose Diridon Station Approach Subsection. Alternative 3 would operate in a dedicated viaduct from Scott Boulevard through the San Jose Diridon Station Approach Subsection. The alternative would continue predominantly on viaduct through the Monterey Corridor and Morgan Hill and Gilroy Subsections on an alignment around downtown Morgan Hill to an embankment approach to the East Gilroy Station. Alternative 3 would include an East Gilroy MOWF and would continue predominantly on viaduct and embankment across the Soap Lake floodplain before entering Tunnel 1 west of Casa De Fruta.
- Alternative 4: Alternative 4 is distinguished from the other three project alternatives by a blended, at-grade alignment that would operate on two electrified passenger tracks and one conventional freight track predominantly within the existing Caltrain and UPRR rights-of-way. The maximum train speed of 110 miles per hour (mph) in the blended guideway would be enabled by continuous access-restriction fencing; four-quadrant gates, roadway lane channels, and railroad trespass deterrents at all public road grade crossings; and fully integrated

communications and controls for train operations, grade crossings, and roadway traffic. Caltrain stations would be reconstructed to enable directional running as part of blended operations.

1.2 Relationship Between the San Jose to Merced Section and Merced to Fresno Section—Central Valley Wye

The San Jose to Merced Section covers the HSR service area between Diridon Station in downtown San Jose, a Gilroy station either in downtown Gilroy or east of Gilroy, and a station in downtown Merced.

The San Jose to Merced Section consists of three project extents (Figure 2-1):

- From Scott Boulevard in Santa Clara[2] to Carlucci Road in Merced County, at the western terminus of the Central Valley Wye (the project).
- The Central Valley Wye, which connects the east-west portion of HSR from the Bay Area to the Central Valley with the north-south portion from Merced to Fresno.
- The northernmost portion of the Merced to Fresno Project Section, from the northern limit of the Central Valley Wye (Ranch Road) to the Merced Station.

The project would connect San Jose to the Central Valley portion of the HSR system at the Central Valley Wye in Merced County, which in turn connects to the portion of the system running north to Merced and south to Fresno and Southern California. The analysis in this document focuses on the project extent between Scott Boulevard and Carlucci Road. In July 2018, the Authority submitted to USACE and EPA the *Merced to Fresno Section Central Valley Wye Supplemental Checkpoint C Summary Report* (Authority and FRA 2018a), which covers the portion of the San Jose to Merced Section between Henry Miller Road/Carlucci Road and Ranch Road/State Route (SR) 99 and Avenue 19 near Madera Acres. The *Central Valley Wye Supplemental Checkpoint C Summary Report* analyzed the four Central Valley Wye options. USACE and EPA issued concurrence with the *Central Valley Wye Supplemental Checkpoint C Summary Report* on July 20, 2018, and July 30, 2018, respectively.

The extent of the San Jose to Merced Section between Carlucci Road and Merced has been analyzed in the *Merced to Fresno Section Final EIR/EIS* (Authority and FRA 2012) and the *Merced to Fresno Section: Central Valley Wye Draft Supplemental EIR/EIS* (Authority and FRA 2018b). Relevant information and analysis from the *Merced to Fresno Section Final EIR/EIS* (and the *Merced to Fresno Section: Central Valley Wye Draft Supplemental EIR/EIS)* are incorporated by reference and summarized where appropriate.

1.3 Scope of Alternatives Analysis Under Clean Water Act Section 404(b)(1)

This Summary Report includes an alternatives analysis pursuant to the CWA Section 404(b)(1) Guidelines. The Guidelines establish the requirements for consideration of alternatives when a Section 404 individual permit is sought. The Guidelines state that no fill of waters of the United States (waters of the U.S.) is permitted if there is a “practicable alternative” to the proposed project that would have a less adverse effect on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences (40 Code of Federal Regulations [CFR] 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 CFR Section 230.10(a) and (a)(2)).

[2] To operate the system for the San Jose to Central Valley Wye Project Extent, changes in track geometry are required to Scott Boulevard. Scott Boulevard therefore serves as the point of transition between alternative design for the San Francisco to San Jose Section and the San Jose to Central Valley Wye Section.

1.4 Scope of Analysis of the Preliminary Compensatory Mitigation Plan

This Summary Report includes a preliminary Compensatory Mitigation Plan (pCMP) (See Appendix A), which is intended to provide information regarding the Authority's approach to providing sufficient compensatory mitigation to offset unavoidable impacts on waters of the U.S. The pCMP will be subject to continued development and refinement as the Authority works with the resource agencies to complete the compensatory mitigation planning process.

1.5 Scope of Section 408 Analysis

The San Jose to Merced Section alternatives are anticipated to have potential effects on federal flood control facilities, which will require USACE review pursuant to 33 USC Section 408. Under 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 USC Section 408*, which superseded previous policy memoranda on this topic dated October 23, 2006; November 17, 2008; and June 18, 2010 (USACE 2014). 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 Engineering Circular 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 Integration Process MOU and the Checkpoint C agency review process, the Authority will provide information sufficient to support a Section 408 preliminary determination from USACE when it is ready.

1.6 Compliance with U.S. Environmental Protection Agency/ U.S. Army Corps of Engineers Data Needs

The information required by the Integration Process MOU is included in this Summary Report and the appendices.

2 SECTION 404(b)(1) ALTERNATIVES ANALYSIS

2.1 Introduction

2.1.1 Purpose of the Analysis

The purpose of this analysis is to evaluate alternatives and identify a Preliminary Least Environmentally Damaging Practicable Alternative (LEDPA) for the San Jose to Merced Section. Pursuant to the MOU, this report contains sufficient information for USACE and EPA to make a preliminary determination regarding the LEDPA, pursuant to the Section 404(b)(1) Guidelines (40 CFR Section 230.10(a)). Additional Checkpoint C requirements not directly related to the Section 404(b)(1) alternatives analysis are also addressed in this Summary Report and the attached appendices, as appropriate.

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

The 404(b)(1) Guidelines establish the requirements for consideration of alternatives when an individual permit under Section 404 is requested by an applicant, as follows (EPA 1993):

> 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 CFR § 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))[3].

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 (40 CFR Section 230.10(a)(2)). For further discussion of the practicability analysis, refer to Section 2.6, Comparative Analysis of Project Alternatives, of this Summary Report.

2.1.3 Selection of Alternatives

The *Program EIR/EIS for the Proposed California High-Speed Train System* (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 following alternatives analysis.

Pursuant to the MOU, the Checkpoint B Summary Report and Checkpoint B Addenda identified the range of alternatives to be carried forward in the Draft 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. To define the project-level alternatives to be considered in the environmental review process, the

[3] Section 404(b)(2) of the Clean Water Act provides that where relevant, if a disposal site would be prohibited under the 404(b)(1) guidelines, USACE shall also consider the economic impact of the site on navigation and anchorage.

Authority and FRA prepared the *San Jose to Merced Preliminary Alternatives Analysis Report* (Authority and FRA 2010a) and the *San Jose to Merced Supplemental Alternatives Analysis* Report (Authority and FRA 2011a). The *San Jose to Merced Preliminary Alternatives Analysis Report* incorporated conceptual engineering information and identified potential alternatives for analysis in the Draft EIR/EIS. The *San Jose to Merced Supplemental Alternatives Analysis Report* recommended that a SR 152 alignment and wye configuration be evaluated in the *San Jose to Merced Section Draft EIR/EIS*. Continued agency coordination helped inform further definition of alternatives proposed to be carried forward.

The 2017 *Checkpoint B Summary Report Addendum 3* (Authority and FRA 2017) narrowed the range of alternatives to three alternatives. USACE and EPA concurred with the range of alternatives in the 2017 *Checkpoint B Summary Report Addendum 3* on September 26, 2017, and September 21, 2017, respectively (USACE 2017, EPA 2017). Subsequent to the agency concurrence in 2017, the Authority continued to evaluate the three alternatives, as well as develop a fourth alternative, Alternative 4. Checkpoint B Addendum 4 (Authority and FRA 2019) evaluated the environmental and other resources for each of the four alternatives considered. USACE and EPA concurred with the range of alternatives in the 2019 *Checkpoint B Summary Report Addendum 4* on January 22, 2019, and February 1, 2019, respectively (USACE 2019, EPA 2019). The *San Jose to Merced Section EIR/EIS* (Authority 2020a) will analyze the alternatives identified in the 2019 *Checkpoint B Summary Report Addendum 4*. The Checkpoint B process also allowed the Authority to refine the alternatives to reduce impacts.

The Authority considered three design options for the Pacheco Pass Subsection. After meeting with regulatory agencies, the Authority developed a tunnel option, which would include a 13.5-mile tunnel and avoid any encroachment into the San Luis Reservoir as well as any surficial encroachment into the Cottonwood Creek Wildlife Area. Once the tunnel design was determined to be practicable, the previous two designs were withdrawn from further consideration because they would have had substantially greater effects on aquatic resources.

The Authority also refined the design to reduce impacts on known resources, including Romero Creek. The alignment originally included three crossings of Romero Creek, but by adjusting the alignment northward (half in tunnel and half at the eastern end of the subsection), the Authority was able to reduce Romero Creek crossings to one, and reduce encroachments on highly sensitive Romero Creek species and rare habitat. Once the Romero Ranch Realignment was determined to be practicable, the other alignment was withdrawn from further consideration because it would have substantially greater effects on sensitive species and rare habitat. Therefore, design refinements were incorporated into the San Jose to Merced Section alternatives carried forward to avoid direct effects on natural waterbodies and associated habitats, as feasible.

2.1.4 Assessment of Environmental Impacts Under the National Environmental Policy Act

2.1.4.1 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 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 and filed a Notice of Determination with the State Clearinghouse on November 2, 2005, and the FRA issued its related Record of Decision on November 11, 2005.

Following the certification of 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 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 and FRA 2010b). 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 2012).[4] With certification of the 2012 programmatic document, the Authority again selected a Pacheco Pass connection 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 is now preparing project-level environmental documents for several HSR sections, tiering from the programmatic documents.

2.1.4.2 Project-Level Assessment, Tier 2

Following completion of the Tier 1 documents, the Authority initiated Tier 2 project-level planning and environmental review efforts, which includes evaluation of alternatives between San Jose and Merced. The analysis in this document focuses on the project extent between Scott Boulevard and Carlucci Road (the project). The Authority is preparing the San Jose to Merced Section EIR/EIS (Authority 2020a). The extent of the San Jose to Merced Section between Carlucci Road and Merced has been analyzed in the *Merced to Fresno Section Final EIR/EIS* (Authority and FRA 2012) and the *Merced to Fresno Section: Central Valley Wye Draft Supplemental EIR/EIS* (Authority and FRA 2018b), Relevant information and analysis from the *Merced to Fresno Section Final EIR/EIS* (Authority and FRA 2012) and the *Merced to Fresno Section: Central Valley Wye Draft Supplemental EIR/EIS* (Authority and FRA 2018b) are incorporated by reference and summarized where appropriate.

2.2 Project Purpose

For CWA Section 404(b)(1) compliance, USACE must take into consideration the applicant's needs in the context of the geographic area and type of proposed project. This section sets out the purpose and need for the system as well as the purpose and need and overall project purpose for the Project Section.

2.2.1 High-Speed Rail Purpose and Need

The Statewide Program EIR/EIS identified and evaluated alternative HSR corridor alignments and stations as part of a statewide HSR system.

> *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).

2.2.2 Purpose and Overall Project Purpose of the San Jose to Merced Project Section

The purpose pursuant to NEPA and the overall project purpose pursuant to the Section 404(b)(1) Guidelines of the Project Section is as follows:

> The purpose of this project is to implement the San Jose to Merced section of the California HSR system: to provide the public with electric-powered high-speed rail service that provides predictable and consistent travel times between major urban centers and connectivity to airports, mass transit systems, and the highway network in the south San Francisco Bay Area and Central Valley; and to connect the Northern and Southern portions of the statewide HSR system.
>
> The purpose and need for the San Jose to Merced Project Section was developed through a process established by the Authority, FRA, USACE, and EPA pursuant to a

4 This litigation was limited to the California Environmental Quality Act.

November 2010 memorandum of understanding that was intended to facilitate the integration of NEPA, Section 404 of the Clean Water Act, and Section 14 of the Rivers and Harbor Act (MOU). The parties reached agreement on the purpose and need in August 2011 (Authority and FRA 2011b; USACE 2011; USEPA 2011).

For Clean Water Act Section 404(b)(1) compliance, the USACE must take into consideration the applicant's needs in the context of the geographic area of the proposed action and the type of project being proposed. The USACE has determined that the overall project purpose (as stated above) allows for a reasonable range of alternatives to be analyzed, as is acceptable as the basis for the USACE 404(b)(1) alternatives analysis.

2.3 Overview of Alternatives

The San Jose to Merced Project Section would provide HSR service between Diridon Station in downtown San Jose and a station in downtown Merced, with a Gilroy station either in downtown Gilroy or east of Gilroy. The project extent evaluated in this Summary Report would connect San Jose to the Central Valley portion of the HSR system at the Central Valley Wye in Merced County, which in turn connects to the portion of the system running north to Merced and south to Fresno and Southern California. Because the portion of the Project Section between Carlucci Road and Merced was analyzed in the prior checkpoint summary reports for the Merced to Fresno Project Section and the Central Valley Wye and was addressed in the Merced to Fresno Section environmental documents (Authority and FRA 2012; Authority and FRA 2018b), the alternatives analysis for the San Jose to Merced Project in this Checkpoint C Summary Report is focused on the project extent between Scott Boulevard and Carlucci Road. An overview of the San Jose to Merced Project Section is provided in Figure 2-1.

Source: Authority 2020a

DRAFT NOVEMBER 2018

Figure 2-1 Proposed San Jose to Merced Project Section

The project extent contains five subsections:

- **San Jose Diridon Station Approach**—Extends approximately 6 miles from north of San Jose Diridon Station at Scott Boulevard in Santa Clara to West Alma Avenue in San Jose. This subsection includes San Jose Diridon Station and overlaps the southern portion of the San Francisco to San Jose Project Section.

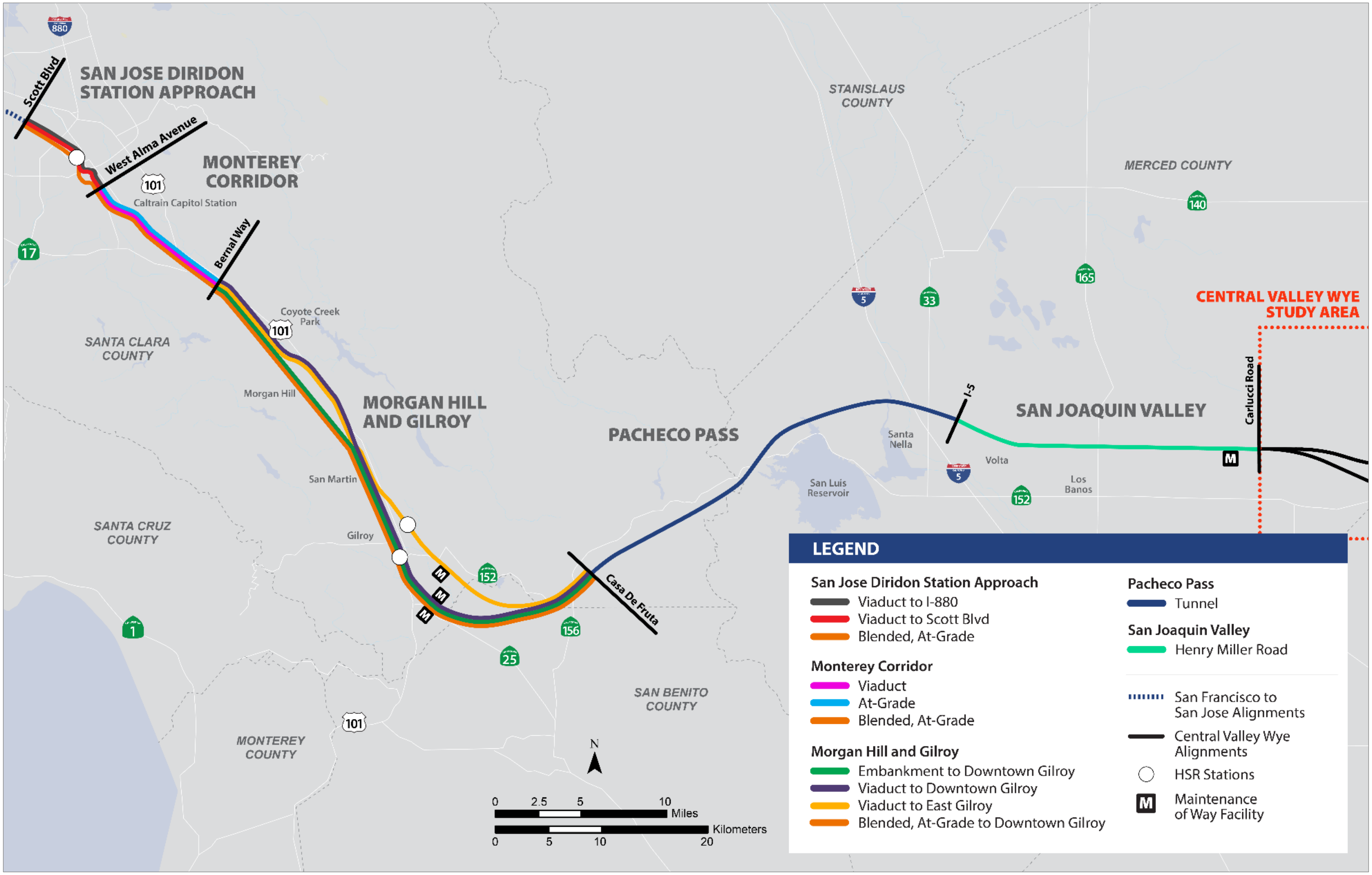
- **Monterey Corridor**—Extends approximately 9 miles from West Alma Avenue to Bernal Way in the community of South San Jose. This subsection is entirely within the city of San Jose.
- **Morgan Hill and Gilroy**—Extends approximately 30 to 32 miles from Bernal Way in the community of South San Jose to Casa de Fruta Parkway/SR 152 in the community of Casa de Fruta in Santa Clara County.
- **Pacheco Pass**—Extends approximately 25 miles from Casa de Fruta Parkway/SR 152 to I-5 in Merced County.
- **San Joaquin Valley**—Extends approximately 18 miles from I-5 to Carlucci Road in unincorporated Merced County.

The Authority has developed four end-to-end alternatives for the project (Figure 2-2). Table 2-1 shows the design options that distinguish the alternatives by subsection; Figures 2-3 through 2-7 illustrate the features of the four alternatives by subsection. The four alternatives are summarized in Section 1.1, Checkpoint C Purpose and Relationship to the Memorandum of Understanding.

Table 2-1 San Jose to Central Valley Wye Design Options by Subsection

Subsection/Design Options	Alternative 1	Alternative 2	Alternative 3	Alternative 4
San Jose Diridon Station Approach				
Viaduct to Scott Boulevard		X	X	
Viaduct to I-880	X			
Blended, at grade				X
Monterey Corridor				
Viaduct	X		X	
At grade		X		
Blended, at grade				X
Morgan Hill and Gilroy				
Embankment to downtown Gilroy		X		
Viaduct to downtown Gilroy	X			
Viaduct to east Gilroy			X	
Blended, at grade to downtown Gilroy				X
Pacheco Pass				
Tunnel	X	X	X	X
San Joaquin Valley				
Henry Miller Road	X	X	X	X

Source: Authority 2020a



Source: Authority 2020a

DRAFT JUNE 2019

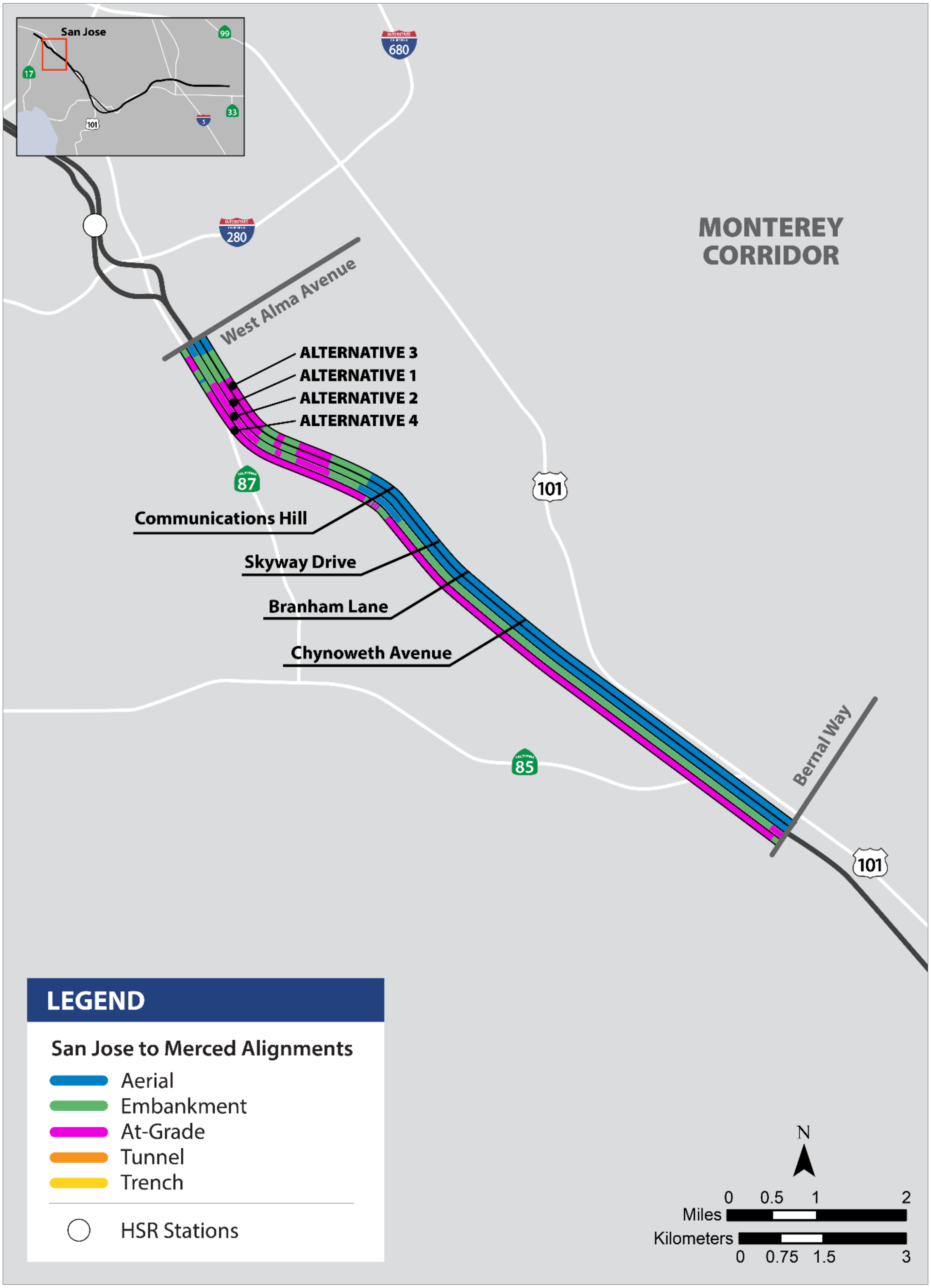
Figure 2-2 Overview of Subsection Design Options

Source: Authority 2020a

DRAFT JUNE 2019

CEMOF = Centralized Equipment Maintenance and Operation Facility

Figure 2-3 San Jose Diridon Station Approach Subsection



Source: Authority 2020a

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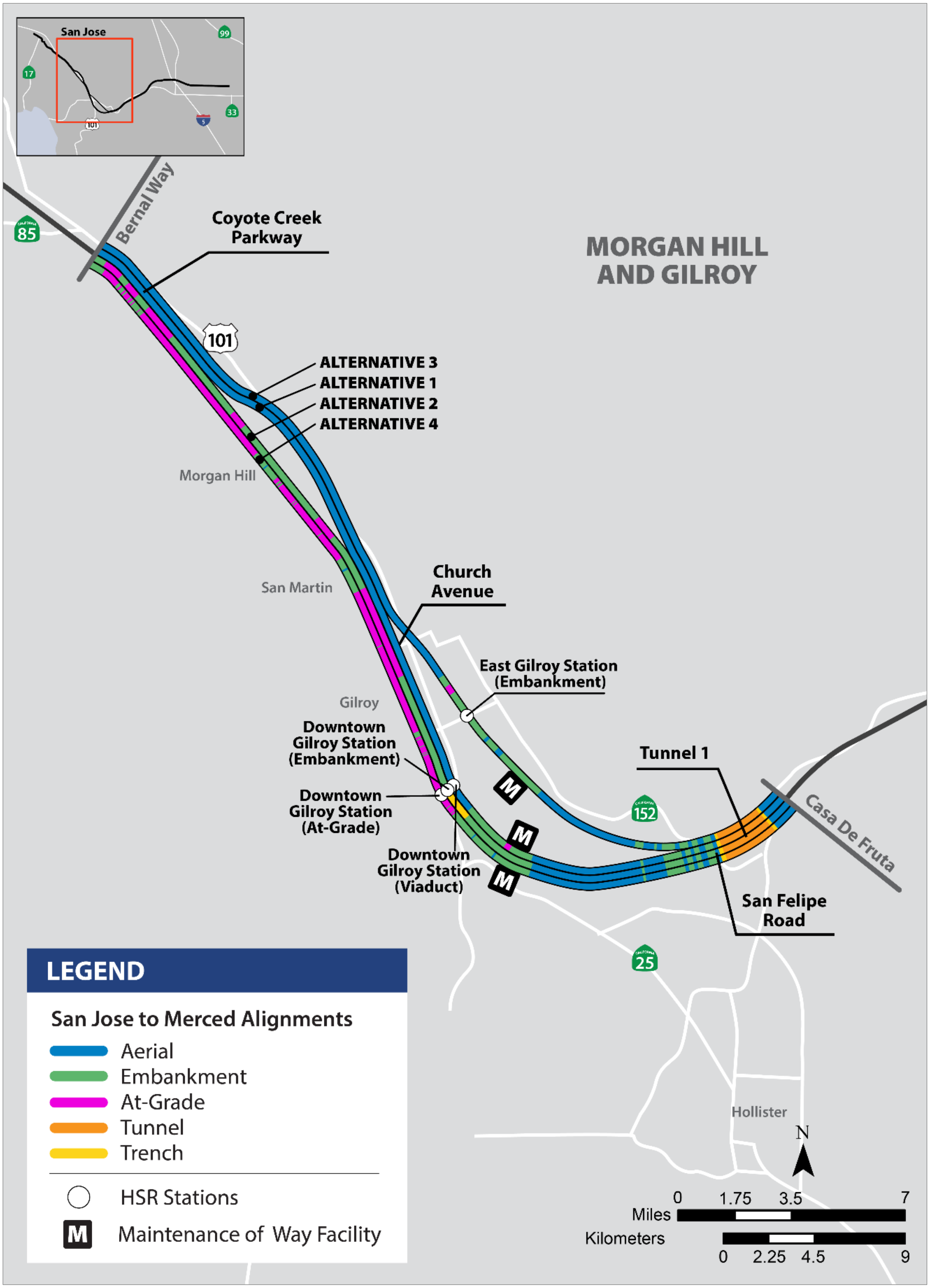
Figure 2-4 Monterey Corridor Subsection



Source: Authority 2020a

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Figure 2-5 Morgan Hill and Gilroy Subsection

Source: Authority 2020a

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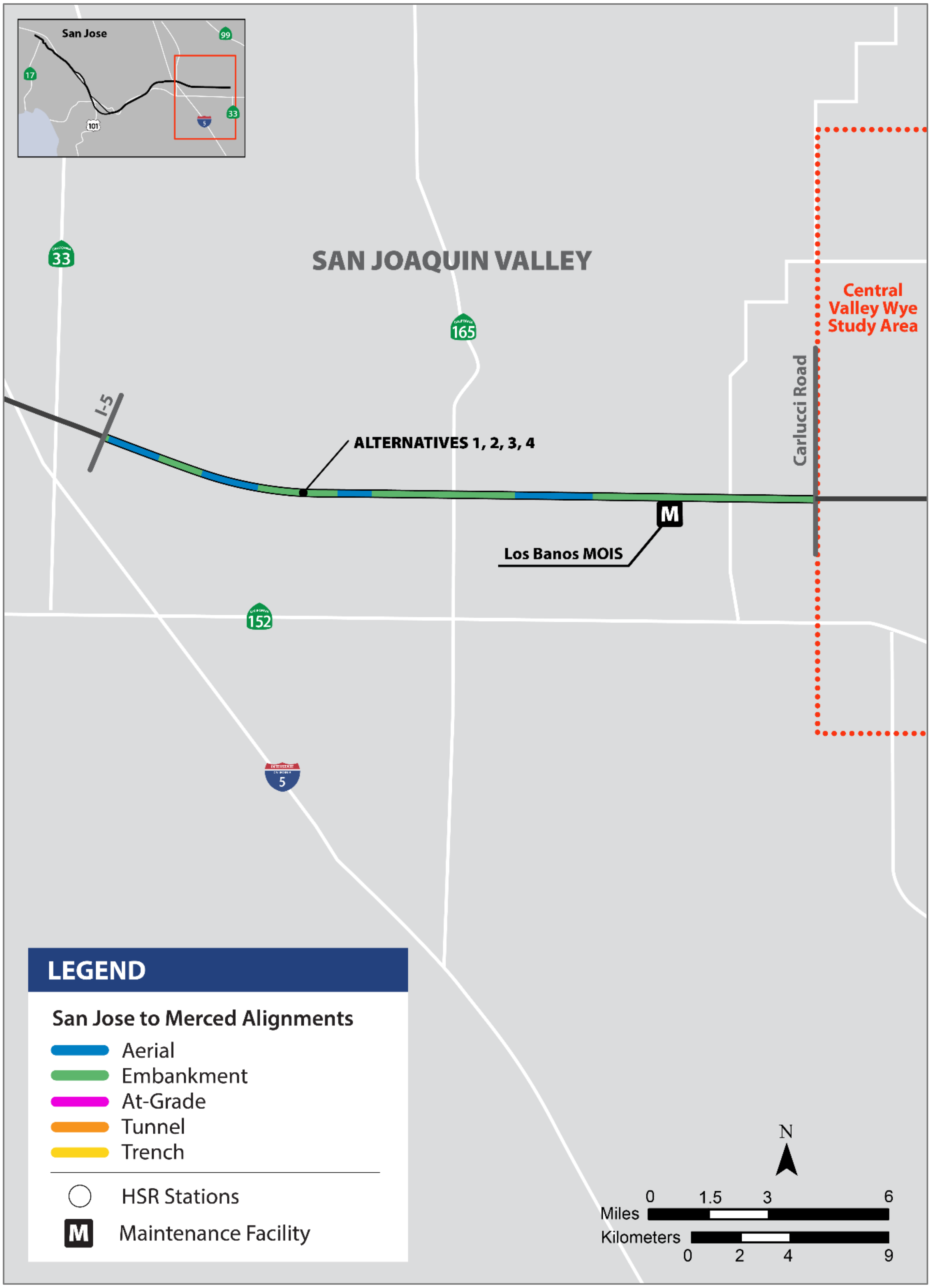
Figure 2-6 Pacheco Pass Subsection



Source: Authority 2020a

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Figure 2-7 San Joaquin Valley Subsection

2.3.1 Common Components of Alternatives

All four alternatives are identical in the Pacheco Pass (Figure 2-6) and San Joaquin Valley (Figure 2-7) Subsections, which are described in detail in this section. In the other three subsections, each of the alternatives is characterized by a particular set of features (i.e., profiles and alignments) generally referred to as design options, described in greater detail in Section 2.3.3, Project Section Alternatives.

2.3.1.1 Pacheco Pass Subsection

2.3.1.1.1 Alignment and Ancillary Features

The Pacheco Pass Subsection would be approximately 25 miles long. The alignment would generally follow the existing SR 152 corridor east from Casa de Fruta for approximately 17 miles, then diverge north around the Cottonwood Creek ravine of the San Luis Reservoir for approximately 8 miles before transitioning to the San Joaquin Valley Subsection near I-5 in Merced County. Tunnel is the only design option in this subsection.

From the eastern limit of the Morgan Hill and Gilroy Subsection, the guideway would transition from aerial structure to embankment along the southern boundary of Casa de Fruta. This stretch of embankment would be on fill or in excavated hillside cuts to accommodate a level HSR guideway profile over varied surface elevations and to control unstable slopes known for vulnerability to landslip (i.e., areas subject to the downward falling or sliding of a mass of soil, detritus, or rock on or from a steep slope). The alignment would ascend to viaduct over Pacheco Creek along the south side of SR 152 and remain on viaduct to the Tunnel 2 west portal. This portal would include a staging area for tunnel construction and a permanent area for traction and facility power with access provided by a service road from SR 152. Tunnel 2 would extend approximately 13.5 miles northeast. Access to the Tunnel 2 east portal for HSR construction, operations, and maintenance would be on McCabe Road north of Romero Ranch. Continuing east, the HSR guideway would be predominantly on a combination of embankment and aerial structures, with viaducts over Romero Creek and the California Aqueduct. Romero Road would be realigned at its intersection with I-5. East of I-5, the alignment would cross over SR 33/Santa Nella Road and the Central California Irrigation District Outside Canal before transitioning to the San Joaquin Valley Subsection at Fahey Road.

2.3.1.1.2 Wildlife Crossings

Four wildlife crossing culverts would be provided west of the California Aqueduct, with an additional two between the California Aqueduct and the Delta-Mendota Canal and one between the Delta-Mendota Canal and I-5. Three wildlife crossings would be provided between I-5 and Santa Nella Road, and three more between Santa Nella Road and Fahey Road. Viaducts would also function as wildlife movement areas in this subsection.

2.3.1.1.3 Stations

No stations are proposed for this subsection.

2.3.1.1.4 Traction Power Facilities

One new traction power substation (TPSS), Site 5—O’Neill, would be constructed approximately 1.2 miles west of the California Aqueduct. A new 230-kilovolt (kV) double-circuit tie-line would be constructed from the expanded Quinto switching station to the TPSS, paralleling an existing Pacific Gas and Electric Company (PG&E) transmission line for approximately 0.6 mile. The tie-line would be installed either underground in a utility easement or overhead, requiring the existing 500-kV transmission line to be raised. No reinforcements to the PG&E power system would be required for this site. Communication facilities (i.e., redundant fiber optic lines) would also be required to support the electrical interconnection. The interconnection would link the TPSS to a new PG&E switching station, to existing PG&E facilities, or both—typically within tie-line/utility corridors.

A traction power switching station would be constructed at each Tunnel 2 portal. A power drop site would be co-located with the switching stations. A new permanent distribution power line from the Quinto switching station along McCabe Road to the Tunnel 2 east portal location would provide power for tunnel construction and fire and life safety systems during operations. The existing PG&E 230-kV Quinto switching station would be expanded within the fence line to support the HSR system.

Traction power paralleling stations would be constructed at three locations:

- Two stations within Tunnel 2 cross passages, approximately 5 miles apart; and
- One station either southeast or northwest of the alignment crossing of Fahey Road.

2.3.1.1.5 Train Control and Communication Facilities

Three automatic train control (ATC) sites would be constructed in the Pacheco Pass Subsection at the following locations:

- West portal of Tunnel 2,
- Underground within the limits of Tunnel 2, and
- Adjacent to TPSS Site 5.

One standalone communication radio antenna site would be constructed in the Pacheco Pass Subsection:

- Near SR 152 and the Tunnel 2 west portal.

2.3.1.1.6 Maintenance Facilities

No maintenance facilities are proposed for this subsection.

2.3.1.1.7 State Highway or Local Roadway Modifications

SR 152 would be modified to allow for construction traffic.

2.3.1.1.8 Freight or Passenger Rail Modifications

No freight or passenger rail modifications would be required in this subsection.

2.3.1.1.9 Land Use and Community Modifications

This subsection would require acquisition of residential, commercial, and industrial properties in this subsection to obtain adequate right-of-way for construction and operations.

2.3.1.2 San Joaquin Valley Subsection

2.3.1.2.1 Alignment and Ancillary Features

The San Joaquin Valley Subsection would be approximately 18 miles long, from east of I-5 (at Fahey Road) to the intersection of Henry Miller Road and Carlucci Road in Merced County, where the alignment would connect to the Central Valley Wye. The single design option in this subsection is Henry Miller Road—a combination of viaduct and embankment.

South of Fahey Road, the guideway would continue east and cross over three irrigation ditches, Cherokee Road, the Central California Irrigation District Main Canal, two additional irrigation ditches, and adjacent farmland on viaduct. Continuing east, the alignment would be on embankment (including four proposed culvert crossings for irrigation ditches) before ascending on an approximately 1.4-mile-long viaduct over the San Luis Wasteway, the UPRR West Side branch line, and Ingomar Grade Road.

The alignment would descend to embankment west of Volta Road while turning southeast before crossing to the south side of Henry Miller Road. Henry Miller Road would be realigned to pass over the HSR alignment on a bridge. The HSR embankment between the Volta Road overcrossing and Los Banos Creek would cross over two proposed culverts to maintain irrigation canals. The alignment would then ascend to cross over Los Banos Creek and Badger Flat Road on a 1.35-mile-long viaduct before descending onto embankment.

The alignment would continue east for 3.6 miles on embankment over several combined wildlife crossing/drainage culverts and drainage culverts, including an irrigation ditch at Wilson Road, an irrigation ditch at Johnson Road, two irrigation ditches at Nantes Avenue, the Santa Fe Canal, the San Luis Canal, the San Luis Drain, and the Porter-Blake Bypass. A road would be constructed between Badger Flat Road and Nantes Avenue. SR 165/Mercey Springs Road would be raised to cross over the HSR alignment and Henry Miller Road on a bridge. East of SR 165 and the Santa Fe Grade, the alignment would ascend to an approximately 1.8-mile viaduct south of the Los Baños State Wildlife Area across Mud Slough to maintain wildlife movement within the GEA. Baker Road, Midway Road, and Hereford/Salt Slough would be closed south of Henry Miller Road. Box Car Road would become a cul-de-sac with a new road to the east. Hutchins Road would be abandoned. The alignment would continue on embankment to the eastern limit of the subsection and the project. Culvert crossings would be provided for the San Pedro Canal, Boundary Drain, Longe Tree Canal, Devon Drain, West Delta Drain, West Delta Canal, Dambrosia Ditch, Delta Canal and seepage drain, East Delta Canal, Poso Drain, Belmont Drain, Delta Canal #1, West San Juan Drain, San Juan #1, and several other irrigation ditches and drains in the section of viaduct over the GEA. Several local roadways—Delta Road, Turner Island Road, and Carlucci Road—would be elevated over the HSR guideway, maintaining access to adjacent properties. The alignment would transition to the Central Valley Wye at Carlucci Road.

2.3.1.2.2 Wildlife Crossings

The rail alignment would be primarily on viaduct where it overlaps with the GEA boundary and modeled wildlife movement corridors. Three additional wildlife crossing culverts would be added between Fahey Road and Cherokee Road. Regularly spaced wildlife crossing culverts would continue through the remainder of this subsection. In total, there would be 64 wildlife crossings in this subsection.

2.3.1.2.3 Stations

No stations are proposed for this subsection.

2.3.1.2.4 Traction Power Facilities

A traction power switching station would be constructed on the north or south side of the alignment at one of two alternate sites east of the intersection of Henry Miller Road and Santa Fe Grade.

Traction power paralleling stations would be constructed at the following locations:

- Either east or west of the Henry Miller Road overcrossing of the HSR alignment near Volta Road (two site options), and
- Intersection of Henry Miller Road and Box Car Road (two site options either north or south of the alignment).

2.3.1.2.5 Train Control and Communication Facilities

Five ATC sites would be constructed in the San Joaquin Valley Subsection:

- One site east of the Central California Irrigation District Main Canal (two options),
- Three sites near Johnson Road, and
- One site near Box Car Road (two site options).

One standalone communication radio site would be constructed at Wilson Road (two site options: one east of the San Pedro Canal and one at Carlucci Road).

2.3.1.2.6 Maintenance Facilities

A maintenance of infrastructure siding is proposed near Turner Island Road near the eastern limit of the project (Figure 2-8). It would be about 0.5 mile long, encompassing about 4 acres. The facility would be constructed near Henry Miller Road to avoid the GEA and other sensitive habitat.

2.3.1.2.7 State Highway or Local Roadway Modifications

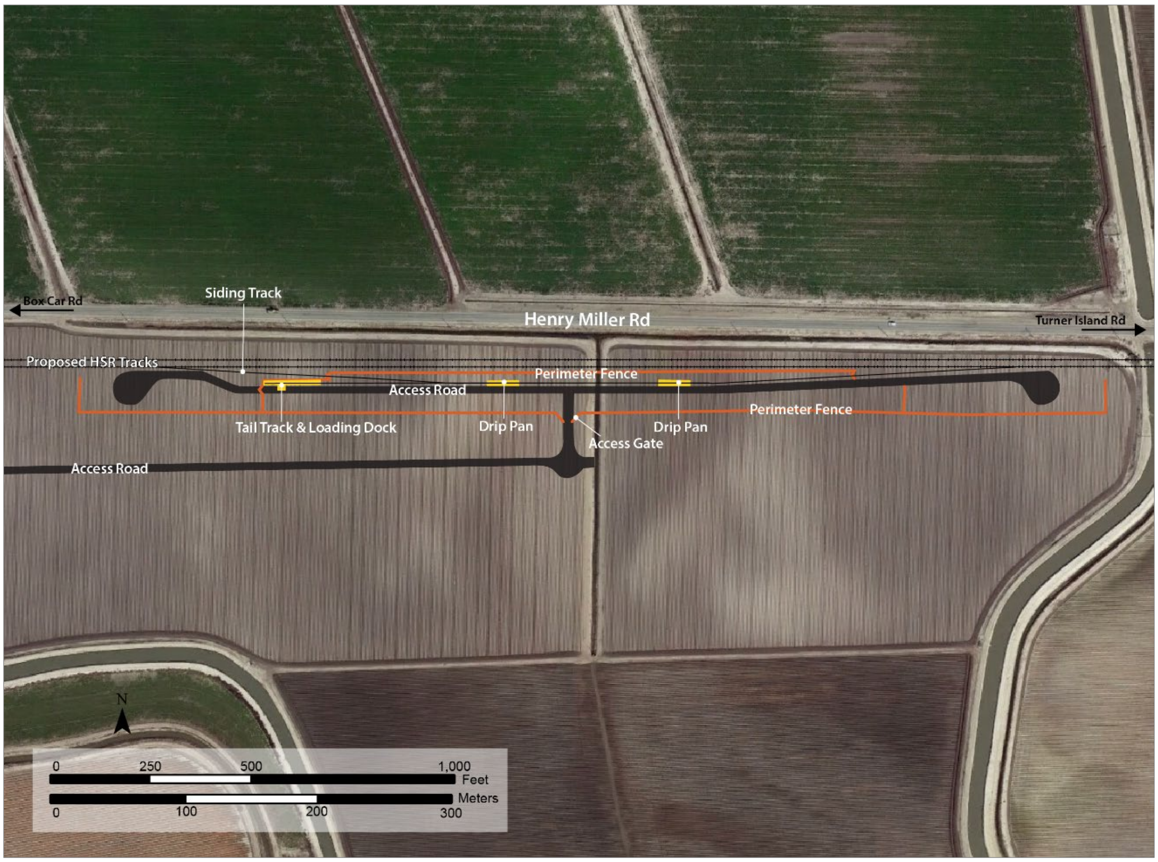
Some local road modifications would be necessary in the San Joaquin Valley Subsection.

2.3.1.2.8 Freight or Passenger Rail Modifications

No freight or passenger rail modifications would be required in this subsection.

2.3.1.2.9 Land Use and Community Modifications

This subsection would require acquisition of land in residential, commercial, or agricultural uses to obtain adequate right-of-way for construction and operations. The alignment would traverse a portion of the GEA, requiring acquisition of land under conservation easement.



Source: Authority 2020a DRAFT JUNE 2019

Figure 2-8 Maintenance of Infrastructure Siding near Turner Island Road

2.3.2 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 considering 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 San Jose to Merced Section. The practicability analysis of the No-Fill Alternative is set out in Section 2.6.5.1, Consistency with Overall Project Purpose, and Section 2.6.5.2, Other Practicability Factors, of this report.

2.3.3 Project Section Alternatives

This section describes the characteristics of alternatives where they differ.

2.3.3.1 Alternative 1

Development of Alternative 1 was intended to minimize the project footprint, minimize ground disturbance, minimize continuous surface features, and decrease necessary right-of-way acquisition through extensive use of viaduct structures and bypassing downtown Morgan Hill. The HSR alignment for this alternative would consist of 45.4 miles of viaduct, 4.3 miles at grade, 21.9 miles of embankment, two tunnels totaling 15.0 miles, and 2.3 miles in trench.

2.3.3.1.1 San Jose Diridon Station Approach Subsection

2.3.3.1.1.1 Alignment and Ancillary Features

The San Jose Diridon Station Approach Subsection, from Scott Boulevard in Santa Clara to West Alma Avenue in San Jose, would be approximately 6 miles through the cities of Santa Clara and San Jose (Figure 2-3). The existing Caltrain track in this subsection consists of predominantly two-track and three-track at-grade alignment. South of De La Cruz Boulevard, UPRR tracks of the Coast Line from the northeast converge with the Caltrain corridor and continue south adjacent to the east side of the railroad corridor to the Santa Clara Caltrain Station. Between the Caltrain College Park Station and San Jose Diridon Station, Caltrain's Central Equipment and Maintenance Facility comprises three mainline tracks, a maintenance building, and nine-yard tracks. San Jose Diridon Station includes five passenger platforms served by nine-yard tracks along the west side of the station house. HSR would diverge from the Caltrain corridor at Park Avenue, just south of San Jose Diridon Station, returning to the Caltrain corridor at the north end of the Caltrain Tamien Station, which includes a passenger platform served by two tracks and a single through track.

Alternative 1 would begin at Scott Boulevard in blended service with Caltrain at grade. Beginning at I-880 on the southbound approach to West Hedding Street, Caltrain tracks would be realigned to accommodate the HSR tracks. Dedicated HSR tracks would diverge from the Caltrain Mainline Track (MT) 2 and MT3 and continue south along the north side of the existing Caltrain corridor, crossing under West Hedding Street. To accommodate the new track configuration, the West Hedding Street roadway overpass would be replaced with a new overpass bridge that would also pass over Stockton Avenue.

Both legs of the UPRR Warm Springs Subdivision Lenzen Wye would be relocated, and North Montgomery Street would be extended north of the alignment of Lenzen Avenue almost to the former Lenzen Wye to maintain property access beneath the 60-foot-high HSR viaduct. The HSR viaduct would cross over Cinnabar Street, both legs of the relocated Lenzen Wye and North Montgomery Street, West Julian Street, and West Santa Clara Street while curving west toward the UPRR/Caltrain mainline tracks to enter a new aerial dedicated HSR station at San Jose Diridon Station. Continuing on an aerial structure, the alignment would diverge from the Caltrain right-of-way south of the San Jose Diridon Station HSR platforms by turning sharply east at the Park Avenue overcrossing. The HSR aerial structure would cross over Los Gatos Creek and San Carlos Street, then over Royal Avenue and the intersection of Bird Avenue and Auzerais Avenue, then over the I-280/SR 87 interchange. Continuing south along the east side of SR 87, the HSR aerial structure would cross over West Virginia Street and the Guadalupe River Trail, then over the Caltrain rail bridge, the Guadalupe River, and Willow Street. The HSR aerial structure would continue south over the Caltrain Tamien Station on an alignment between Tamien Station and the SR 87 freeway, transitioning to the Monterey Corridor Subsection at West Alma Avenue.

2.3.3.1.1.2 Wildlife Crossings

There would be no wildlife crossings in this subsection.

2.3.3.1.1.3 Stations

The HSR San Jose Diridon Station is estimated to have up to 15,430 boardings in 2040. The station would entail a four-track aerial alignment over the existing Diridon station at approximately 62 feet to top of rail, with 1,410-foot-long platforms above the existing Caltrain rail yard centered between Santa Clara Street and Park Avenue (Figure 2-11 and Figure 2-12). The existing historic station would remain in place. The primary HSR station building would be constructed north of the existing station building, but it would continue to the south wrapping around the existing Caltrain station building. The HSR station building would be accessed from the east at three entrances: the main entrance east of the tracks and north of the existing historic station next to the future Bay Area Rapid Transit (BART) alignment; an entrance south of the existing historic station; and an entrance on the east side of the alignment and south of the PG&E power station.[5] There would also be three entrances to the HSR station on the west side of the tracks: a north entrance at the end of White Street and two entrances on Laurel Grove Lane, one north and one south. The aerial station would require viaduct columns within the PG&E substation. The HSR station building would encompass 99,289 square feet with a 4,440-square-foot substation and systems building. The concourse would consist of a mezzanine level above the existing Caltrain tracks and below the HSR platforms, with three east-west connections across the tracks at the north, south, and middle.

Existing parking spaces (226) at Cahill Street would be displaced and replaced 1:1 with new parking areas at Cahill and Park Streets and at Stockton and Alameda Streets.

HSR parking demand of 1,050 spaces in 2040 would be met by commercially available parking downtown or at the airport. The Authority has provided a Station Area Planning grant to the City of San Jose to advance the implementation of the Diridon Station Area Plan adopted by the San Jose City Council. Through this effort, the City would address short-term parking needs during HSR and BART Phase II construction and would also address plans for transitioning the parking needed during construction to the highest and best use after construction. Another Station Area Planning grant to the Valley Transportation Authority (VTA) would fund a San Jose Diridon Station Facilities Master Plan. This grant would be used to develop a parking program to manage parking demand and supply over time to reflect changes in ridership and park-and-ride mode share. These two studies would provide input into a multimodal access plan for the station that would be developed prior to final station design and construction.

Existing underutilized parking capacity at and around the station would be used to meet the estimated HSR parking demand until a station area parking policy and program are implemented. The Authority would rely on commercially available parking to meet HSR parking demand, provided and priced in accordance with local conditions. HSR riders would be able to walk or take a shuttle, such as the City of San Jose’s DASH, from parking downtown or adjacent to the station.

The existing off-site bus transit center would be relocated to an on-street facility on Cahill, Stover, and Crandall Streets. Street improvements would include reconfiguring and extending Cahill Street from Santa Clara Street to Park Avenue, and converting Cahill, Stover, and Crandall Streets to a transit street with 12 to 15 bus stops. Montgomery Street would be reconfigured to provide curb space for a bus layover. A pick-up/drop-off zone of 1,900 square feet would be provided. New two-way cycle tracks would be installed on the east side of Cahill Street. A 4,000-square-foot bicycle facility would be constructed. New signals and pedestrian crossings would be developed at Cahill and Park, Otterson, Stover, West San Fernando, and Crandall Streets.

Other rail operators in the station area are Caltrain, Altamont Commuter Express, Amtrak, VTA light rail, and future BART. VTA has plans to construct new light rail station platforms as a separate project, and BART plans to extend service from the Berryessa Station to Santa Clara with a stop at the San Jose Diridon Station by 2026.

2.3.3.1.1.4 Traction Power Sites and Power Connections

One new TPSS would be constructed in this subsection on the east side of the Caltrain corridor south of I-880 in San Jose (just southeast of the I-880 overcrossing). The TPSS would be interconnected to two new gas-insulated substation breaker-and-a-half bays. The bays would be installed within the fence line of the PG&E FMC substation, just north of the I-880 overcrossing, by means of an aerial double-circuit 115-kV tie-line.

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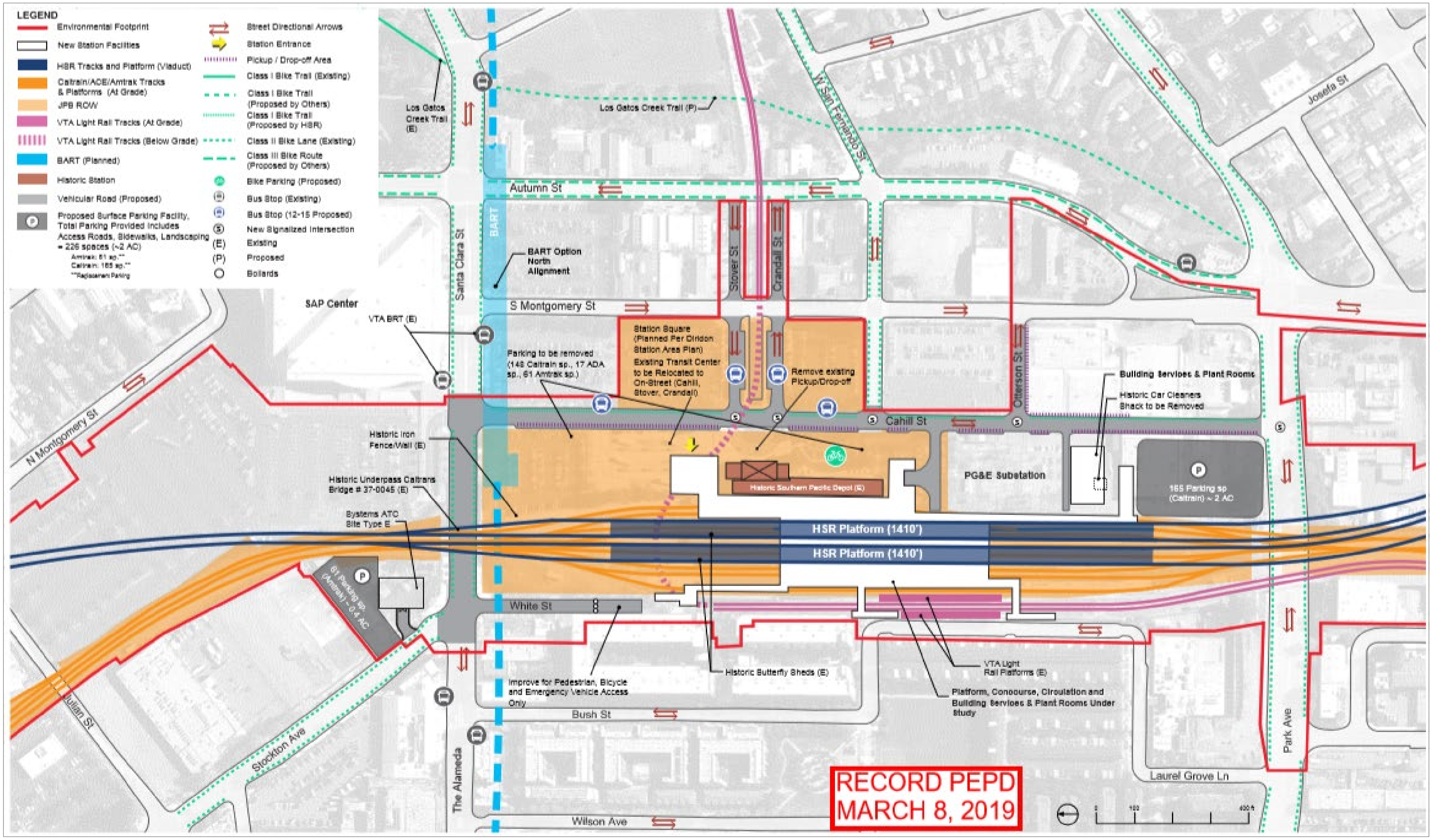
[5] The PG&E substation is not part of the project footprint.



Source: Authority 2020a

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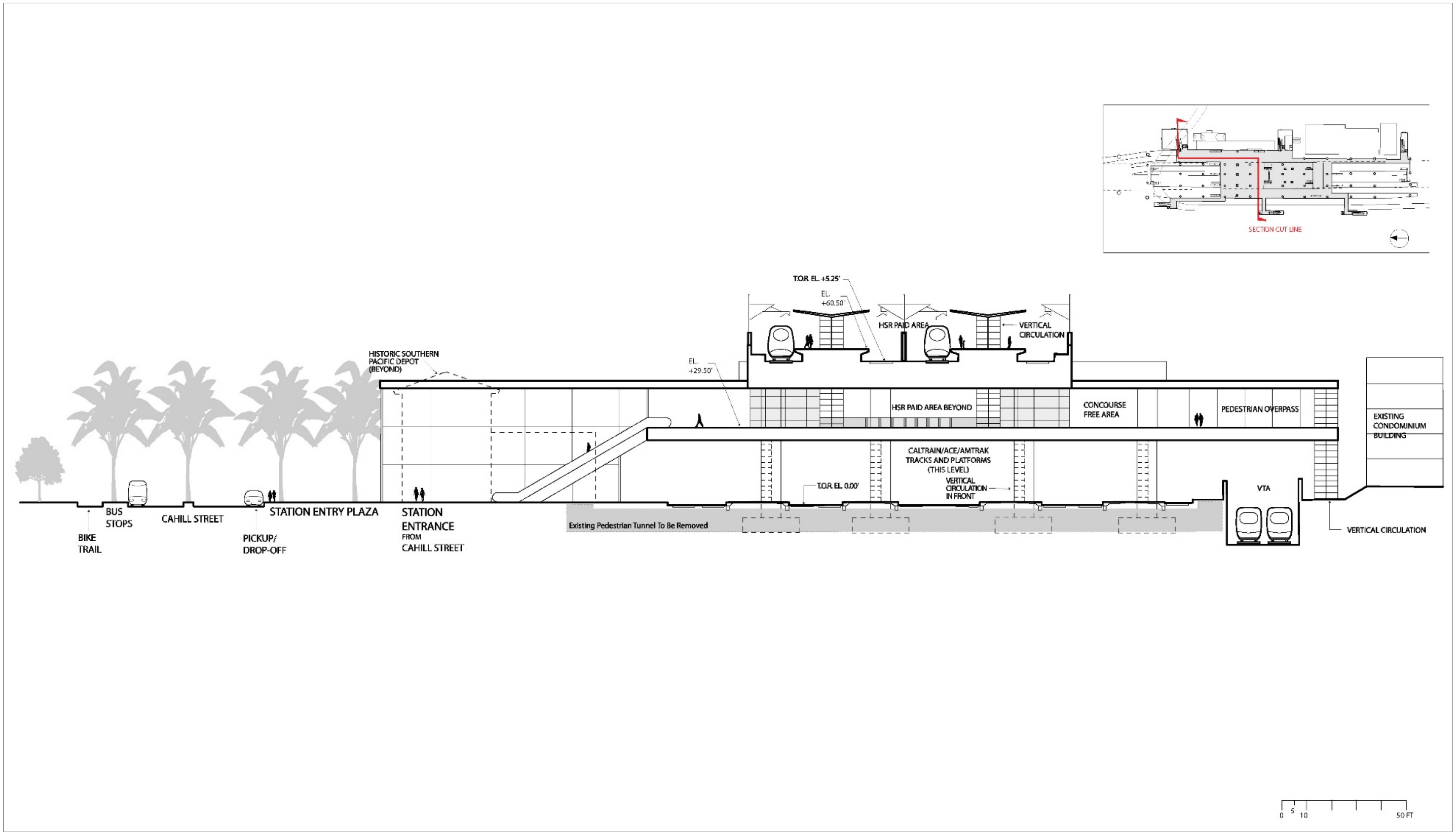
Figure 2-9 Conceptual San Jose Diridon Station Plan



Source: Authority 2020a

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Figure 2-10 Conceptual San Jose Diridon Station Cross Section

2.3.3.1.1.5 Train Control and Communication Facilities

An enhanced ATC system would control the trains and comply with the FRA-mandated positive train control (PTC) requirements, including safe separation of trains, over-speed prevention, and work zone protection. This system would include communications towers at intervals of approximately 1.5 to 3 miles. Signaling and train control elements within the right-of-way would include 10- by 8-foot communications shelters that house signal relay components and microprocessor components, cabling to the field hardware and track, signals, and switch machines on the track. Communications towers in these facilities would use 6- to 8-foot-diameter 100-foot-tall poles. The communications facilities would be sited in the vicinity of track switches and would be grouped with other traction power, maintenance, station, and similar HSR facilities where possible. Where communications towers cannot be co-located with TPSSs or other HSR facilities, the communications facilities would be sited near the HSR corridor in a fenced area approximately 20 by 15 feet.

Under Alternative 1, there would be six ATC sites between I-880 in San Jose and the I-280 and SR 87 interchange:

- two sites near the TPSS facility,
- one site just north of the San Jose Diridon Station, and
- three sites between Park Avenue and the proposed HSR crossing of SR 87.

One standalone communications radio site would be built at one of two alternative locations, both south of Scott Boulevard along the east side of the Caltrain corridor.

2.3.3.1.1.6 Maintenance Facility

No maintenance facilities are proposed for this subsection.

2.3.3.1.1.7 State Highway or Local Roadway Modifications

The HSR viaduct crossing over the I-280/SR 87 interchange would require construction of a complex, long-span viaduct approximately 70 to 100 feet high (measured from existing ground level to top of rail). Construction activities would entail disturbance of traffic and may require temporary lane closures on the highway and associated ramps for the duration of construction. Proposed viaduct footings would be constructed below the existing freeway, and the viaduct superstructure would be constructed above the freeway. Moreover, the proposed viaduct columns would be constructed adjacent to existing freeway bridges and within the freeway shoulder, median, gore (i.e., split) of I-280, and nearby ramps. Space for HSR construction equipment and materials would be limited by the proximity of these roadway features. The HSR viaduct may also require redesign and reconstruction of existing signage, striping, or other freeway appurtenances. Three straddle bents spanning the platform and tracks are proposed to avoid affecting the existing railroad tracks near Tamien and the Tamien Station platform. The HSR footings and columns would be near the SR 87 freeway and the Lelong Street on-ramp. The footing construction would likely involve temporary closure of the ramp.

2.3.3.1.1.8 Freight or Passenger Rail Modifications

Between Scott Boulevard and Benton Street, HSR would operate on blended service tracks, entailing several minor track modifications of less than 1 foot between Scott Boulevard and I-880. The blended service tracks are owned by the Peninsula Corridor Joint Powers Board. The Santa Clara Station would remain unchanged. Beginning at I-880 on the southward approach to West Hedding Street, Caltrain tracks would be realigned to accommodate the HSR tracks. Dedicated HSR tracks would diverge from the Caltrain MT2 and MT3 and continue south along the east side of the existing Caltrain corridor. The UPRR/Caltrain MT1 tracks would be shifted east by up to 226 feet. College Park Station would have new northbound and southbound platforms and pedestrian undercrossings. The freight track would be shifted up to 64 feet at the Lenzen Wye. Straddle bents would be constructed over the existing Tamien Station.

2.3.3.1.1.9 Land Use and Community Modifications

The HSR facilities in this subsection would be constructed predominantly in the existing Caltrain right-of-way. The HSR alignment would diverge from the Caltrain right-of-way just south of the San Jose Diridon Station along a southeast alignment over the I-280/SR 87 interchange before returning to the Caltrain right-of-way just north of the Tamien Caltrain Station. This alignment would require modifications of some intersections, acquisition of temporary construction easements (TCE), and acquisition of permanent right-of-way in some areas along the alignment.

2.3.3.1.2 Monterey Corridor Subsection

2.3.3.1.2.1 Alignment and Ancillary Features

The Monterey Corridor Subsection would be approximately 9 miles long and entirely within the San Jose city limits. From the San Jose Diridon Station Approach Subsection at West Alma Avenue just south of the Caltrain Tamien Station, the alignment would extend southeast to Bernal Way (Figure 2-4). Alternative 1 would be on viaduct in the median of Monterey Road. UPRR MT1, Caltrain MT2, and Caltrain storage tracks would be shifted east between West Alma Avenue and Caltrain/UPRR Control Point (CP) Lick, at the southeast base of Communications Hill. The railroad bridge over Almaden Road and the Almaden Expressway road bridge would be extended to accommodate the track shift. The UPRR Luther spur track south of Almaden Expressway would also be relocated to accommodate the MT shifts.

From West Alma Avenue, the HSR alignment would descend from a viaduct 54 feet high to embankment (i.e., 5 feet or higher) north of Almaden Road. The alignment would continue primarily on embankment to cross over Almaden Road on a short aerial structure, then under Almaden Expressway, then continue south on embankment to at grade under Curtner Avenue. The alignment would continue south primarily at grade along the northern base of Communications Hill and ascend to aerial structure before crossing over and entering the Monterey Road median just south of Hillsdale Avenue. Construction of the viaduct over the existing Caltrain Capitol Station would require either falsework over the station if constructed by cast-in-place methods or relocating the station 500 feet to the south if built using precast segments. The alignment would continue south on viaduct in the median of Monterey Road, crossing over Capitol Expressway, Skyway Drive, Branham Lane, Roeder Road/Chynoweth Avenue, Blossom Hill Highway, SR 85/West Valley Freeway, and Bernal Road.

The design assumes a reduction from six to four travel lanes on Monterey Road, beginning south of Southside Drive and continuing south of Blossom Hill Road, where the existing roadway is already four travel lanes. Three existing mid-block left-turn lanes would be closed because of substandard stopping sight distance. Additionally, the design assumes a combined left-turn and through lane at Palm Avenue.

2.3.3.1.2.2 Wildlife Crossings

There would be no wildlife crossings in this subsection.

2.3.3.1.2.3 Stations

No stations are proposed for this subsection.

2.3.3.1.2.4 Traction Power Facilities

Two traction power paralleling stations would be constructed in the subsection:

- north of the alignment near Curtner Avenue or south of the alignment at Communications Hill, and
- south of SR 85 or between Bernal Road and the Bernal Road ramp onto Monterey Road.

2.3.3.1.2.5 Train Control and Communication Facilities

One ATC site would be constructed in the subsection at one of two locations east of the guideway in the vicinity of Chynoweth Avenue.

Two standalone communications radio sites are proposed:

- Near Almaden Road on the east side of Monterey Road (two site options), and
- Near Capitol Expressway (two site options).

2.3.3.1.2.6 Maintenance Facility

No maintenance facilities are proposed for this subsection.

2.3.3.1.2.7 State Highway or Local Roadway Modifications

Monterey Road between Southside Drive and south of Blossom Hill Road would be narrowed to four lanes. Three mid-block left-turn lanes into shopping centers would be closed.

2.3.3.1.2.8 Freight or Passenger Rail Modifications

Construction in this subsection would require temporary use of areas of UPRR right-of-way for construction staging. UPRR MT1, Caltrain MT2, and Caltrain storage tracks would be shifted east between West Alma Avenue and Caltrain/UPRR CP Lick at the southeast base of Communications Hill. A railroad bridge over Almaden Road and the Almaden Expressway road bridge would be extended to accommodate the track shift. The UPRR Luther spur track south of Almaden Expressway would also be relocated to accommodate the mainline track shifts. An HSR viaduct would cross over UPRR on straddle bents with a minimum vertical clearance of 23.4 feet between stations 304+00 and 309+00. A temporary platform would be installed at the Capitol Station south of the existing platform during construction of the straddle bents supporting the HSR tracks.

2.3.3.1.2.9 Land Use and Community Modifications

HSR would require acquisition of residential, commercial, industrial, and public (Monterey Road corridor) properties in this subsection to obtain adequate right-of-way for construction and operations.

2.3.3.1.3 Morgan Hill and Gilroy Subsection

2.3.3.1.3.1 Alignment and Ancillary Features

The Morgan Hill and Gilroy Subsection would be approximately 30 to 32 miles long, continuing south from the Monterey Corridor Subsection (Figure 2-5). From Bernal Way in South San Jose, the alignment would extend through Morgan Hill and San Martin to the Downtown Gilroy Station, then curve generally east across the Pajaro River floodplain and through a portion of northern San Benito County before entering Tunnel 1 at the base of the Diablo Range. The alignment would exit the tunnel at Casa de Fruta Parkway/SR 152 in unincorporated eastern Santa Clara County, where it would transition to the Pacheco Pass Subsection. This subsection under Alternative 1 would use the Viaduct to Downtown Gilroy design option and an aerial Downtown Gilroy Station.

Beginning at the southern limit of the Monterey Corridor Subsection, the alignment would be on viaduct in the median of Monterey Road. In this four-lane section of the road, the design assumes a combined left-turn and through lane to Palm Avenue. The alignment would begin curving east on viaduct (approximately 40 feet above grade) near Ogier Avenue in Santa Clara County. The northbound lanes of Monterey Road would be realigned at this transition to cross beneath the HSR viaduct between columns of the aerial structure.

After crossing the Coyote Valley on viaduct, the alignment would cross over Burnett Avenue in Morgan Hill and parallel U.S. Highway (US) 101 on the west side of the freeway. Continuing south, the alignment would bypass downtown Morgan Hill by crossing over Cochrane Road and associated freeway ramps, East Main Avenue, East Dunne Avenue and associated freeway ramps, and Tennant Avenue and associated freeway ramps.

South of Tennant Avenue and the Morgan Hill city limits, the alignment would turn west, relocating the cul-de-sac at Fisher Avenue to west of the guideway, then crossing over Maple Avenue, West Little Llagas Creek, East Middle Avenue, and Llagas Creek before rejoining

Monterey Road and the UPRR corridor in the community of San Martin. The crossing of Llagas Creek would allow for wildlife movement by clear spanning both banks and riparian habitat. New storm drainage infrastructure would be constructed on the west side of the alignment along Llagas Creek. The alignment would continue on viaduct along the east side of UPRR and cross over East San Martin Avenue.

South of Las Animas Avenue and the west branch of Llagas Creek, the alignment would curve east over Leavesley Road and Casey Lane. Continuing south, the viaduct would cross the Gilroy Prep School/South Valley Middle School sports field, a portion of the Gilroy Prep School campus, and Upper Miller Slough (with armor added to the channel to strengthen the stormwater conveyance) before crossing over Independent Order of Odd Fellows (IOOF) Avenue, Lewis Street, Martin Street, East 6th Street, and a realigned East 7th Street, to arrive at the Downtown Gilroy Station on low viaduct (approximately 33 feet high).

South of the Downtown Gilroy Station, the alignment would continue on viaduct over East 10th Street. Banes Lane would be reconstructed to provide a standard cul-de-sac. South of the Princevale Channel crossing, the alignment would ascend, still on viaduct, over Luchessa Avenue, US 101, and one UPRR spur track. After branching from the main UPRR track and crossing under the HSR viaduct, the new UPRR track for freight access to the MOWF would travel at grade on the east side of the new HSR track toward the South Gilroy MOWF site. Both the UPRR track and HSR tracks would cross the City of Gilroy wastewater disposal ponds. Continuing south, the HSR alignment would ascend onto embankment. New storm drainage infrastructure would be constructed on the west side of the alignment at Carnadero Avenue, which would be closed where it meets the alignment. Bloomfield Avenue would be realigned to cross over the South Gilroy MOWF site. Sheldon Avenue would become a cul-de-sac south of the HSR alignment and would be abandoned north of the HSR alignment. Before crossing the Pajaro River, the alignment would ascend onto viaduct.

The HSR alignment south and east of Gilroy would cross an agricultural area in Santa Clara and San Benito Counties that is part of the upper Pajaro River floodplain, historically referred to as Soap Lake. The HSR guideway would be on viaduct over the major watercourses to provide a floodplain crossing that is neutral to the hydrology and hydraulics of the floodplain and to accommodate wildlife movement. Because of the Calaveras fault crossing at this location, Tequesquita Slough would be partially filled by approximately 800 feet of HSR embankment. The embankment area would include cross-culverts and 1.3 acres of adjacent floodwater detention basins; in addition, an extended viaduct over Pacheco Creek would serve to maintain floodplain capacity and function. HSR would be on embankment between Pacheco Creek and Lovers Lane, returning to viaduct at Lovers Lane. After Lovers Lane, the alignment would continue in a combination of embankment and viaduct until reaching the west portal for Tunnel 1 on the east side of SR 152. After exiting the 1.4-mile Tunnel 1 on the west side of SR 152, the alignment would cross over SR 152 and the southern portion of the Pacheco Creek Valley on an aerial structure south of Casa de Fruta. The alignment would transition onto embankment just beyond Southside Way at the western transition to the Pacheco Pass Subsection.

2.3.3.1.3.2 Wildlife Crossings

Three wildlife crossings would be provided at the base of Tulare Hill north of the Metcalf Substation connecting to Coyote Creek. The existing culvert under Monterey Road at Fisher Creek would be realigned and replaced with a larger box culvert to improve wildlife movement under Monterey Road and the HSR track. The crossing of Llagas Creek would allow for wildlife movement by clear spanning both banks and riparian habitat. The alignment would be primarily on viaduct through the Soap Lake area to allow for wildlife movement. Viaducts have heights, widths, and depths considered to be very favorable for wildlife movement.

2.3.3.1.3.3 Stations

The Downtown Gilroy station Under Alternative 1 is estimated to have 6,210 boardings in 2040. The new HSR station would be constructed south of the existing Caltrain station (Figure 2-11). The station approach would be on a low viaduct—approximately 33 feet to top of rail—with dedicated HSR tracks east of UPRR between relocated Old Gilroy/7th Streets and 9th Street. The 800-foot platforms would be on the east and west sides of the HSR tracks. The new HSR station building would have both east and west entrances: the main entrance for passengers arriving by auto or bicycle would be on the east side while the main entrance for passengers arriving on foot or by transit would be on the west side. The HSR station building would encompass 60,513 square feet with a 4,400-square-foot substation and systems building. The concourse would be below the new HSR tracks.

The existing 471 Caltrain parking spaces on the west side of the station would be replaced 1:1 by either reconfiguring parking on the west side of the station or relocating it to the east side of the station. The existing 269 San Ysidro housing development parking spaces would be replaced 1:1 with new surface parking at the south end of Alexander Street. HSR 2040 parking demand would be 970 spaces. The station site plan provides 970 new parking spaces in five areas, for a total of 1,710 parking spaces in 2040. One site would be west of the station along Monterey Road at 9th Street. The other four would be east of the station along Alexander Avenue at 7th Street, 9th Street, 10th Street, and Banes Lane. A multimodal access plan would be developed prior to design and construction of the station. The plan would be developed in coordination with local agencies and would include a parking strategy that would confirm the location, amount, and phasing of parking.

A total of eight bus bays would be provided. Street improvements would include realignment of Old Gilroy Street at East 7th Street; existing grade crossings would remain unchanged. A 4,000-square-foot bicycle facility would be built. Class II bike lanes would be provided on 7th and Alexander Streets.

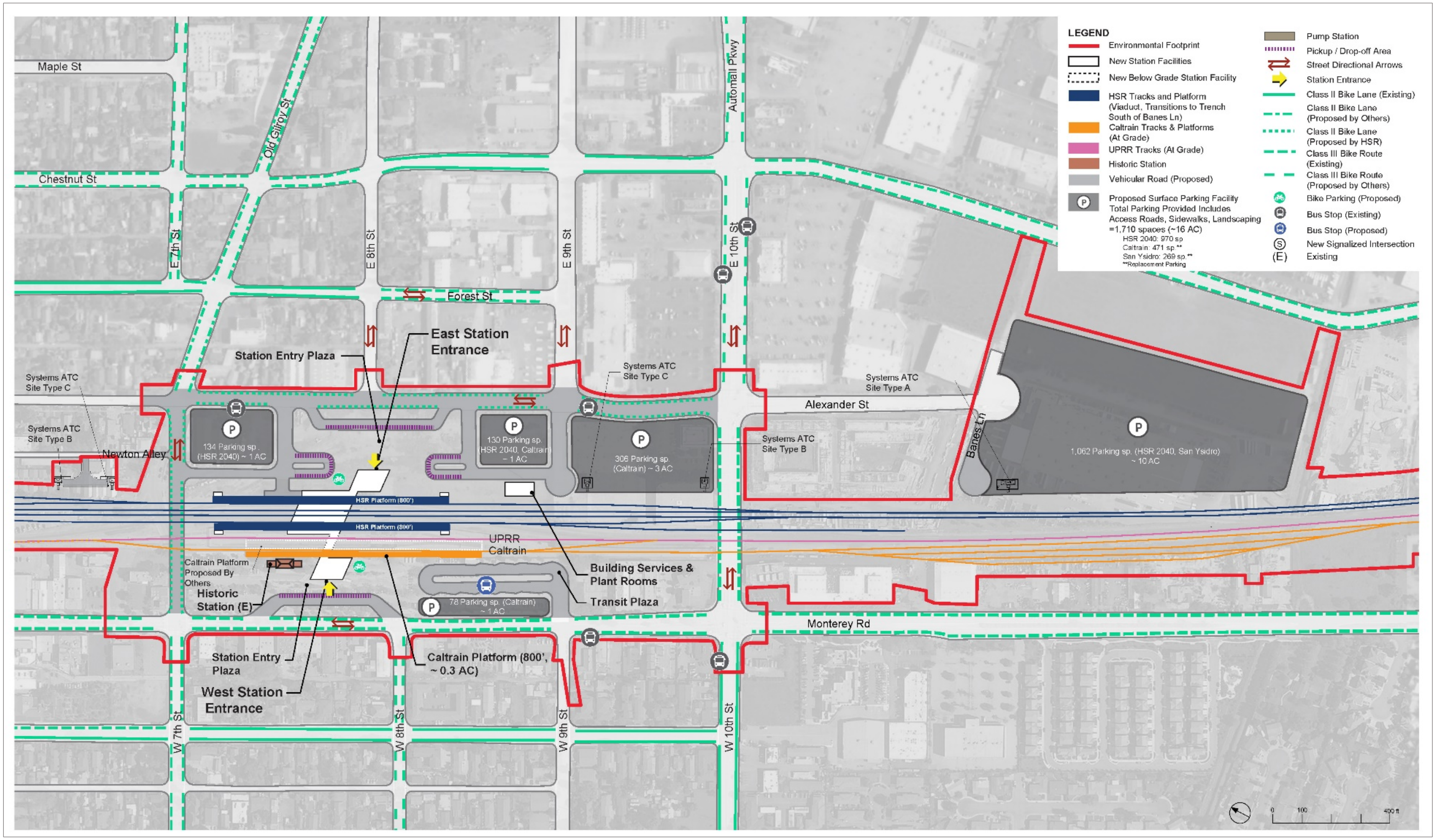
2.3.3.1.3.4 Traction Power Facilities

One new TPSS, Site 4—Gilroy, would be constructed at one of two alternate locations on the north side of the alignment: east or west of Bloomfield Avenue. At this site, one new PG&E switching station could be co-located with the TPSS. Communication facilities (i.e., redundant fiber optic [two underground or one underground and one overhead on existing power structures] lines) would also be required to support the electrical interconnections connecting the TPSS to a new utility switching station, to existing PG&E facilities, or both, typically within tie-line/utility corridors.

North of Site 4—Gilroy, a traction power switching station would be constructed east of the HSR alignment at a location north of Palm Avenue.

Four traction power paralleling stations would be constructed adjacent to the guideway at the following locations:

- south of the alignment, either south of Diana Avenue or at the intersection of San Pedro Avenue and Walnut Grove Drive;
- north of the alignment, either south of Masten Avenue or south of Rucker Avenue;
- in the vicinity of Lovers Lane, either south of the alignment and west of Lovers Lane or north of the alignment and west of Lovers Lane; and
- at the Tunnel 1 east portal.



Source: Authority 2020a

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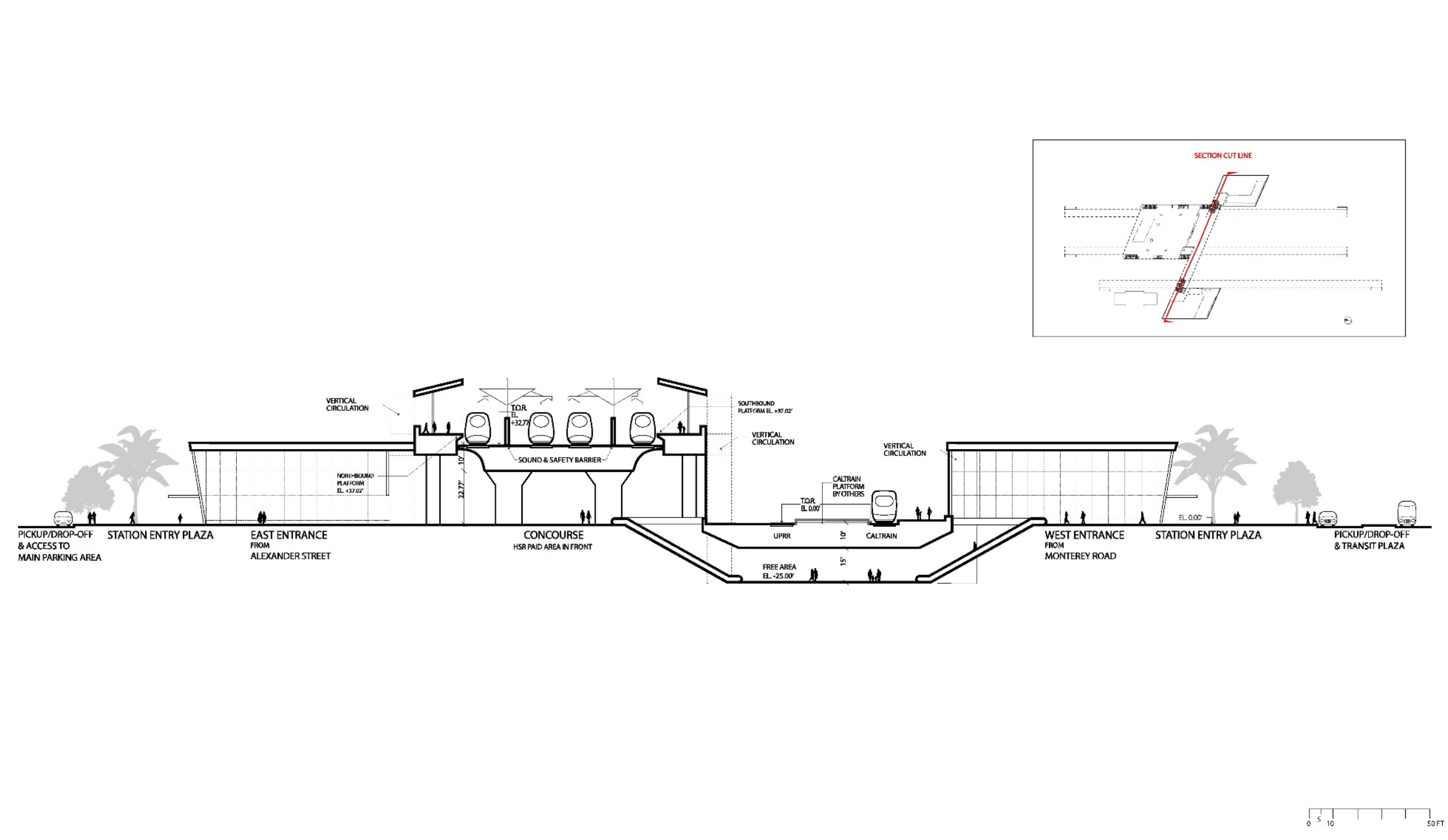
Figure 2-11 Conceptual Downtown Gilroy Station Plan (Viaduct)



Source: Authority 2020a

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Figure 2-12 Cross Section of Downtown Gilroy Station (Viaduct)

PG&E would reinforce the electric power distribution network to meet HSR traction and distribution power requirements by replacing (reconductoring) the 9.8-mile Metcalf to Morgan Hill and the 10.8-mile Morgan Hill to Llagas 115-kV power lines. The existing power lines to be reconductored, reusing the poles and towers, begin at the Metcalf Energy Center in San Jose and continue southeast parallel to the alignment on the east side before crossing to the west side near Ogier Avenue. Continuing on the west side to the Morgan Hill Substation on West Main Avenue in Morgan Hill, the lines then cross the east side of Peak Avenue and Dewitt Avenue, spanning West Dunne Avenue, Chargin Drive, Spring Avenue, and several residences. The alignment would continue south across an open space area, then follow Sunnyside Avenue for approximately 0.5 mile. The alignment would continue south for approximately 4 miles, spanning additional open space areas of wineries and the Corde Valle Golf Course. The alignment would then turn east along the north side of Day Road before heading south for approximately 2.5 miles and terminating at the Llagas Substation in Gilroy. Reconductoring at Metcalf Energy Center in San Jose would be required as well.

A permanent overhead distribution line from TPSS Site 4 to the Tunnel 1 portal location would provide power to the tunnel boring machine during construction and the tunnel fire-life-safety system during operation.

There are alternative sites for power drops at both portals for Tunnel 1. At each portal, one site is north of the alignment and one is south.

2.3.3.1.3.5 Train Control and Communication Facilities

A total of 20 ATC sites would be constructed in the Morgan Hill and Gilroy Subsection for this alternative:

- one site east of Monterey Road near Palm Avenue (two site options),
- one site at East Middle Avenue (two site options),
- one site between Las Animas Avenue and Leavesley Road,
- one site south of Leavesley Road,
- one site south of Lewis Street,
- one site north of 6th Street in Gilroy,
- two sites south of 6th Street in Gilroy,
- two sites north of 10th Street in Gilroy,
- one site south of Banes Lane,
- five sites north of Carnadero Avenue,
- three sites east of the Pajaro River, and
- one site near Lake Road (two site options).

Six standalone communication radio sites would be constructed in this subsection:

- Forsum Road or Blanchard Road (two site options);
- Near Bailey Avenue (two site options);
- Between Barnhart Avenue and Kirby Avenue (two site options);
- South of Cochrane Road along US 101 (two site options);
- North of Cox Avenue and south of West San Martin Avenue (two site options); and
- East of the Pajaro River, south of Gilroy.

2.3.3.1.3.6 Maintenance Facilities

The MOWF under Alternative 1 would be in south Gilroy between Carnadero Road and Bloomfield Road to accommodate machinery and inspection and maintenance staff. The MOWF would encompass approximately 75 acres. The freight connection would be provided as described in the discussion of the alignment and ancillary features. Most of the area would be for storage of rail vehicles on tracks parallel to the HSR mainline. The MOWF would be expected to employ approximately 150 people. Figure 2-13 illustrates the conceptual site plan for the MOWF.

2.3.3.1.3.7 State Highway or Local Roadway Modifications

Local road modifications would be necessary in this subsection.

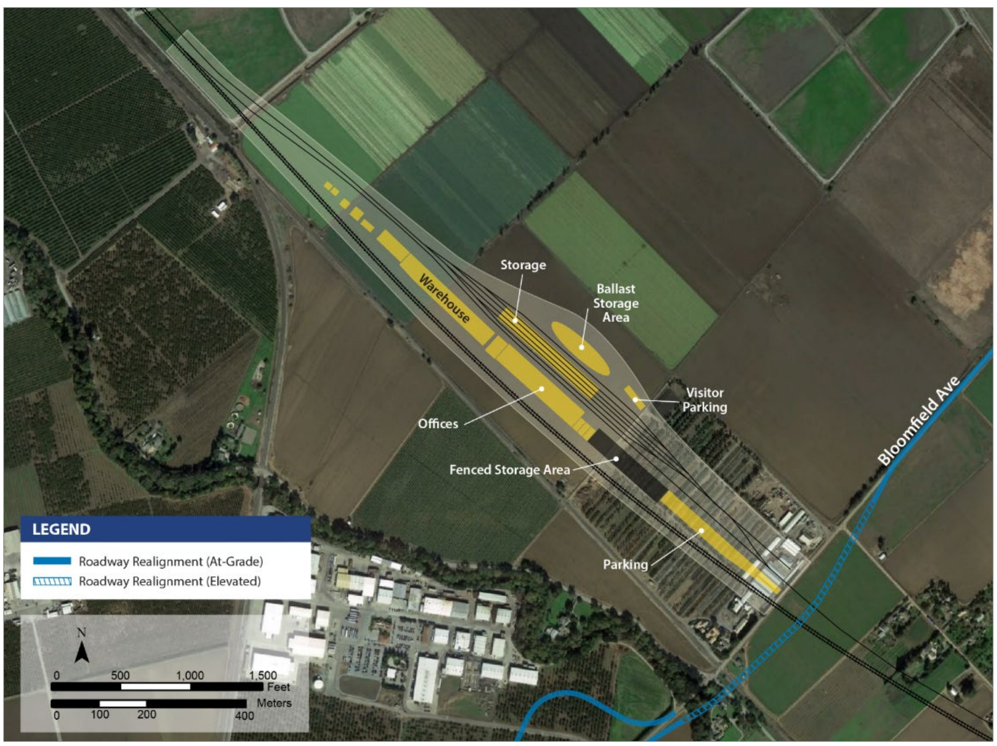
2.3.3.1.3.8 Freight or Passenger Rail Modifications

Construction in this subsection would require temporary use of areas of UPRR right-of-way for construction staging. Permanent modifications would occur at the following locations:

- south of North Avenue to South Street, UPRR right-of-way would be on either side of the HSR right-of-way, with the UPRR tracks to the south of HSR;
- south of Highland Avenue to Day Road, slivers of UPRR right-of-way would be required;
- south of Lewis Street through the downtown Gilroy station to 10th Street, UPRR right-of-way would be required for track realignment and station construction;
- from 6th Street to US 101;
- south of US 101 for a shifted UPRR siding track; and
- freight connection from UPRR to the MOWF.

2.3.3.1.3.9 Land Use and Community Modifications

Alternative 1 would require acquisition of residential, commercial, industrial, and park and recreation properties to obtain adequate right-of-way for construction and operations.



Source: Authority 2020a DRAFT JUNE 2019

Figure 2-13 South Gilroy Maintenance of Way Facility for Alternatives 1 and 2

2.3.3.2 Alternative 2

Alternative 2 is the alternative that most closely approximates the alignment and structure types identified in the prior program-level documents, implemented by limiting longitudinal encroachment into the UPRR right-of-way to combine railroad grade separations with minimum property displacements. The alignment most closely follows the existing UPRR and Monterey Road transportation corridor. The San Jose Diridon Station Approach Subsection under Alternative 2 would use a longer viaduct, ascending to aerial structure near Scott Boulevard rather than ascending to aerial structure south of I-880. A result of the longer viaduct is that blended service with Caltrain would occur north of Scott Boulevard. The alignment would be at grade through the Monterey Corridor Subsection and through Morgan Hill, and on embankment on approach and through Gilroy, maintaining a lower profile than the viaduct structures under Alternatives 1 and 3 through these areas.

Alternative 2 would operate on a dedicated viaduct from Scott Boulevard through the San Jose Diridon Station Approach Subsection. The alternative would be predominantly at grade east of the UPRR alignment through the Monterey Corridor Subsection, continuing at grade east of UPRR through Morgan Hill to an embankment approach to the downtown Gilroy station through the Morgan Hill and Gilroy Subsection. Like Alternative 1, Alternative 2 would include a South Gilroy MOWF, continuing predominantly on viaduct and embankment across the Soap Lake floodplain before entering Tunnel 1 west of Casa De Fruta. The alignment and guideway in the Pacheco Pass and San Joaquin Valley Subsections would be the same as under Alternative 1.

Overall, this alternative would be comprised of 20.9 miles on viaduct, 8.5 miles at grade, 41.0 miles on embankment, two tunnels totaling 15.0 miles, and 3.2 miles in trench.

2.3.3.2.1 San Jose Diridon Station Approach Subsection

2.3.3.2.1.1 Alignment and Ancillary Features

Alternative 2 would begin at Scott Boulevard at grade in blended service with Caltrain. Approximately 300 feet south of Scott Boulevard, the HSR tracks would separate from the Caltrain tracks and begin ascending to embankment and then to the 50-foot-tall dedicated viaduct at Main Street. The long viaduct under Alternative 2 would have a wider footprint than the short viaduct to I-880 under Alternative 1, requiring more curve straightening of the Caltrain tracks north of I-880. At the Lafayette Street crossing, the project would replace the existing pedestrian overpass with an underpass. The existing De La Cruz Boulevard overcrossing would be replaced with an undercrossing to enable the HSR aerial structure to cross 43 feet high over De La Cruz Boulevard, the relocated UPRR MT1 and two industry tracks, and the Caltrain Santa Clara Station. The Santa Clara Station northbound platform would be reconstructed to accommodate the supports for the HSR aerial structure. South of Santa Clara Station, the three relocated UPRR tracks would cross under the HSR viaduct so that all Caltrain and UPRR tracks would be west of the HSR viaduct. The viaduct would then ascend to approximately 68 feet to cross over I-880.

Farther south, the existing West Hedding Street roadway overcrossing would be replaced by an undercrossing under the rail corridor. A short section of retained fill would be used to support the tracks over the future BART to San Jose tunnel. The intersection of Stockton Avenue and University Avenue would be replaced by cul-de-sacs. Emory Street would be a new cul-de-sac on the north side of HSR. The curve from westbound West Taylor Street to northbound Chestnut Street would be realigned for the HSR crossing over West Taylor Street; the alignment would then ascend to cross over Cinnabar Street. The UPRR Warm Springs Subdivision Lenzen Wye would be relocated to the southwest. North Montgomery Street would be extended to Cinnabar Street to maintain property access beneath the 68-foot-high HSR viaduct. The alignment would curve west toward the UPRR/Caltrain MTs before crossing over the western part of the SAP Center parking lot, then over West Santa Clara Street to enter the new dedicated HSR aerial platforms at the San Jose Diridon Station. Between San Jose Diridon Station and the transition to the Monterey Corridor Subsection at West Alma Avenue, Alternative 2 would be identical to Alternative 1.

2.3.3.2.1.2 Wildlife Crossings

There would be no wildlife crossings in this subsection.

2.3.3.2.1.3 Stations

The HSR San Jose Diridon Station would be constructed as described for Alternative 1.

2.3.3.2.1.4 Traction Power Facilities

One new TPSS would be constructed on the east side of the Caltrain corridor as described for Alternative 1 on the south side of I-880.

2.3.3.2.1.5 Train Control and Communication Facilities

Alternative 2 would have six ATC sites within this subsection:

- one site at Scott Boulevard,
- one site at Main Street, and
- one site just north of the San Jose Diridon Station.

South of San Jose Diridon Station, the ATC sites would be the same as under Alternative 1: three sites between Park Avenue and the proposed HSR crossing of SR 87.

No standalone communications radio sites would be located within this subsection.

2.3.3.2.1.6 Maintenance Facilities

No maintenance facilities are proposed for this subsection.

2.3.3.2.1.7 State Highway or Local Roadway Modifications

Local roadway modifications would be required in this subsection.

2.3.3.2.1.8 Freight or Passenger Rail Modifications

Two new bridges would be constructed over UPRR and Caltrain at De La Cruz. Caltrain would be relocated between south of Scott Boulevard and I-880. The UPRR tracks would be relocated south of De La Cruz to pass around the east side of the new Santa Clara Station northbound platform and would connect to the existing tracks south of I-880. Like Alternative 1, Alternative 2 would shift the freight tracks at the Lenzen Wye; however, the curves would be different. South of San Jose Diridon Station, Alternatives 1 and 2 would be the same.

2.3.3.2.1.9 Land Use and Community Modifications

The HSR facilities in this subsection would be constructed predominantly in the existing Caltrain right-of-way. Like Alternative 1, the HSR alignment would diverge from the Caltrain right-of-way just south of the San Jose Diridon Station along a southeast alignment over the I-280/SR 87 interchange before returning to the Caltrain right-of-way just north of the Tamien Caltrain Station. This alternative would require modifications of some intersections and acquisition of additional TCEs and permanent acquisition of right-of-way in some areas along the alignment.

2.3.3.2.2 Monterey Corridor Subsection

2.3.3.2.2.1 Alignment and Ancillary Features

The Monterey Corridor Subsection is approximately 9 miles long and entirely within the San Jose city limits. Between West Alma Avenue and the northern base of Communications Hill, Alternative 2 would be the same as Alternatives 1 and 3. However, Alternative 2 would begin the viaduct transition to the Monterey Road/UPRR corridor approximately 400 feet north of the transition under Alternatives 1 and 3 but would be primarily at grade or on embankment upon entering the road/rail corridor. Alterations of existing railroad track and systems between West Alma Avenue and CP Lick (near the east base of Communications Hill) would be the same as under Alternatives 1 and 3 except for a new, continuous intrusion barrier between the existing UPRR tracks and HSR tracks.

From West Alma Avenue, the HSR alignment would descend from a viaduct 54 feet above grade to embankment north of Almaden Road. The alignment would continue primarily on embankment on the west side of the Caltrain/UPRR tracks, crossing over Almaden Road on a short aerial structure, then proceeding at grade under West Almaden Expressway and Curtner Avenue. South of Curtner Avenue, the alignment would continue south at grade along the west side of the Caltrain/UPRR tracks around the northern base of Communications Hill, ascending to aerial structure before crossing over and entering the Monterey Road/UPRR corridor just south of Hillsdale Avenue. On the approach to Monterey Road, the aerial structure would cross over the UPRR tracks and the Caltrain Capitol Station while curving southeast to return to grade within the road/rail corridor northwest of the Capitol Expressway. Monterey Road would be realigned to the east, while HSR would run along the east side of UPRR. South of Fehren Drive, Monterey Road would be reduced from six to four lanes. Continuing south, the alignment would descend into a trench beneath a widened Capitol Expressway bridge before ascending to grade at Skyway Drive. Under Skyway Drive Variant A, Monterey Road would retain its current at-grade configuration, and a new connector ramp at the north corner of the intersection of Skyway Drive and Monterey Road would connect Monterey Road to the depressed Skyway Drive underpass. San Jose Fire Station #18 would have access along the connector ramp. Skyway Drive Variant B would depress Monterey Road to connect to the Skyway Drive underpass. Under this variant, access to the mobile home park north of the intersection of Skyway Drive and Monterey Road would be provided by an access road across the northern portion of the San Jose South Service Yard property. Variant B would not provide access to the fire station.

Continuing south, the HSR alignment would be at grade or on embankment between Monterey Road and UPRR for the remainder of the subsection. Branham Lane and Roeder Road/Chynoweth Avenue would be lowered to be separated from the HSR and existing railroad crossings. Because of the new grade difference between Branham Lane and Roeder Road/Chynoweth, access to Rice Way and four driveways from Monterey Road would be closed. A new Branham Lane pedestrian bridge would span the combined railroad and Monterey Road corridor. The westbound Blossom Hill Road ramp at Monterey Road would be shifted to the east side of Monterey Road. A new pedestrian bridge would be built to maintain connectivity between Ford Road and the Caltrain Blossom Hill Station. The alignment would continue south at grade under SR 85/West Valley Freeway, with modifications to the existing highway bridge to allow HSR to pass underneath. The alignment would then cross under Bernal Road before transitioning to the Morgan Hill and Gilroy Subsection at Bernal Way.

Like the other alternatives, the design assumes a reduction from six to four travel lanes on Monterey Road, beginning north of Capitol Expressway and continuing south to Blossom Hill Road; south of Blossom Hill Road the existing roadway is already four travel lanes. Under Alternative 2, one left turn lane would be removed south of Senter Street and one left turn lane would be removed south of Roeder where Monterey Road would be depressed and grade-separated from adjacent properties. Existing mid-block left-turn lanes would be closed because of substandard stopping sight distance. Alternative 2 (and Alternative 4) differs from Alternatives 1 and 3 by shifting all Monterey Road travel lanes and median east of their current locations.

2.3.3.2.2.2 Wildlife Crossings

There would be no wildlife crossings in this subsection.

2.3.3.2.2.3 Stations

No HSR stations are proposed for this subsection.

2.3.3.2.2.4 Traction Power Facilities

In the Monterey Corridor Subsection, TPSSs would be located in the same area for Alternatives 1, 2, and 3. Traction power paralleling stations would be constructed at the following locations:

- either the north side of the alignment near Curtner Avenue or the south side of the alignment at Communications Hill (same as Alternative 1), and
- either the south side of SR 85 or between Bernal Road and the Bernal Road ramp onto Monterey Road.

2.3.3.2.2.5 Train Control and Communication Facilities

Train control facilities and communication facilities under Alternative 2 would be as described for Alternative 1.

2.3.3.2.2.6 Maintenance Facilities

No maintenance facilities are proposed for this subsection.

2.3.3.2.2.7 State Highway or Local Roadway Modifications

Local roadway modifications would be necessary in this subsection.

2.3.3.2.2.8 Maintenance Facilities

Construction in this subsection would require temporary use of UPRR right-of-way for construction staging. Alternative 2 would be the same as Alternative 1 between West Alma Avenue and Communications Hill, and also at the Capitol Station. Permanent modifications would occur at the following locations:

- **Daylight Way**—Sliver of UPRR right-of-way required;
- **South of Daylight Way**—This area is needed to transition from HSR running on the west of the UPRR alignment to curve over UPRR right-of-way and transition to running along Monterey Road on the east side of UPRR alignment;
- **Fehren Drive to Capitol Expressway**—HSR alignment would be constructed on straddle bents to pass over UPRR;
- **New rail bridge**—New bridge over new grade separations (Skyway Drive, Branham Lane, Chynoweth Avenue); and
- **New pedestrian overcrossing**—New overcrossing at Blossom Hill Station.

2.3.3.2.2.9 Land Use and Community Modifications

This alternative would require acquisition of residential, commercial, and industrial properties in this subsection to obtain adequate right-of-way for construction and operations.

2.3.3.2.3 Morgan Hill and Gilroy Subsection

2.3.3.2.3.1 Alignment and Ancillary Features

The Morgan Hill and Gilroy Subsection under Alternative 2 would be approximately 31 miles long, continuing south from the Monterey Corridor Subsection. From Bernal Way in South San Jose, the alignment would extend through Morgan Hill and San Martin to the Downtown Gilroy Station, then curve generally east across the Pajaro River floodplain and through a portion of northern San Benito County before entering Tunnel 1 at the base of the Diablo Range. The alignment would exit the tunnel at Casa de Fruta Parkway/SR 152 in unincorporated eastern Santa Clara County, and then transition to the Pacheco Pass Subsection (Figure 2-9).

From the southern limit of the Monterey Corridor Subsection, Alternative 2 would be at grade on retained fill between the UPRR right-of-way and Monterey Road in South San Jose. Because of the guideway's proximity to UPRR, a 3-foot-thick continuous intrusion barrier would be constructed between the HSR and UPRR tracks. In contrast to the other alternatives, Alternative 2 would require construction of new roadway grade separations to maintain east-west connectivity across Monterey Road. Before turning south near Kittery Court, the two UPRR tracks would be realigned to the west to accommodate the alignment curvature required for HSR operations before returning to the existing alignment adjacent to the south side of the Calpine Metcalf Energy Center. The existing Fisher Creek culvert would be improved with a new culvert installed beneath the new HSR alignment, realigned Monterey Road, and UPRR. The creek crossing would be improved to provide a suitable wildlife crossing. The Blanchard Road grade crossing would be closed.

As the UPRR and Monterey Road rights-of-way converge to the south approaching Bailey Avenue, the four-lane Monterey Road would be realigned eastward to accommodate the HSR alignment at grade between the railroad and roadway. The existing Bailey Avenue bridge would remain in place and HSR would cross beneath the road. The alignment would continue south, ascending onto embankment, crossing beneath a new Palm Avenue bridge and a new Live Oak Avenue bridge (which would also cross over UPRR, eliminating both existing at-grade crossings). Tilton Avenue would become a cul-de-sac. Madrone Parkway would be lowered to allow HSR and UPRR to cross over the roadway. At Cochrane Road, the realigned Monterey Road would converge with the existing roadway alignment.

South along the UPRR alignment through Morgan Hill, a new culvert would be placed in the HSR embankment for Fisher Creek. The alignment would then cross over Monterey Road on a clear-span bridge. Continuing south on embankment along the east side of UPRR, the HSR and UPRR alignments would cross over Main, East/West Dunne, San Pedro, and Tennant Avenues on short bridges over the roadways, which would be lowered 17 to 30 feet below grade to maintain east-west connections. A new pedestrian underpass would be provided to maintain access from east of the HSR corridor to the Morgan Hill Caltrain Station. Railroad Avenue would be closed between San Pedro Avenue and Barrett Avenue and relocated eastward between Barrett Avenue and Maple Avenue to accommodate the HSR alignment adjacent to UPRR. The existing bridge at Butterfield Boulevard would be extended to cross over the realigned Railroad Avenue and at-grade HSR alignment. The Butterfield canal would be relocated to the east to accommodate the HSR alignment adjacent to UPRR.

Continuing south, the alignment would ascend onto embankment, and West Little Llagas Creek would flow through a new culvert. The existing East Middle Avenue would become cul-de-sacs on both sides of the alignment. A new alignment of East Middle Avenue would be built to the south, where it would cross over the HSR tracks and Monterey Road on a bridge. Monterey Road and UPRR would be realigned westward between East Middle Avenue and Roosevelt Avenue to accommodate the southward alignment curvature required for HSR operations. The realigned roadway, UPRR, and the new HSR alignment would cross Llagas Creek on new clear-span bridges. South of Llagas Creek, Monterey Road would return to the existing alignment near Roosevelt Avenue.

San Martin Avenue would be realigned between Murphy and Harding Avenues to connect to Oak Street at Llagas Avenue (north of the HSR alignment) in San Martin. HSR would cross over San Martin Avenue and Oak Street, which would be below grade. A pedestrian path under the HSR embankment would be provided south to San Martin Avenue. Depot Street, UPRR, and Monterey Road, which parallel the HSR tracks at Oak Street, would cross the newly depressed San Martin (formerly Oak) Street on bridges supported by retained fill. HSR would continue south at grade adjacent to the east side of UPRR. Church Avenue would be raised onto a bridge over both HSR and UPRR. Fitzgerald and Masten Avenues would be realigned to the south and would be depressed beneath Monterey Road, UPRR, and HSR. Similarly, Rucker Avenue and Buena Vista Avenue would be depressed beneath Monterey Road, UPRR, and HSR. Both Cohansey Avenue and Las Animas Avenue would remain at grade, with bridges for HSR and UPRR to cross over the existing streets.

Continuing south into Gilroy, the alignment would shift east for the approach to the Downtown Gilroy Station. The existing culvert for the West Branch of Llagas Creek would be extended to the east to accommodate the rail alignment shift. HSR and UPRR would be on embankment (approximately 15–25 feet high) and cross over Leavesley Road, Casey Street, IOOF Avenue, Lewis Street, East 6th Street, and the realigned East 7th Street/Old Gilroy on bridges before arriving at the Downtown Gilroy Station embankment (approximately 16 feet high). Each of these streets would be lowered approximately 20 feet beneath existing grade, and a pedestrian underpass would replace Martin Street across the rail alignment. Miller Slough would be realigned eastward in a new culvert beneath the railroad alignment. HSR and UPRR would continue on embankment and cross over East 9th Street and East 10th Street.

The HSR alignment would continue on embankment south from the Downtown Gilroy Station to the Princevale Channel, then descend into a trench under Luchessa Avenue and US 101 where existing bridges would be demolished and reconstructed to accommodate the freeway undercrossing and two UPRR spur tracks. Just south of the US 101 overcrossing, a freight connection would be made from UPRR on the south side of HSR, crossing over the HSR trench to connect to the Gilroy MOWF on the north side of HSR. Two UPRR spur tracks would be realigned to connect to the MOWF freight track north of HSR.

The remainder of this subsection—to Casa de Fruta—would be the same as under Alternative 1.

2.3.3.2.3.2 Wildlife Crossings

Three adjacent box culverts would be installed to provide wildlife with a connection between Tulare Hill and Coyote Creek south of Metcalf Road. The box culverts under Monterey Road and UPRR would be replaced with larger box culverts at Fisher Creek. HSR would also be on a box culvert over Fisher Creek. These three box culverts would have larger openings than existing culverts to improve wildlife movement. There would be seven additional crossings at Emado Avenue, Laguna Avenue, Richmond Avenue, Fox Lane, Paquita Espana Court, south of Palm Avenue, and south of Live Oak Avenue.

2.3.3.2.3.3 Stations

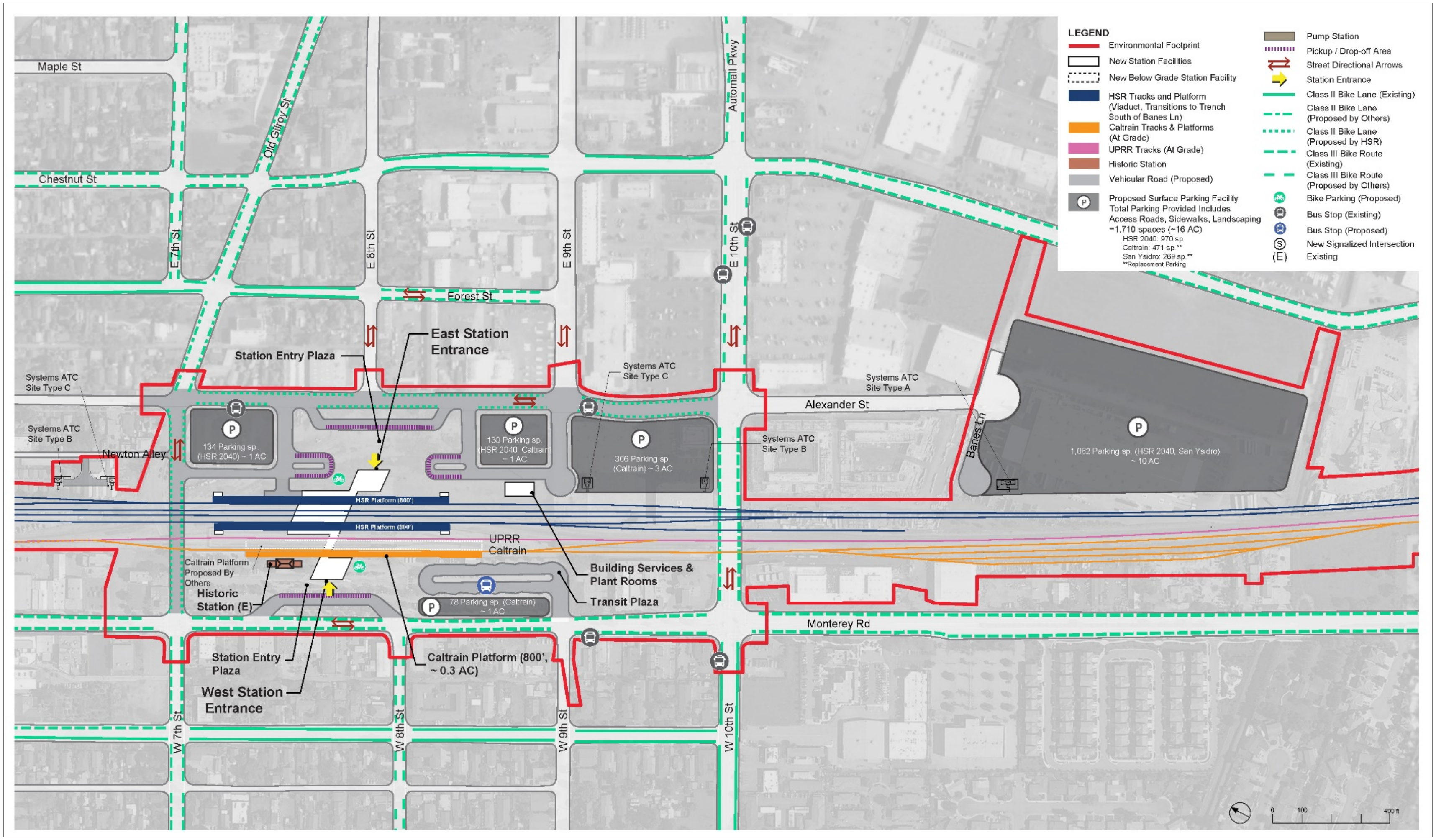
The Downtown Gilroy Station under Alternative 2 is estimated to have approximately 6,210 boardings in 2040. The station layout and configuration would be similar to those described for Alternative 1, except that UPRR and Caltrain would be elevated to the same height as HSR on the embankment. The station approach would be on embankment approximately 15 feet to top of rail, with dedicated HSR tracks to the east of UPRR between relocated Old Gilroy Street/7th Street and 9th Street. The 800-foot platforms would be on the Caltrain side of the tracks. A new HSR station would be constructed south of the existing Caltrain station. The new HSR station building would have both east and west side entrances: the main entrance for passengers arriving by auto or bicycle would be on the east side, while the main entrance for passengers arriving on foot or by transit would be on the west side. The HSR station building would encompass 64,913 square feet with a 4,400-square-foot substation and systems building. The concourse would be below raised UPRR and Caltrain tracks.

As under Alternative 1, the existing 471 Caltrain parking spaces on the west side of the station would be replaced 1:1 by either reconfiguring parking on the west side of the station or relocating it to the east side of the station. The existing 269 San Ysidro housing development parking spaces would be replaced 1:1 with new surface parking along Automall Parkway with access from the south end of Alexander Street. HSR would provide an additional 970 spaces in 2040, for a total of 1,710 parking spaces in 2040 (including existing demand). The station site plan provides 970 new parking spaces in five areas. One site would be west of the station along Monterey Road at 9th Street. The other four would be on the east side of the station along Alexander Street at Old Gilroy Street, 9th Street, 10th Street, and Banes Lane. A multimodal access plan would be developed prior to design and construction of the station. The plan would be developed in coordination with local agencies and would include a parking strategy that would confirm the location, amount, and phasing of parking.

A total of eight bus bays would be provided. Street improvements would include realignment of Old Gilroy Street at East 7th Street; existing grade crossings would remain unchanged. A 4,000-square-foot bicycle facility would be built. Class II bike lanes would be provided on 7th, Alexander, and 10th Streets. Figure 2-14 and Figure 2-15 illustrate the conceptual on-embankment downtown Gilroy station.

2.3.3.2.3.4 Traction Power Facilities

As under Alternative 1, one new TPSS, Site 4—Gilroy, would be constructed at one of two alternate sites on the north side of the alignment: east or west of Bloomfield Avenue. At this location, one new utility switching station would be co-located with the TPSS. Communication facilities (i.e., redundant fiber optic lines) would also be required to support the electrical interconnection of the TPSS to a new utility switching station, to existing PG&E facilities, or both—typically within tie-line/utility corridors. Site 4—Gilroy would connect to the Llagas PG&E substation via existing and proposed transmission or distribution lines along SR 152, Frazier Lake Road, and Bloomfield Avenue. Fiber optic and high-voltage lines would be reconductored overhead on existing towers where available. Where no overhead connections exist, both fiber optic and high-voltage lines would be undergrounded within or adjacent to the public right-of-way.



Source: Authority 2020a

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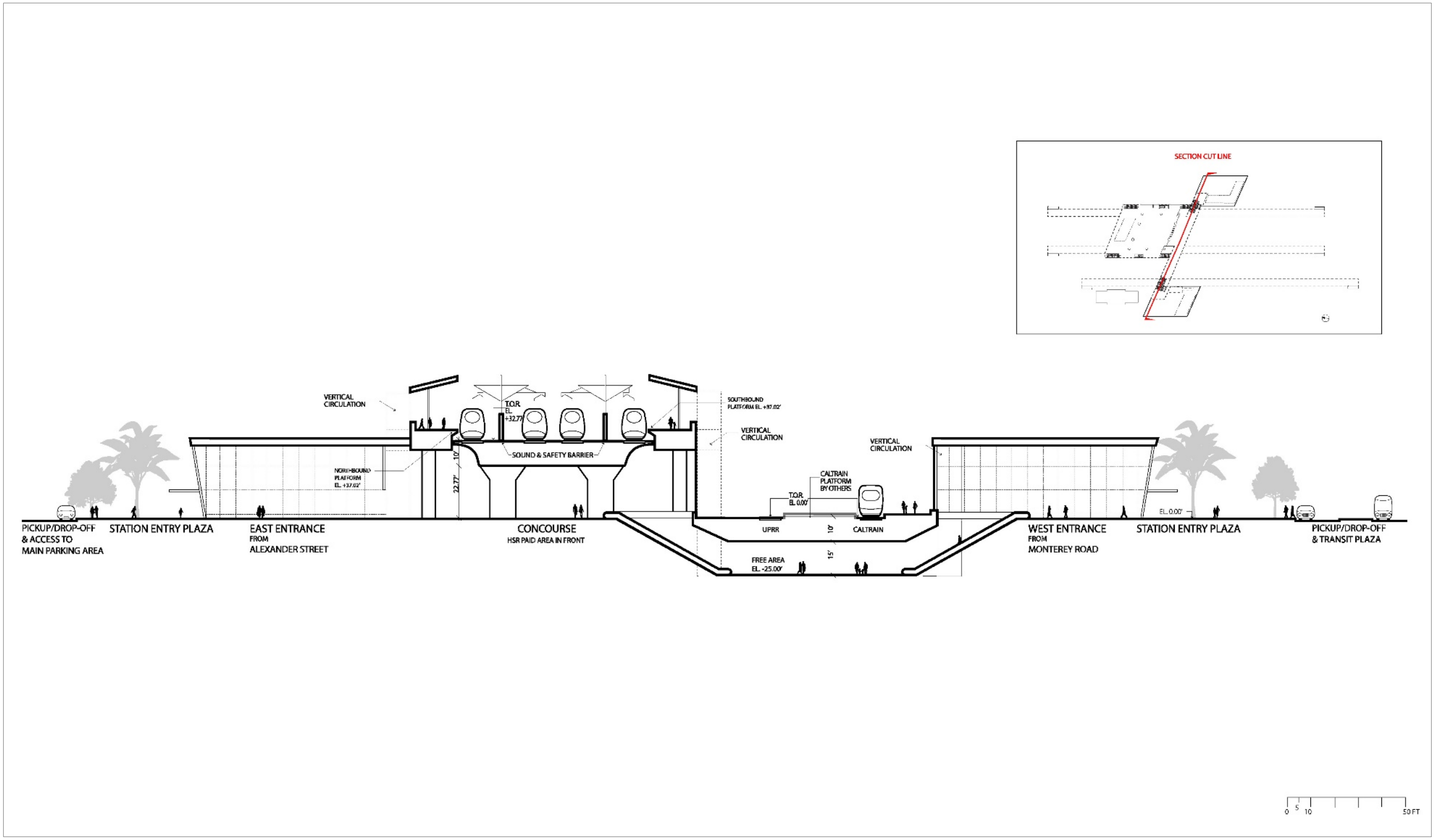
Figure 2-14 Conceptual Downtown Gilroy Station Plan (Embankment Option)



Source: Authority 2020a

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Figure 2-15 Cross Section of Downtown Gilroy Station (Embankment Option)

A traction power switching station would be constructed east of the HSR alignment at a location north of Paquita Espana Court or north of Palm Avenue. Two traction power paralleling stations would be constructed at the following locations:

- either the east side of the alignment between East Dunne and San Pedro Avenues or south of San Pedro Avenue; and
- east of the alignment, either north or south of a new Masten Avenue/Fitzgerald Avenue in-trench alignment.

South of US 101, Alternative 2 would have the same two switching stations as Alternative 1:

- either south of the alignment and west of Lovers Lane or north of the alignment and west of Lovers Lane; and
- in the vicinity of the Tunnel 1 east portal, either at the portal or east of SR 152 in the southern area of Casa de Fruta.

PG&E would reinforce the electric power distribution network to meet HSR traction and distribution power requirements by reconductoring the approximately 9.8-mile Metcalf to Morgan Hill and 10.6-mile Morgan Hill to Llagas 115-kV power lines. These PG&E transmission network upgrades described under Alternative 1 would also be necessary under Alternative 2.

2.3.3.2.3.5 Train Control and Communication Facilities

A total of 20 ATC sites would be constructed in the Morgan Hill and Gilroy Subsection for this alternative, three of which would be the same as those under Alternative 1:

- one site east of Monterey Road north of Palm Avenue (two site options),
- one site north of East Middle Avenue (two site options),
- one site between Las Animas Avenue and Leavesley Road,
- one site south of Leavesley Road,
- one site south of Lewis Street,
- one site north of 6th Street in Gilroy,
- two sites south of 6th Street in Gilroy,
- two sites between 9th and 10th Streets in Gilroy,
- one site south of Banes Lane,
- five sites north of Carnadero Avenue (same as Alternative 1),
- three sites east of the Pajaro River (same as Alternative 1), and
- one site near Lake Road (two site options—same as Alternative 1).

A total of six standalone communication radio sites would be constructed in this subsection at the following locations, one of which would be the same as under Alternative 1:

- between Forsum Road and Blanchard Road (two site options),
- near Bailey Avenue (two site options),
- near Kirby Avenue (two site options),
- west of the intersection of Cochrane Road and Monterey Road (two site options),
- near South Street (two site options), and
- east of the Pajaro River south of Gilroy (same as Alternative 1).

2.3.3.2.3.6 Maintenance Facilities

The South Gilroy MOWF under Alternative 2 would be constructed along the HSR alignment near Carnadero Avenue as described for Alternative 1 and illustrated on Figure 2-13. The freight connection would be provided as described above.

2.3.3.2.3.7 State Highway or Local Roadway Modifications

Local road modifications would be necessary in this subsection.

2.3.3.2.3.8 Freight or Passenger Rail Modifications

Construction in this subsection would require temporary use of areas of UPRR right-of-way for construction staging. Permanent modifications would occur at the following locations:

- for new road or rail bridges at all new grade separations;
- Felice Court to Blanchard Road to allow for shifting UPRR tracks west;
- south of Blanchard Road—a sliver of UPRR right-of-way required for embankment construction;
- north of Campoli Drive;
- East Third Street to south of Diana Avenue—right-of-way required;
- Pollard Avenue to San Martin Avenue—permanent right-of-way acquisition for relocation of UPRR;
- North Street to South Street—right-of-way required for HSR construction;
- south of grade-separated Fitzgerald Avenue/Masten Avenue—a sliver of right-of-way required;
- north of Denio Avenue to Lewis Street for shifting of UPRR track east;
- East 6th Street to Luchessa—right-of-way required for construction of the Downtown Gilroy Station and approach from the north; and
- south of US 101 to allow for two relocated spur tracks, a shifted siding track with new UPRR right-of-way, and a new freight connection to the MOWF.

2.3.3.2.3.9 Land Use and Community Modifications

Alternative 2 would require acquisition of residential, commercial, and industrial properties in this subsection to obtain adequate right-of-way for construction and operations.

2.3.3.3 Alternative 3

Alternative 3 was designed to minimize the project footprint through the use of viaduct and by going around downtown Morgan Hill, much like Alternative 1. Alternative 3 would bypass downtown Gilroy to an East Gilroy Station, further minimizing interface with the UPRR corridor in comparison to Alternative 1. Like Alternative 2, Alternative 3 would use the viaduct to Scott Boulevard design option, requiring less disruption of UPRR track than the shorter viaduct to I-880 option. Alternative 3 would incorporate the same alignment and profile as Alternative 1 in the Monterey Corridor, Pacheco Pass, and San Joaquin Valley Subsections, and the same alignment and profile as Alternative 2 in the San Jose Diridon Station Approach Subsection. The maintenance of infrastructure siding would be the same under all alternatives.

Alternative 3 would operate in a dedicated viaduct from Scott Boulevard through the San Jose Diridon Station Approach Subsection. The alternative would continue predominantly on viaduct through the Monterey Corridor and Morgan Hill and Gilroy Subsections on an alignment around downtown Morgan Hill to an embankment approach to the East Gilroy Station. Alternative 3 would include an East Gilroy MOWF and would continue predominantly on viaduct and embankment across the Soap Lake floodplain before entering Tunnel 1 west of Casa De Fruta. The alignment and guideway in the Pacheco Pass and San Joaquin Subsections would be the same under all four alternatives.

Overall, this alternative would comprise 43.2 miles on viaduct, 1.8 miles at grade, 24.9 miles on embankment, 2.4 miles in trench, and two tunnels totaling 15.0 miles.

2.3.3.3.1 San Jose Diridon Station Approach Subsection

2.3.3.3.1.1 Alignment and Ancillary Features

Under Alternative 3, the alignment and characteristics of this subsection would be as described for Alternative 2.

2.3.3.3.1.2 Wildlife Crossings

As under Alternative 2, there would be no wildlife crossings in this subsection.

2.3.3.3.1.3 Stations

The HSR San Jose Diridon Station would be built as described for Alternatives 1 and 2.

2.3.3.3.1.4 Traction Power Facilities

Traction power facilities of Alternative 3 would be as described for Alternative 2.

2.3.3.3.1.5 Train Control and Communication Facilities

Train control and communication facilities under Alternative 3 would be the same as described for Alternative 2. No standalone communication radio towers would be constructed in this subsection under Alternative 3.

2.3.3.3.1.6 Maintenance Facilities

No maintenance facilities are proposed for this subsection.

2.3.3.3.1.7 State Highway or Local Roadway Modifications

State highway or local roadway modifications would be as described for Alternative 2.

2.3.3.3.1.8 Freight or Passenger Rail Modifications

Freight or passenger rail modifications would be as described for Alternative 2.

2.3.3.3.1.9 Land Use and Community Modifications

The alignment and features in this subsection would be as described for Alternative 2.

2.3.3.3.2 Monterey Corridor Subsection

2.3.3.3.2.1 Alignment and Ancillary Features

The alignment and features in the Monterey Corridor Subsection would be as described for Alternative 1.

2.3.3.3.2.2 Wildlife Crossings

As under Alternative 1, there would be no wildlife crossings in this subsection.

2.3.3.3.2.3 Stations

No stations are proposed in this subsection.

2.3.3.3.2.4 Traction Power Facilities

Traction power facilities under Alternative 3 would be as described for Alternative 1.

2.3.3.3.2.5 Train Control and Communication Facilities

Train control and communications facilities under Alternative 3 would be as described for Alternative 1.

2.3.3.3.2.6 Maintenance Facilities

No maintenance facilities are proposed in this subsection.

2.3.3.3.2.7 State Highway or Local Roadway Modifications

State highway or local roadway modifications would be as described for Alternative 1.

2.3.3.3.2.8 Freight or Passenger Rail Modifications

Freight rail modifications would be as described for Alternative 1.

2.3.3.3.2.9 Land Use and Community Modifications

Alternative 3 would require acquisition of residential, commercial, and industrial properties in this subsection to obtain adequate right-of-way for construction and operations.

2.3.3.3.3 Morgan Hill and Gilroy Subsection

2.3.3.3.3.1 Alignment and Ancillary Features

The Morgan Hill and Gilroy Subsection under Alternative 3 would be approximately 30 miles long, continuing south from the Monterey Corridor Subsection. From Bernal Way in South San Jose, the alignment through Morgan Hill and San Martin would be the same as described for Alternative 1. The Alternative 3 alignment would diverge from the Alternative 1 alignment by turning east north of Gilroy to arrive at the East Gilroy Station and an MOWF near SR 152. South of the MOWF, the alignment would curve generally east across the Pajaro River floodplain and through a portion of northern San Benito County before entering Tunnel 1 at the base of the Diablo Range. The Morgan Hill and Gilroy Subsection would end in the Pacheco Pass at Casa de Fruta Parkway/SR 152 (Figure 2-11), where the Alternative 3 alignment would converge with those of Alternatives 1, 2, and 4.

South of the Monterey Corridor Subsection, Alternative 3 would diverge east from Alternative 1 north of Gilroy, near the intersection of Monterey Road and Church Avenue. Beginning at Church Avenue, a new freight track would diverge off the UPRR mainline to provide a freight connection to the MOWF. The freight track would continue parallel to the HSR alignment on the west side until the MOWF. The alignment would cross over Church Avenue, Lena Avenue, Masten Avenue, and US 101 at Rucker Avenue on viaduct approximately 60 feet above grade. The aerial alignment would also cross over Denio Avenue and Buena Vista Avenue on viaduct before descending onto embankment. Cohansey Avenue would be closed. On the north end of the East Gilroy Station site, the alignment would cross beneath Las Animas Avenue; on the south end of the station site, Leavesley Road would be raised on bridges over the HSR embankment. At the south end of the East Gilroy Station site, the Llagas Creek overbank flow would be directed across the HSR alignment through two culvert crossings. Farther southeast, the alignment would cross over Gilman Avenue on viaduct. The alignment would cross Llagas Creek on a low viaduct, and Holsclaw Road would be closed to vehicular traffic. Levee Road would be realigned north of Llagas Creek. Continuing south, the alignment would ascend to approximately 25 feet above grade on embankment approaching the MOWF site. SR 152 would be grade-separated and realigned, crossing over the MOWF on a bridge. Both Frazier Lake Road and Holsclaw Road would connect to the grade-separated SR 152. The MOWF, on the south side of the alignment, would have the same features as the MOWF for Alternatives 1 and 2 and would similarly be on embankment. Additional flood detention basins would be installed around the eastern edge of the MOWF to provide sufficient flood capacity in the Soap Lake floodplain. Jones Creek would be realigned around the eastern boundary of the MOWF, crossing beneath the HSR viaduct over Bloomfield Avenue. Continuing on a 40-foot-high embankment and then on viaduct, the alignment would cross the Pajaro River, Millers Canal, Lake Road, Pacheco Creek, Lovers Lane, San Felipe Road, and SR 152 before entering the west portal of Tunnel 1. Tequesquita Slough would be partially filled by the HSR embankment, which would include cross-culverts, 3.1 acres of adjacent floodwater detention basins, and extended viaduct over Pacheco Creek to maintain floodplain capacity and function.

The Alternative 3 alignment would converge a short distance west of Tunnel 1 with the alignments of Alternatives 1, 2, and 4.

2.3.3.3.3.2 Wildlife Crossings

Wildlife crossings would be provided between Bernal Way and San Martin as described for Alternative 1, with crossings at Tulare Hill, Fisher Creek, and Llagas Creek. Although Alternative 3 would include more embankment than Alternative 1, it would be similar to Alternative 1 by continuing primarily on viaduct through the Soap Lake area to allow for wildlife movement.

2.3.3.3.3.3 Stations

The HSR East Gilroy Station is estimated to have approximately 6,210 boardings in 2040. The station approach would be on embankment approximately 17 feet to top of rail north of Leavesley Road (Figure 2-16 and Figure 2-17). The platforms would be 800 feet long. The station buildings would be constructed on both the east and west sides of the tracks with a connecting concourse under the tracks. The MOWF freight access track would continue through the station on the west side of the west station platform. Access for passengers arriving by auto would be available from either the east or west entrance, while the main entrance would be on the west side providing access for passengers arriving by transit or bicycle.

The HSR station buildings would encompass 58,611 square feet with a 4,400-square-foot substation and systems building. The concourse would be below the tracks and embankment. Approximately 1,520 on-site parking spaces would be provided to meet the projected demand for 1,520 spaces in 2040. Spaces would be on the east and west sides of the building. The west side station parking would be accessed from Leavesley Road and a new station access road east of the outlet mall. The east side station parking would be accessed from Marcella Avenue. A multimodal access plan would be developed prior to design and construction of the station. The plan would be developed in coordination with local agencies and would include a parking strategy that would confirm the location, amount, and phasing of parking.

Seven bus bays would be provided on site on the west side of the station. A 4,000-square-foot bicycle parking facility would be built; a new Class III bike route would be provided from the outlet mall to the site entrance and Class II lanes from the station entrance to the parking. A Class I bidirectional off-street path would be provided adjacent to parking, connecting to the bike station. This would be a new station without any other rail operators in the station area.

2.3.3.3.3.4 Traction Power Facilities

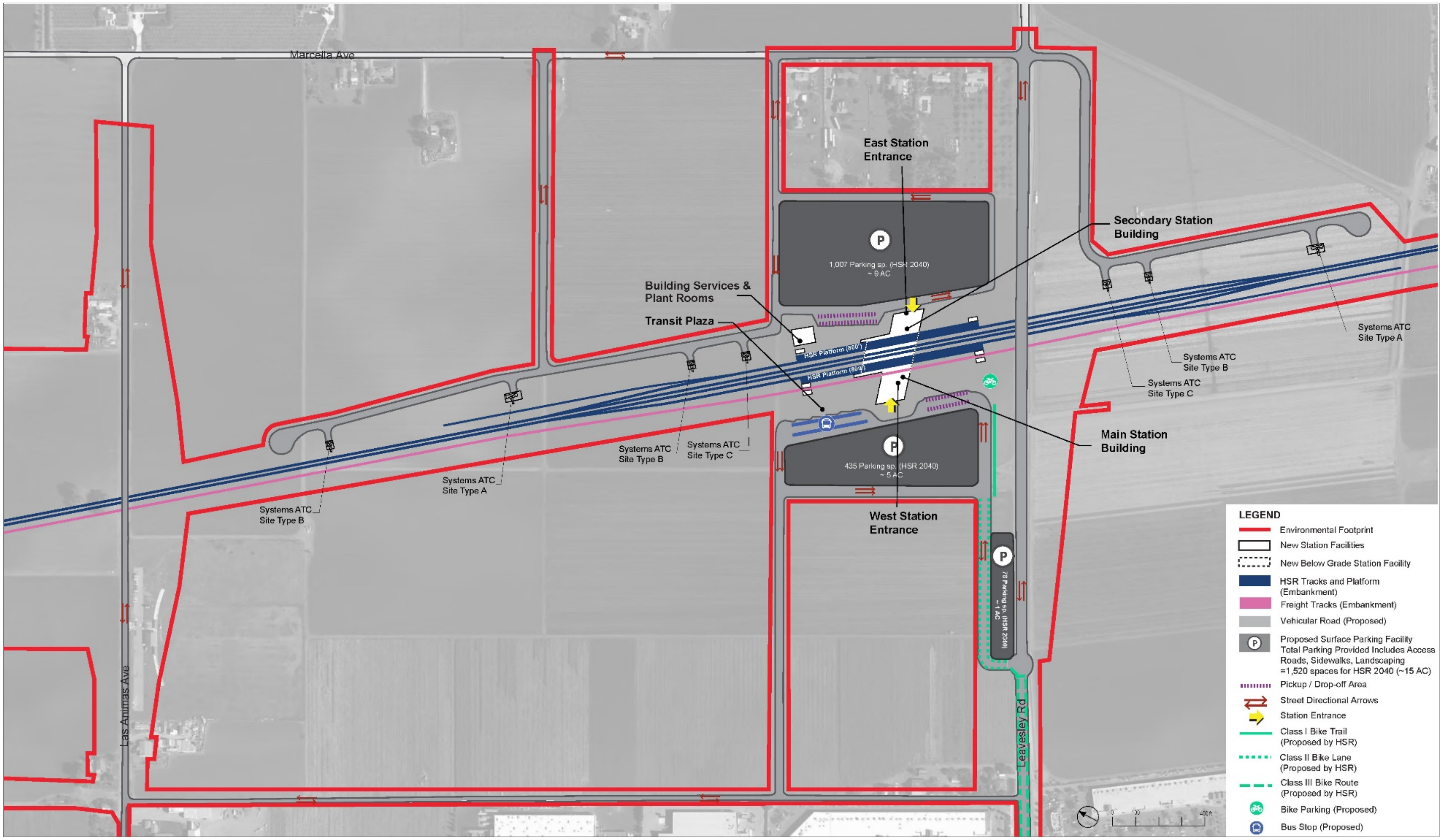
Under Alternative 3, one new TPSS, Site 4—Gilroy, would be constructed at one of two sites: north of the alignment either east or west of the former SR 152. Communication facilities (i.e., redundant fiber optic lines) would also be required to support the electrical interconnection of the TPSS to a new PG&E switching station, to existing PG&E facilities, or both—typically within tie-line/utility corridors.

As under Alternative 1, a traction power switching station would be constructed at one of two locations north of Palm Avenue and east of the alignment.

Four traction power paralleling stations would be constructed at the following locations:

- South of the alignment, either south of Diana Avenue or at the intersection of San Pedro Avenue and Walnut Grove Drive (same as Alternative 1);
- Either at the northwest or southeast corner of the HSR crossing of Masten Avenue;
- South of Gilroy at one of three site options: on Lake Road north of the alignment, on Lake Road south of the alignment, or at Lovers Lane south of the alignment; and
- Near the Tunnel 1 east portal, either at the portal or east of SR 152 in the southern area of Casa de Fruta.

The PG&E transmission network upgrades from Metcalf to Morgan Hill and from Morgan Hill to Llagas described for Alternative 1 would also be necessary under Alternative 3. In addition to a new utility switching station co-located with the TPSS, a tie-line route and power distribution to the Tunnel 1 portal under this alternative would be the same, albeit with shorter electrical line routes, as those described for Alternative 1. A distribution power line for the Tunnel 1 portals would be constructed on the south side of the alignment northeast of the intersection of Walnut Lane and SR 152, crossing over and connecting with the TPSS from the north. One power drop site would be provided at the east and west portals (two options for each portal location).



Source: Authority 2020a

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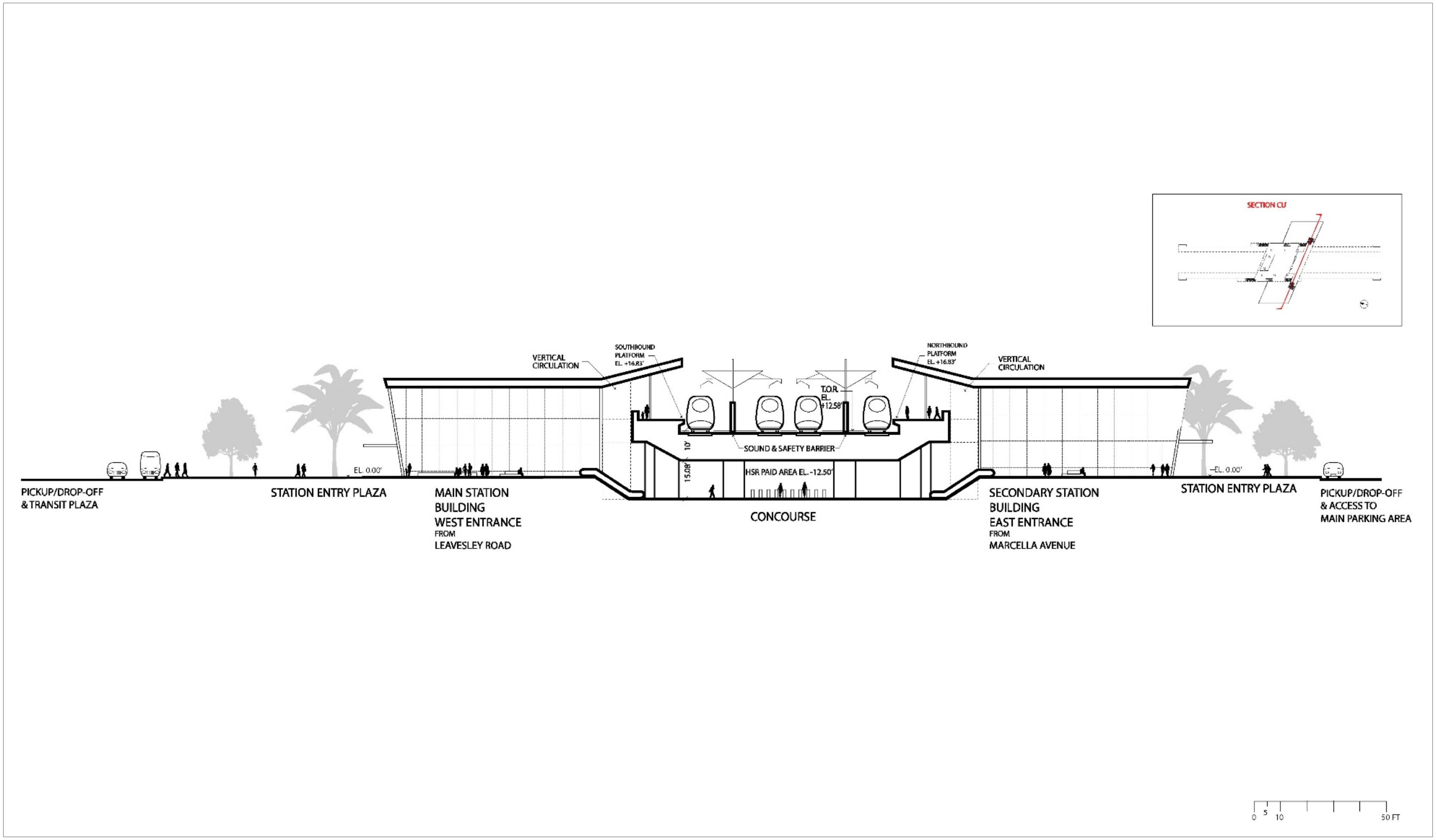
Figure 2-16 Conceptual East Gilroy Station Plan



Source: Authority 2020a

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Figure 2-17 Cross Section of East Gilroy Station

2.3.3.3.3.5 Train Control and Communication Facilities

A total of 21 ATC sites would be constructed in the Morgan Hill and Gilroy Subsection for this alternative:

- one site east of Monterey Road near Palm Avenue (two site options);
- one site East Middle Avenue (two site options);
- two sites near Cohansey Way;
- four sites between Las Animas Avenue and Leavesley Road;
- three sites south of Leavesley Road;
- four sites north of SR 152, east of Gilroy;
- two sites within the MOWF;
- three sites north of Bloomfield Avenue; and
- one site near Lake Road (two site options).

A total of six standalone communication radio sites would be constructed within this subsection at the following locations (five locations are the same as those for Alternative 1):

- at Forsum Road or at Blanchard Road (two site options),
- near Bailey Avenue (two site options),
- between Barnhart Avenue and Kirby Avenue (two site options),
- south of Cochrane Road along US 101 (two site options),
- north of Cox Avenue and south of West San Martin Avenue (two site options), and
- at Bloomfield Avenue.

2.3.3.3.3.6 Maintenance Facilities

Alternative 3 would include the East Gilroy MOWF west of the HSR mainline, south of the community of Old Gilroy (Figure 2-18). The MOWF would encompass approximately 75 acres and extend along the west side of the HSR alignment from the intersection of SR 152 and Frazier Lake Road south to Jones Creek. The site is near Holsclaw Road, a potentially eligible historic landscape, and is within the Soap Lake floodplain. The freight connection would be provided as described in the discussion of the alignment and ancillary facilities.

2.3.3.3.3.7 State Highway or Local Roadway Modifications

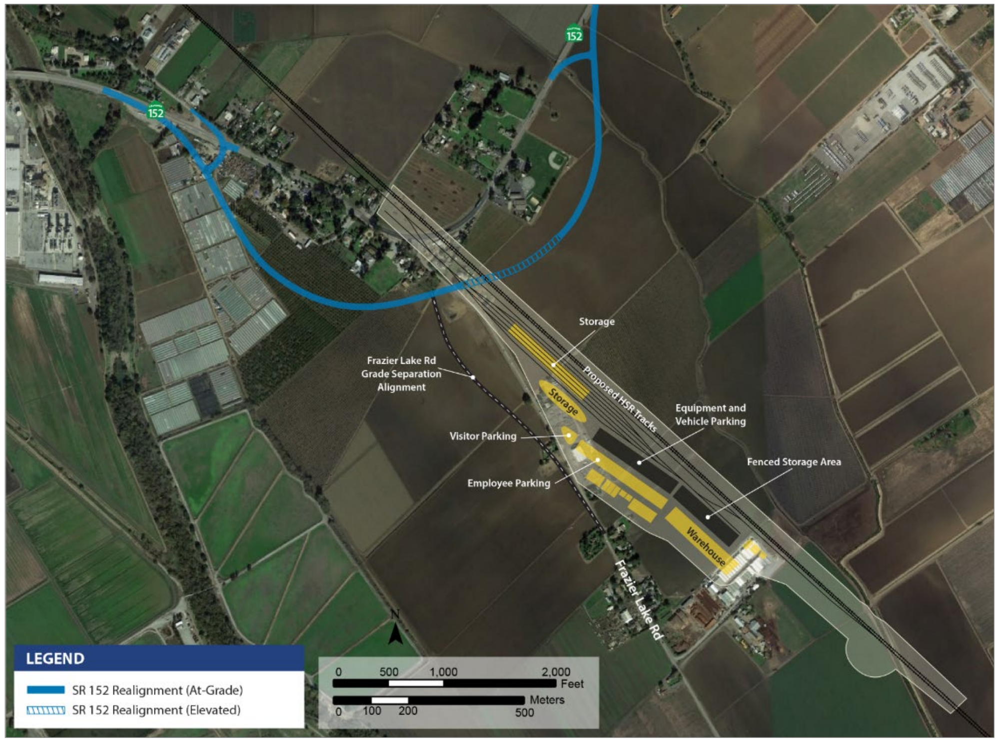
Local road modifications would be necessary in this subsection.

2.3.3.3.3.8 Freight or Passenger Rail Modifications

The freight rail modifications would be generally as described for Alternative 1 between Kittery and Cox. Alternative 3 would require a new freight connection to the MOWF.

2.3.3.3.3.9 Land Use and Community Modifications

Alternative 3 would displace residential, commercial, agricultural, and parks and recreation uses.



Source: Authority 2020a DRAFT JUNE 2019

Figure 2-18 East Gilroy Maintenance of Way Facility for Alternative 3

2.3.3.4 Alternative 4

Development of Alternative 4 was intended to extend blended electric-powered passenger railroad infrastructure from the southern limit of Caltrain's Peninsula Corridor Electrification Project through Gilroy. South and east of Gilroy, HSR would operate on a dedicated guideway similar to that of Alternatives 1 and 2. The objectives of this approach are to minimize property displacements and natural resource impacts, retain local community development patterns, improve the operational efficiency and safety of the existing railroad corridor, and accelerate delivery of electrified passenger rail services in the increasingly congested southern Santa Clara Valley corridor. The alternative is distinguished from the other three project alternatives by a blended, at-grade alignment that would operate on two electrified passenger tracks and one conventional freight track predominantly within the existing Caltrain and UPRR rights-of-way. The maximum train speed of 110 mph in the blended guideway would be enabled by continuous access-restriction fencing; four-quadrant gates, roadway lane channels, and railroad trespass deterrents at all public road grade crossings; and fully integrated communications and controls for train operations, grade crossings, and roadway traffic. Caltrain stations would be reconstructed to enable directional running as part of blended operations. Overall, this alternative would be comprised of 15.2 miles on viaduct, 30.3 miles at grade, 25.9 miles on embankment, 2.3 miles in trench, and two tunnels with a combined length of 15.0 miles.

2.3.3.4.1 San Jose Diridon Station Approach Subsection

2.3.3.4.1.1 Alignment and Ancillary Features

Alternative 4 would begin at Scott Boulevard in blended service with Caltrain on an at-grade profile following Caltrain MT2 and MT3 south along the east side of the existing Caltrain corridor. The existing Lafayette Street pedestrian overpass would remain in place, as would the De La Cruz Boulevard and West Hedding Street roadway overpasses. New UPRR track would start just south of Emory Street to maintain freight movement capacity north of San Jose Diridon Station. The new UPRR track would be east of Caltrain MT1. The existing Santa Clara Station would remain. The existing College Park Caltrain Station would be reconstructed just north of Emory Street on the west side of the Caltrain Corridor on the existing siding track to eliminate the existing holdout rule at the station. A portion of both legs of the UPRR Warm Springs Subdivision Lenzen Wye would undergo minor track adjustments, and a new bridge would be built over Taylor Street for UPRR to tie into the Lenzen Wye.

The blended at-grade alignment would continue along MT2 and MT3 to enter new dedicated HSR platforms at grade at the center of San Jose Diridon Station (Figure 2-19). HSR platforms would be extended south to provide 1,385-foot and 1,465-foot platforms and would be raised to provide level boarding with the HSR trains. The existing Santa Clara Street underpass would remain, but the track in the throat and yard would require modification. There would be no need for modifications to the VTA light rail.

Continuing south, the blended at-grade three-track alignment would remain in the Caltrain right-of-way through the Gardner neighborhood. The existing underpass at Park Avenue and the existing overpass at San Carlos Street would remain in place. Four-quadrant gates with channelization would be built at Auzerais Avenue and West Virginia Street. A new bridge for the blended HSR/MT3 track over I-280 would be constructed. The existing underpasses at Bird Avenue and Delmas Avenue would be reconstructed, as would the rail bridge overpasses. New standalone rail bridges over Prevost Street, SR 87, the Guadalupe River, and Willow Street would be built for MT3. MT1 and MT2 would remain on the existing structures. The existing Tamien Caltrain Station would remain in place.

2.3.3.4.1.2 Wildlife Crossings

There would be no wildlife crossings in this subsection.

2.3.3.4.1.3 Stations

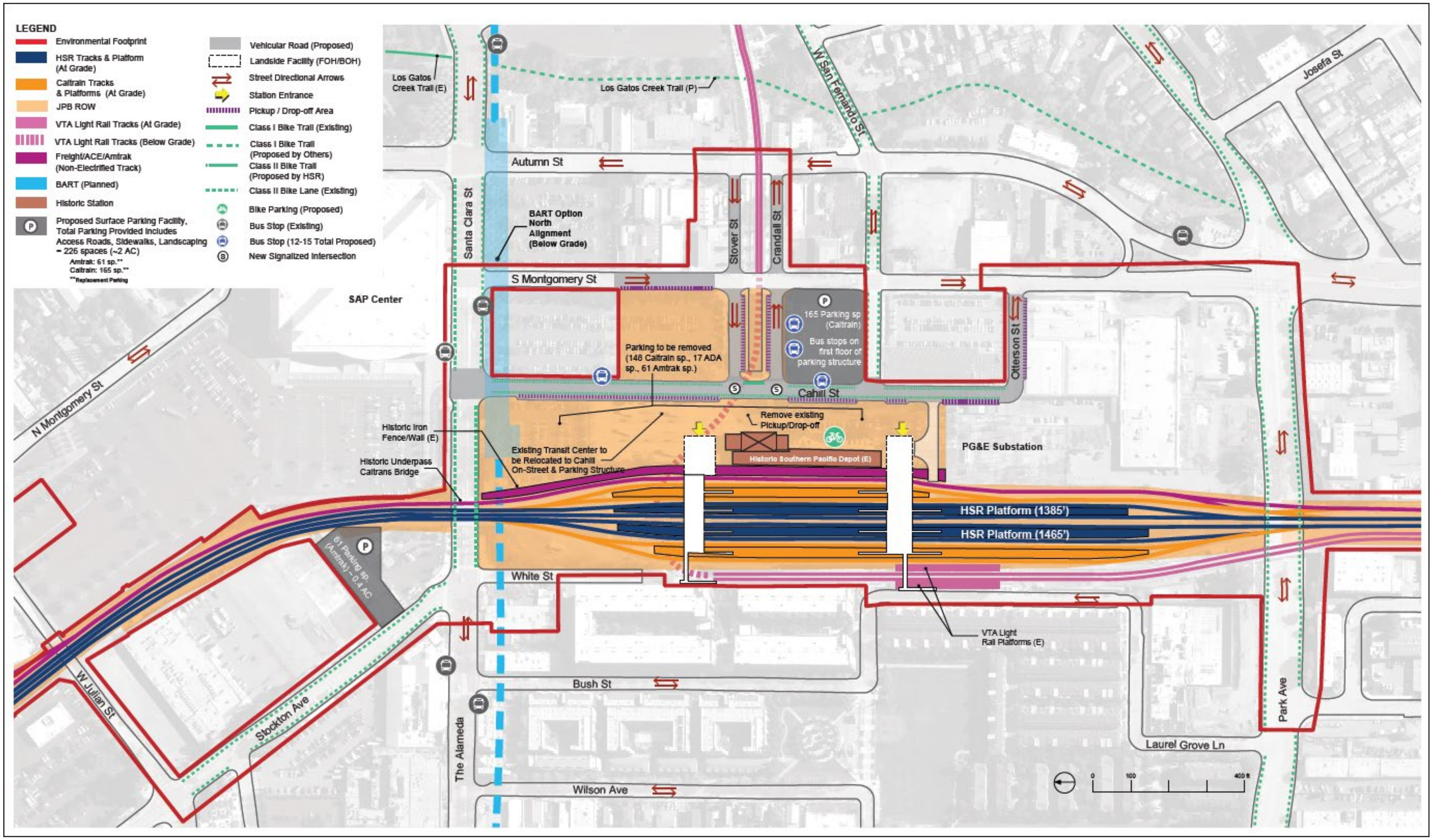
The San Jose Diridon Station would entail a four-track at-grade alignment through the center of the existing Diridon station, with 1,385- and 1,465-foot platforms centered between Santa Clara Street and Park Avenue (Figure 2-15). The existing historic station would remain in place. A pedestrian concourse would be built above the yard to provide access to the platforms below. The concourse would consist of a pedestrian walkway above the existing Caltrain tracks and below the HSR platforms, with two entrances on the east side and one on the west.

Construction of San Jose Diridon Station would require displacement of 226 parking spaces. These would be replaced 1:1 in a parking structure at Cahill/Crandall Streets and a second site at Stockton/Alameda Streets. The existing on-site/off-street bus transit center would be relocated to an off-street facility between Cahill, Crandall, South Montgomery, and West San Fernando Streets. Street improvements would include reconfiguring and extending Cahill Street from Santa Clara Street to Otterson Street and extending Stover and Crandall Streets to South Montgomery Street. New bike lanes would be installed on the east side of Cahill Street. New signals and pedestrian crossings would be developed at Cahill and Stover Streets and Cahill and Crandall Streets.

Phasing for interim operations (2027) includes a pedestrian overhead crossing (PED OC) south of the existing historic station and would provide circulation access from the PED OC only to HSR platforms. Caltrain would continue to use the existing tunnel for access. Phasing for Valley-to-Valley service (2029) includes access to and from all Caltrain and HSR platforms. At this stage, the existing tunnel would be used only for exiting purposes on HSR platforms. At buildout, there would be an additional PED OC north of the historic station with access to all Caltrain and HSR platforms. From the HSR platforms, the existing tunnel would continue to be used only for exiting.

2.3.3.4.1.4 Traction Power Facilities

No traction power facilities would be required in this subsection under Alternative 4 because power would be supplied through Peninsula Corridor Electrification Project facilities.



Source: Authority 2020a

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Figure 2-19 San Jose Diridon Station—At-Grade Conceptual Site Plan

2.3.3.4.1.5 Train Control and Communication Facilities

Under Alternative 4, HSR would use the existing ATC sites included as part of the Caltrain Positive Control and Electrification Project.

One standalone communications radio site would be constructed at one of two locations, both south of Scott Boulevard along the east side of the Caltrain corridor.

2.3.3.4.1.6 Maintenance Facilities

No maintenance facilities are proposed in this subsection.

2.3.3.4.1.7 State Highway or Local Roadway Modifications

Local road modifications would be required in this subsection.

2.3.3.4.1.8 Freight or Passenger Rail Modifications

Because Alternative 4 would operate in blended service with Caltrain in the Caltrain/UPRR right-of-way, there would be freight track changes throughout the entire alignment from Scott Road to the South Gilroy MOWF:

- a new rail bridge over West Taylor Street,
- quad gates at Auzerais and West Virginia Street,
- freight track shifted north and east from West Virginia Street to Delmas Avenue, and
- new rail bridge over Bird and Delmas Avenues.

Two track modifications in this subsection could have effects on environmental resources:

- new freight track MT0 along the east side of the alignment from Emory Street to San Jose Diridon Station, and
- MT1 (nonelectrified freight track) shifted east.

To allow for single tracking during construction by VTA light rail, Alternative 4 would install a new crossover with powered switches south of Tamien Station. Power would be provided to existing switches for the four crossovers at the diamond north of Virginia VTA Station, as well as to the existing crossover south of Tamien. Alternative 4 would include signaling for these powered switches.

2.3.3.4.1.9 Land Use and Community Modifications

Alternative 4 would require the acquisition of residential, commercial, and industrial properties in this subsection to obtain adequate right-of-way for construction and operations.

2.3.3.4.2 Monterey Corridor Subsection

2.3.3.4.2.1 Alignment and Ancillary Features

The Monterey Corridor Subsection would be approximately 9 miles long and entirely within the San Jose city limits. From the San Jose Diridon Station Approach Subsection at West Alma Avenue just south of the Caltrain Tamien Station, the alignment would extend southeast to Bernal Way (Figure 2-4). Unlike Alternatives 1, 2, and 3, Alternative 4 would be in blended service with Caltrain on an at-grade profile within the Caltrain and UPRR right-of-way. HSR and Caltrain would operate on the electrified MT2 and MT3, while UPRR would operate on a nonelectrified MT1. The two existing tracks would be shifted to accommodate the third track. The existing Tamien Caltrain Station would remain in place with two new electrified turnback tracks constructed south of the station to facilitate turning trains outside the station platform areas. The Michael Yard would be reconfigured to a double-ended facility to accommodate storage of Altamont Commuter Express trains and relocated to the east side of the corridor. A new standalone bridge over West Alma Avenue would be constructed for MT3 and a maintenance track, with MT1 and MT2 remaining on the existing structure. A new bridge over Almaden Road would be constructed for MT2 and MT3, while MT1 would remain on the existing structure. The bike path at Almaden Expressway would be realigned to the west in a culvert under the roadway. The existing pedestrian overpass at Communications Hill would remain in place. Capitol Caltrain

Station would be reconstructed with a new center platform between MT2 and MT3. The platform would be reached by a new pedestrian overpass built at the north end of the platform. The existing Capitol Expressway overpass would remain in place. Four-quadrant barrier gates with channelization would be built at Skyway Drive, Branham Lane, and Chynoweth Avenue. The existing Blossom Hill Road overpass and adjacent pedestrian overpass would remain in place. The Blossom Hill Caltrain Station would be reconstructed; the existing pedestrian overpass and platform would be removed, and a new center platform constructed between MT2 and MT3. The platform would be reached by a new pedestrian overpass built at the south end of the platform. Great Oaks Parkway would be realigned for approximately 1,350 feet to accommodate the widened rail corridor. SR 85 and Bernal Road overpasses would remain in place.

2.3.3.4.2.2 Wildlife Crossings

There would be no wildlife crossings in this subsection.

2.3.3.4.2.3 Stations

There would be no HSR stations in this subsection.

2.3.3.4.2.4 Traction Power Facilities

One traction power paralleling station would be built on the west side of the Caltrain Corridor near the Blossom Hill Caltrain Station.

2.3.3.4.2.5 Train Control and Communication Facilities

Five ATC sites would be constructed within the subsection at the following locations:

- near Communications Hill on the east side of the Caltrain corridor near Chateau La Salle Drive,
- near Communications Hill on the east side of the Caltrain corridor near Montecito Vista Way,
- near Monterey Road on the west side of the Caltrain corridor near Capitol Caltrain Station,
- near Skyway Drive on the west side of the Caltrain corridor (two site options), and
- near Branham Lane on the west side of the Caltrain corridor.

Two standalone communications radio sites would be built:

- near Almaden Road on the east side of the Caltrain corridor, and
- near Branham Lane on the west side of the Caltrain corridor.

PTC sites would be constructed at the following locations:

- two sites south of Almaden Road,
- one site north of Capitol Caltrain Station, and
- one site co-located with the ATC site at Branham Lane.

2.3.3.4.2.6 Maintenance Facilities

No maintenance facilities are proposed in this subsection.

2.3.3.4.2.7 State Highway or Local Roadway Modifications

Local road modifications would be required in this subsection.

2.3.3.4.2.8 Freight or Passenger Rail Modifications

Because Alternative 4 would operate in blended service with Caltrain in the Caltrain/UPRR right-of-way, there would be freight track changes throughout the entire alignment from Scott Road to the South Gilroy MOWF. Four-quadrant gates would be installed at all at-grade crossings. Capitol Station and Blossom Hill Station would have a new center platform and pedestrian underpass. Four track modifications in this subsection could have effects on environmental resources:

- Michael Yard (between West Alma and Almaden Road)—there are additional Altamont Commuter Express storage tracks to the east;

- MT1 would be shifted east from south of Almaden Expressway to south of Communications Hill;
- MT1/freight would be shifted west from Pullman Way to Fehren Drive; and
- from Fehren Drive south to Bernal, MT1/freight would be shifted to the east of existing freight tracks.

2.3.3.4.2.9 Land Use and Community Modifications

Alternative 4 would require the acquisition of residential, commercial, and industrial properties in this subsection to obtain adequate right-of-way for construction and operations.

2.3.3.4.3 Morgan Hill and Gilroy Subsection

2.3.3.4.3.1 Alignment and Ancillary Features

The Morgan Hill and Gilroy Subsection under Alternative 4 would be approximately 32 miles long, continuing south from the Monterey Corridor Subsection. From Bernal Way in South San Jose, the alignment would extend through Morgan Hill and San Martin to the Downtown Gilroy Station, then curve generally east across the Pajaro River floodplain and through a portion of northern San Benito County before entering Tunnel 1 at the base of the Diablo Range. The alignment would exit the tunnel at Casa de Fruta Parkway/SR 152 in unincorporated eastern Santa Clara County, where it would transition to the Pacheco Pass Subsection. This subsection under Alternative 4 would be in blended service with Caltrain on an at-grade profile within the Caltrain/UPRR right-of-way with an at-grade Downtown Gilroy Station. Past the Downtown Gilroy Station and south of the US 101 overpass, HSR would enter the fully grade-separated, dedicated track needed to operate HSR trains at speeds faster than 125 mph.

Beginning at the southern limit of the Monterey Corridor Subsection, the alignment would continue in blended service with Caltrain on an at-grade profile in the existing UPRR right-of-way. HSR and Caltrain would operate on the electrified MT2 and MT3 tracks, while UPRR would operate on MT1. A UPRR siding track would be provided between Blanchard Road and Bailey Avenue. Four-quadrant barrier gates would be installed at all existing public road crossings. Intrusion deterrents would be installed at all at-grade crossings. Three private road crossings would be eliminated, and alternate access would be provided to those properties. The existing Bailey Avenue overpass would remain in place. The Monterey Road underpass would be reconstructed to accommodate the future widening of Monterey Road to four lanes. The Morgan Hill Caltrain Station would be reconstructed with two new side platforms built outside MT2 and MT3. The platform would be reached by a new pedestrian underpass built at the north end of the platform. The existing Butterfield Boulevard overpass would remain in place. Upper Llagas Creek bridge would be reconstructed.

The San Martin Caltrain Station would be reconstructed—the existing platform would be removed, and a new center platform would be built between MT2 and MT3. The platform would be reached by a new pedestrian overpass constructed at the south end of the platform. The existing bridge at Miller Slough would be replaced with a triple-cell box. Blended service would end just south of the Downtown Gilroy Station, where Caltrain would have access to turn back and stabling tracks relocated from the station area to south of 10th Street on the west side of the UPRR right-of-way. The Gilroy Caltrain Station would be reconstructed—the existing Caltrain platform would be shifted south and served by a southbound station track. A northbound Caltrain side platform would be provided to the east of a northbound station track. Two side platforms would be provided for HSR on the outside of the MT2 and MT3 tracks. The platforms would be reached by a new pedestrian overpass built over the center of the platforms. HSR would continue south under the US 101 overpass, which would remain in place. Past the Industry spur, HSR would ascend onto embankment and then a bridge over the UPRR. Two bridges would be constructed, one for MT2 and MT3 and one for the MOWF lead track. The UPRR Hollister branch line would be realigned to the west to accommodate HSR bridging over the UPRR tracks at a single location. HSR MT2 and MT3 would descend from the embankment before crossing over Bloomfield Avenue on a new structure. Four-quadrant barrier gates and intrusion deterrents would be installed at Bloomfield Avenue for the MOWF lead track and UPRR service track. HSR would continue past the MOWF and transition to a new viaduct structure to cross over Pajaro Creek. Continuing on viaduct until just west of Millers Canal, Alternative 4 would resume the alignment described for Alternative 1.

2.3.3.4.3.2 Wildlife Crossings

Twelve wildlife crossings or jump-outs would be built in this subsection:

- three adjacent wildlife crossings with jump-outs integrated into the wing walls at Tulare Hill;
- Fisher Creek culvert under UPRR and Monterey Road replaced with a larger box culvert to improve wildlife crossing potential at this location;
- wildlife crossings and integrated jump-outs south of Emado Avenue, south of Fisher Road, and south of Live Oak;
- wildlife crossings at Richmond Avenue, Paquita Espana Court, and north of Kalana Avenue; and
- dedicated jump-outs north of Fisher Creek, south of Blanchard Road, north of Kalana Avenue, and at Miramonte Avenue.

Wildlife intrusion deterrents would be constructed for at-grade crossings at Blanchard Road, Palm Avenue, Live Oak Avenue, and Bloomfield Avenue.

2.3.3.4.3.3 Stations

The Downtown Gilroy Station approach would be at grade with dedicated HSR tracks to the west of UPRR between Old Gilroy Street/7th Street, which would be closed, and 9th Street (Figure 2-20). A new HSR station with 800-foot platforms would be built south of the existing Caltrain station. A pedestrian concourse would be built above the UPRR and Caltrain tracks to provide access to the platforms below.

The existing 489 Caltrain parking spaces on the west side of the station would be replaced 1:1 in parking lots on the east and west sides of the alignment. The existing 269 parking spaces at the San Ysidro housing development would be replaced 1:1 with new surface parking at the south end of Alexander Street. HSR parking demand would be 970 spaces in 2040, for a total of 1,728 aggregated parking spaces in 2040. The station site plan provides 970 new parking spaces in five areas. One site would be west of the station along Monterey Road at 9th Street. The other four would be on the east side of the station along Alexander Avenue at 7th Street, 9th Street, 10th Street, and Banes Lane. A multimodal access plan would be developed prior to design and construction of the station. The plan would be developed in coordination with local agencies and would include a parking strategy that would specify the location, amount, and phasing of parking.

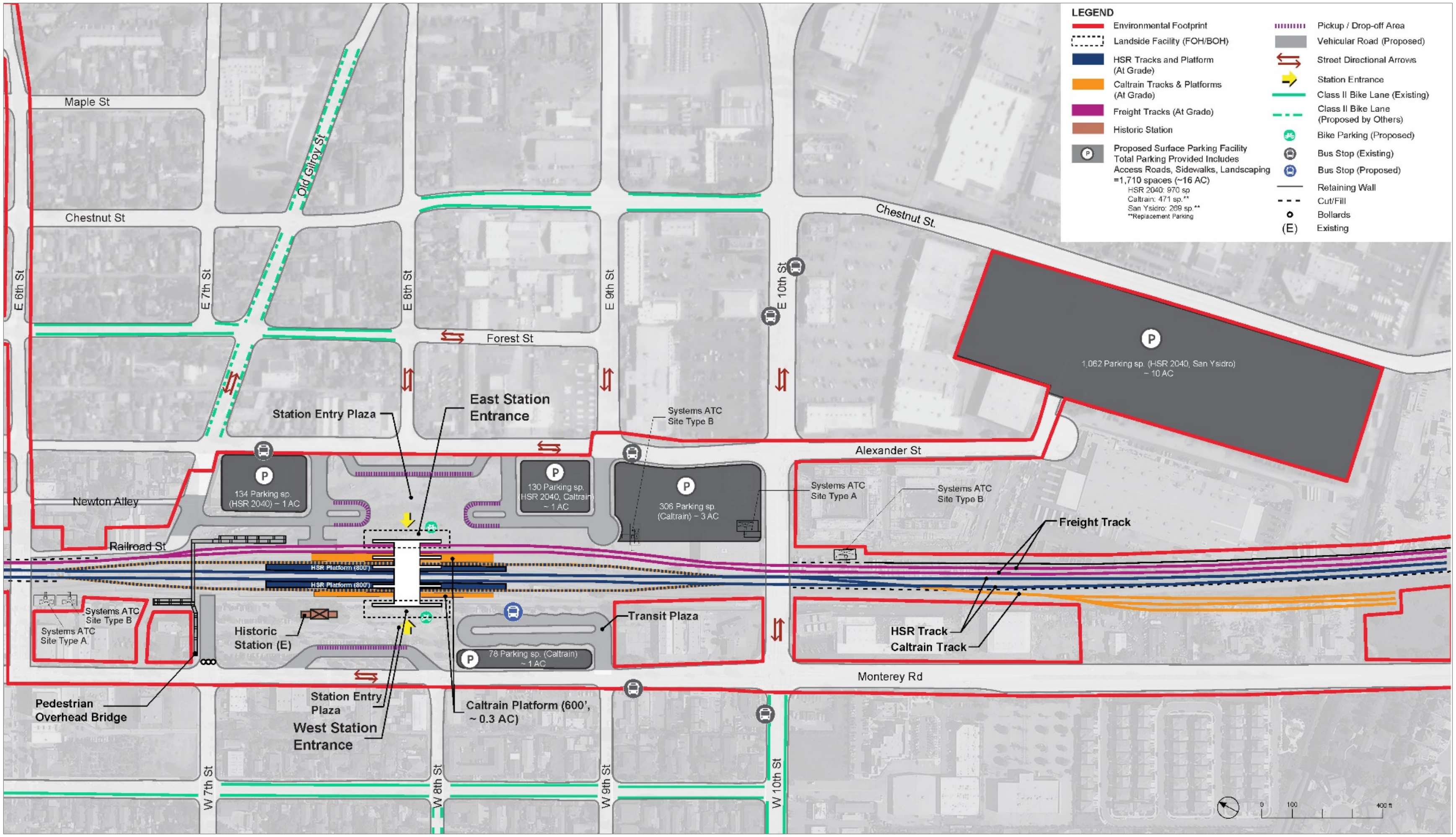
A total of eight bus bays would be provided, adding one bay to the existing seven. East 7th Street would be closed and East 10th Street would be modified with quadrant gates and channelization. A pedestrian overcrossing would be installed to provide access between East and West 7th Street. A 4,000-square-foot bicycle facility would be built.

The Morgan Hill Caltrain Station would be reconstructed with two new side platforms built outside MT2 and MT3. The platform would be reached by a new pedestrian underpass built at the north end of the platform. The San Martin Caltrain Station would be reconstructed where the existing platform would be removed, and a new center platform would be built between MT2 and MT3. The platform would be reached by a new pedestrian overpass at the south end of the platform.

2.3.3.4.3.4 Traction Power Facilities

One new TPSS, Site 4—Gilroy, would be constructed at one of two locations on the east side of the alignment: south of Buena Vista Avenue or north of Cohansey Avenue. At this site, one new utility switching station could be co-located with the TPSS. Communication facilities (i.e., redundant fiber optic lines) would also be required to support the electrical interconnections of the TPSS to a new PG&E switching station, to existing PG&E facilities, or both—typically within tie-line/utility corridors.

A traction power switching station would be constructed west of the HSR alignment at Richmond Avenue.



Source: Authority 2020a

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Figure 2-20 Downtown Gilroy Station—At-Grade Conceptual Site Plan

Three traction power paralleling stations would be constructed adjacent to the guideway:

- Either south of San Pedro Avenue on the west side of the alignment or just north of Butterfield Boulevard on the east side of the alignment;
- West of Lovers Lane either south of the alignment or north of the alignment (same as Alternative 1); and
- Near the Tunnel 1 east portal, either at the portal or east of SR 152 in the southern area of Casa de Fruta (same as Alternatives 1 and 2).

PG&E would reinforce the electric power distribution network to meet HSR traction and distribution power requirements by reconductoring approximately 11.1 miles of existing power line associated with the Spring to Llagas and Green Valley to Llagas 115-kV power lines. The existing power lines to be reconductored, reusing the poles and towers, begin at the Morgan Hill Substation on West Main Avenue in Morgan Hill, then cross the east side of Peak Avenue and Dewitt Avenue, spanning West Dunne Avenue, Chargin Drive, Spring Avenue, and several residences. The alignment would continue south across an open-space area, then follow Sunnyside Avenue for approximately 0.5 mile. The alignment would continue south for approximately 4 miles, spanning additional open-space areas of wineries and the Corde Valley Golf Course. The alignment would then turn east along the north side of Day Road before heading south for approximately 2.5 miles and terminating at the Llagas Substation in Gilroy.

A permanent overhead distribution electrical power line from TPSS Site 4 to the Tunnel 1 portal location would provide power to the tunnel boring machine during construction and the tunnel fire-life-safety system during operations.

2.3.3.4.3.5 Train Control and Communication Facilities

Twenty-three ATC sites would be constructed:

- one site south of Blanchard Road on the east side of the alignment (two site options),
- three sites south of Live Oak Avenue on the west side of the alignment,
- one site north of San Pedro Avenue on the west side of the alignment,
- one site north of Barrett Avenue on the west side of the alignment (two site options),
- one site north of East Middle Avenue on the west side of the alignment,
- one site in the vicinity of either Church Avenue or Lena Avenue on the east side of the alignment (two site options),
- one site between Leavesley Road and IOOF Avenue,
- two sites south of Lewis Street on the east side of the alignment,
- two sites south of 6th Street on the west side of the alignment,
- three sites in the vicinity of 10th Street on the east side of the alignment,
- four sites north of Carnadero Avenue on the west side of the alignment,
- two sites east of the Pajaro River, and
- one site near Lake Road (two site options) (same as Alternative 1).

PTC sites would be constructed at the following locations:

- one site south of Blanchard Road,
- one site north of Bailey Avenue,
- one site co-located with ATC site south of Live Oak Avenue,
- one site at Cohansey Avenue,
- one site south of Lewis Street, and
- one site south of East 6th Street.

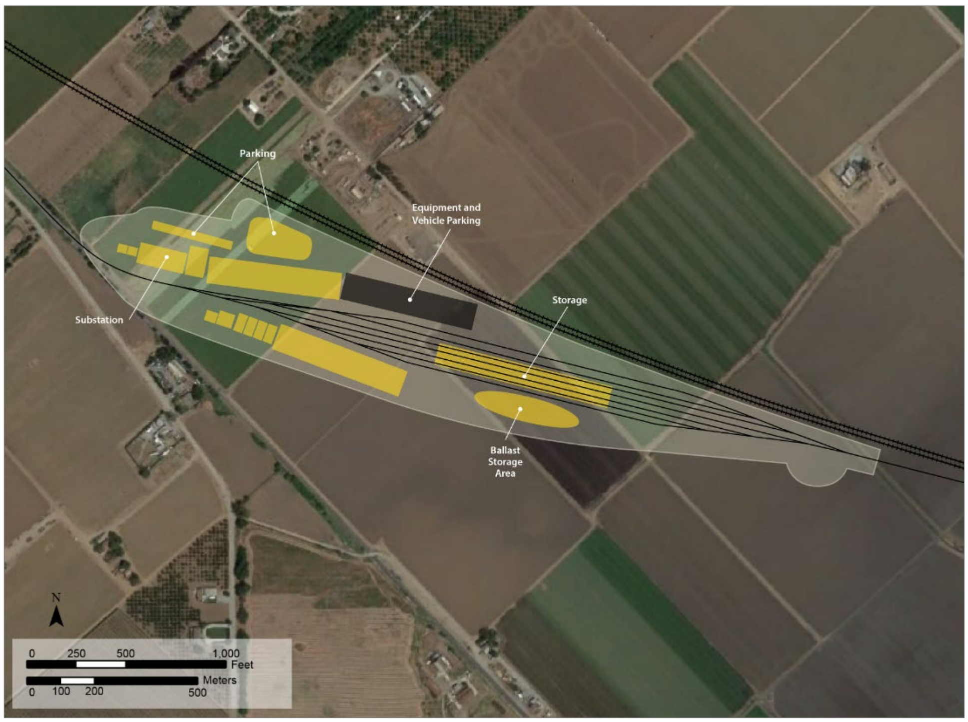
Five standalone communications radio sites would be constructed:

- near Bernal Way on the west side of the alignment (two site options);
- south of Live Oak Avenue on the west side of the alignment (two site options);
- in the vicinity of East Central Avenue (two site options, one on either side of the alignment);

- south of California Avenue on the east side of the alignment; and
- east of the Pajaro River south of Gilroy.

2.3.3.4.3.6 Maintenance Facilities

The South Gilroy MOWF (Figure 2-21) near Bloomfield Avenue would encompass approximately 50 acres and the program and layout would be as described for Alternatives 1 and 2. In contrast to Alternatives 1 and 2, the MOWF for Alternative 4 would be located on the west side of the tracks between Carnadero Avenue and the Pajaro River. This configuration would require realignment of the UPRR Hollister Subdivision. HSR mainline and MOWF lead track would pass over UPRR Coast Subdivision tracks.



Source: Authority 2020a DRAFT JUNE 2019

Figure 2-21 South Gilroy Maintenance of Way Facility for Alternative 4

2.3.3.4.3.7 State Highway or Local Roadway Modifications

Local road modifications would be required in this subsection.

2.3.3.4.3.8 Freight or Passenger Rail Modifications

Because Alternative 4 would operate in blended service with Caltrain in the Caltrain/UPRR right-of-way, there would be freight track changes throughout the entire alignment from Scott Road to the South Gilroy MOWF. Four-quadrant gates would be installed at all at-grade crossings. Eight track modifications in this subsection could have effects on environmental resources:

- eastward shift of freight track from Bernal Avenue to south of Gilroy, except from Tulare Hill to Blanchard Road and Llagas Creek curve, where some westward shifts would be necessary for curve adjustments;
- south of Blanchard Road until Bailey Road, a new UPRR siding track east of the existing tracks;
- the Redwood Lumber industry spur realigned at Madrone Avenue on the west side of the alignment;
- new rail bridge over Monterey Road;

- new side platforms and pedestrian underpass at Morgan Hill Station and new center platform and pedestrian overpass at San Martin Station;
- just south of the Downtown Gilroy Station, additional Caltrain storage tracks on the west side of the alignment;
- new UPRR siding track at Downtown Gilroy Station; two freight tracks would continue south of US 101; and
- south of Carnadero Avenue, the UPRR Hollister track realigned to pass under HSR to accommodate the MOWF layout and provide freight access to the MOWF. A crossover just south of Bolsa Road for freight to access the MOWF.

2.3.3.4.3.9 Land Use and Community Modifications

Alternative 4 would require the acquisition of residential, commercial, and industrial properties in this subsection to obtain adequate right-of-way for construction and operations.

2.4 Environmental Setting and Impact Evaluation Methods

2.4.1 Aquatic Resources

2.4.1.1 Definition of the Study Area for Aquatic Resources

Resource study areas (RSA) are the geographic boundaries within which the environmental investigations specific to each resource topic were conducted and impacts on those resources assessed. The aquatic RSA is the project footprint plus a 250-foot buffer outside the project footprint. The project footprint includes all project elements (i.e., alignment rights-of-way, station locations, light maintenance facility, passing track, and TCEs) associated with the project alternatives.
The methods used to assess the impact types associated with the RSA are described below in Section 2.4.1.2.

2.4.1.2 Aquatic Resources Considered in the Alternatives Analysis

Detailed information regarding aquatic resources identified in the aquatic RSA is presented in the *San Jose to Merced Project Section Aquatic Resources Delineation Report* (Authority 2020b) and summarized by subsection in Table 2-2.

Table 2-2 Aquatic Resources by Subsection

Aquatic Resource	San Jose Diridon Station Approach	Monterey Corridor	Morgan Hill and Gilroy	Pacheco Pass	San Joaquin Valley
Wetlands					
Alkali marsh	–	–	–	–	Yes
Alkali scrub wetland	–	–	–	–	Yes
Alkali vernal pool	–	–	–	Yes	Yes
Freshwater marsh	–	Yes	Yes	Yes	Yes
Mixed riparian	Yes	Yes	Yes	Yes	Yes
Palustrine forested wetland	Yes	Yes	Yes	Yes	Yes
Seasonal wetland	Yes	Yes	Yes	Yes	Yes
Vernal pool	–	–	–	Yes	Yes

Aquatic Resource	San Jose Diridon Station Approach	Monterey Corridor	Morgan Hill and Gilroy	Pacheco Pass	San Joaquin Valley
Other Waters of the U.S. (Non-Wetland Waters)					
Constructed basin	–	Yes	Yes	Yes	Yes
Constructed watercourse	Guadalupe River	Yes (unnamed)	Cochran Channel/Metcalf Creek, Santa Clara Valley Water District Percolation Channel, Madrone Channel/Metcalf Creek, West Little Llagas Creek, Butterfield Channel, West Branch Llagas Creek Channel, Upper Miller Slough, San Ysidro Creek, Pajaro River, Millers Canal, Tequisquita Slough, Pacheco Creek Side Channel, Ortega Creek tributaries	California Aqueduct, Delta-Mendota Canal, Outside Canal	Main Canal, San Luis Wasteway, Santa Fe Canal, San Luis Canal, San Luis Drain, San Pedro Canal, Boundary Drain, Lone Tree Canal, Devon Drain, Midway Swamp Ditch, West Delta Canal, Delta Canal, East Delta Canal, Poso Drain, Belmont Drain, Delta No.1 Canal, San Juan Drain, West San Juan No.1 Canal
Freshwater pond	–	Yes	Yes	Yes	Yes
Natural watercourse	Guadalupe River, Los Gatos Creek	Guadalupe River, Coyote Creek	Coyote Creek, Fisher Creek, Little Llagas Creek, Llagas Creek, West Branch Llagas Creek, Dexter Creek, Jones Creek, Uvas-Carnadero Creek, Pajaro River, Miller Slough, Pacheco Creek, Ortega Creek, Pacheco Creek tributaries	Pacheco Creek, Pacheco Creek tributaries, Elephant Head Creek, Harper Canyon Creek, San Luis Reservoir tributary, Cottonwood Creek, Romero Creek	San Luis Creek, Los Banos Creek, Mud Slough
Reservoir	–	–	Yes	Yes	–

Source: Authority 2020b

2.4.1.2.1 Wetlands

The following wetland types were identified within the aquatic RSA: alkali marsh, alkali scrub wetland, alkali vernal pool, freshwater marsh, mixed riparian-natural watercourse, palustrine forested wetland, palustrine forested wetland-natural watercourse, seasonal wetland, and vernal pool. Of these wetland types, alkali marsh, alkali scrub wetland, alkali vernal pool, freshwater marsh, palustrine forested wetland, seasonal wetland, and vernal pools are considered special-status species habitat or special-status plant communities (see Section 2.4.2.6). For the purposes of this analysis, riparian communities are considered wetlands if they meet the USACE definition of wetlands (i.e., they meet the three-parameter approach outlined by USACE in the *Corps of Engineers Wetlands Delineation Manual* [USACE 1987]).

All wetlands identified within the aquatic RSA are considered jurisdictional based on the Preliminary Jurisdictional Delineation approach, as described in the Jurisdictional Determinations, Regulatory Guidance Letter (USACE 2008).

2.4.1.2.2 Other Waters of the U.S.

The following non-wetland waters were investigated in the aquatic RSA: constructed basin, constructed watercourse, freshwater pond, natural watercourse, and reservoir. All natural and constructed waterways are considered potentially jurisdictional under the Preliminary Jurisdictional Delineation approach (USACE 2008).

2.4.1.3 Existing Conditions: Jurisdictional Resources

2.4.1.3.1 Wetlands Occurring in the Aquatic Resource Study Area

Wetland types are described in the following subsections and depicted in Appendix B.

2.4.1.3.1.1 Alkali Marsh

Alkali marsh areas are wetlands that are classified by the *Manual of California Vegetation* as *Frankenia salina* Herbaceous Alliance (alkali heath marsh), and the biological community is equivalent to the alkali desert scrub community as defined by the California Wildlife Habitat Relationships (CWHR) System. Alkali marsh communities are considered a special-status plant community as identified on the California Department of Fish and Wildlife (CDFW) Sensitive Community List (Authority 2020c). Additionally, alkali marsh areas are wetlands that are considered an aquatic resource.

Alkali marsh areas are herbaceous communities with 30 percent or more cover dominated by alkali heath. Associate species include grasses and forbs adapted to saline aquatic environments, such as alkali weed, salt grass, and salt bush. Alkali marshes are located within coastal salt marshes, brackish marshes, alkali meadows, and alkali playas. Soils are saline, sandy to clayey alluvium (Authority 2020b).

Thirty-nine individual alkali marsh wetlands were mapped in the aquatic RSA. Most of these wetlands are located on the north and south sides of Henry Miller Road and are associated with the Los Banos Waterfowl Management Area. An additional area of alkali marsh wetland is located adjacent to Henry Miller Avenue and west of the town of Volta; this alkali marsh area is approximately one-half mile south of the Volta Wildlife Area border. Access was granted to the Los Banos Waterfowl Management Area parcels in 2018. The remaining parcels that support alkali marsh wetlands, where access was not granted, were identified on the basis of the presence of perennial water visible from the road and aerial imagery.

Alkali marsh wetlands in the aquatic RSA are associated with perennial drainages and sloughs. The density of alkali marsh vegetation varies from small, scattered clumps to large, dense stands. The dominant vegetation in alkali marsh consists of alkali heath, an herbaceous hydrophyte (water-adapted plant) that is rooted in saturated or inundated saline soils; associate species include cattails and bulrushes. Alkali marsh wetlands are classified by Cowardin et al. (1979) as palustrine emergent wetlands (PEM). A total of 45.98 acres of alkali marsh were identified in the RSA.

2.4.1.3.1.2 Alkali Scrub Wetland

Alkali scrub wetlands are classified by the *Manual of California Vegetation* as *Allenrolfea occidentalis* Shrubland Alliance (iodine bush scrub), and the biological community is equivalent to the alkali desert scrub community as defined by the CWHR System. Iodine bush scrub communities are considered a special-status plant community as identified on the CDFW Sensitive Community List (Authority 2020c). Additionally, alkali scrub wetlands are considered an aquatic resource.

Alkali scrub wetlands are dominated by iodine bush with saltbush and shadescale species as associates. The understory can be open to sparse with saltgrass and alkali heath. Alkali scrub wetlands are found in dry lakebed margins, hummocks, playas perched above drainages, and seeps (Authority 2020b).

Three areas of alkali scrub wetlands, totaling 49 individual features, were mapped in the aquatic RSA. One of these areas is approximately 1,000 feet south of the Volta Wildlife Area border. The other two are located along Henry Miller Road east of Volta and along Ingomar Grade north of Volta. Access was granted in the area south of the Volta Wildlife Area, and fieldwork was conducted during the April 2018 survey. Access was not granted in the remaining areas where alkali scrub wetlands were mapped; they were identified on the basis of the presence of perennial water visible from the road and aerial imagery.

Alkali scrub wetlands in the aquatic RSA are associated with playa areas and are dominated by iodine bush with saltbush and shadescale species as associates. The understory can be open to sparse with saltgrass and alkali heath. Alkali scrub wetlands are classified by Cowardin et al. (1979) as palustrine emergent scrub-shrub (PSS). A total of 10.03 acres of alkali scrub wetland were identified in the RSA.

2.4.1.3.1.3 Alkali Vernal Pool

Alkali vernal pool areas are wetlands that are classified by the *Manual of California Vegetation* as *Cressa truxillensis—Distichlis spicata* Herbaceous Alliance (alkali weed—salt grass playas and sinks), and the biological community is equivalent to the alkali desert scrub as defined by the CWHR System. Alkali weed—salt grass playas and sinks communities are considered a special-status plant community as identified on the CDFW Sensitive Community List (Authority 2020c). Additionally, alkali vernal pools are wetlands that are considered an aquatic resource.

Alkali vernal pool areas are herbaceous communities with alkali weed or salt grass dominating. Associate species include vernal pool grasses and forbs adapted to saline aquatic environments, such as seaside barley, flatface downingia, dwarf popcornflower, and prostrate navarretia. Alkali vernal pools are located within alkaline or saline vernal playas and alkali sinks. Soils are seasonally inundated saline alluvium that lose water mostly through evaporation (Authority 2020b).

Two alkali vernal pools were mapped in the aquatic RSA. One of the alkali vernal pools is located at the corner of Henry Miller Road and Mercey Springs Road, and one is approximately 2.5 miles east on the north side of Henry Miller Road. Access was not granted in areas where the alkali vernal pools were mapped; they were identified on the basis of the presence of ponded water visible from the road and aerial imagery. Alkalinity was assumed based on the soil map unit's pH (8.5) and its electrical conductivity in the subsurface layer (12.0 decisiemens per meter).

Three segments of one large alkali vernal pool/California annual grassland complex, containing alkali vernal pools, were mapped in the aquatic RSA. This complex is located northwest of the confluence of Romero Creek and the California Aqueduct, west of I-5. Access was not granted in this area; the vernal pool complex was identified on the basis of a hummocky signature (corresponding to topographic highs and lows) on aerial imagery and on soil survey data. Additionally, based on soil survey data, the complex is estimated to be 45-percent wetland (i.e., alkali vernal pools) and 55-percent California annual grassland.

Alkali vernal pools in the aquatic RSA are herbaceous communities with alkali weed or salt grass dominating. Associate species observed include vernal pool grasses and forbs adapted to saline aquatic environments, such as seaside barley and prostrate navarretia. Alkali vernal pool wetlands are classified by Cowardin et al. (1979) as palustrine emergent seasonally flooded (PEMC). A total of 27.1 acres of alkali vernal pools were identified in the aquatic RSA.

2.4.1.3.1.4 Freshwater Marsh

Freshwater marsh communities are classified by the *Manual of California Vegetation* as *Schoenoplectus californicus* Herbaceous Alliance (California bulrush marsh), *Typha (angustifolia, domingensis, latifolia)* Herbaceous Alliance (cattail marshes), and *Eleocharis macrostachya*

Herbaceous Alliance (pale spike rush marshes), and the biological community is equivalent to the fresh emergent wetland community as defined by the CWHR System. Freshwater marsh communities in the habitat study area could include one sensitive marsh community as identified on the CDFW Sensitive Community List (Authority 2020c): *Carex barbarae* Herbaceous Alliance (white-root beds). Additionally, freshwater marsh communities are wetlands that are considered an aquatic resource.

These wetlands are scattered throughout the aquatic RSA but are most common in the Gilroy area, in the San Felipe Lake watershed. Access was granted to four parcels south of the Soap Lake area near Gilroy. In areas where access was not granted, the freshwater emergent marsh wetlands were identified on the basis of ponding visible from the road and aerial imagery.

Freshwater marshes are semi-permanently flooded areas that typically support perennial emergent vegetation, such as cattails, sedges, and rushes. Freshwater marshes are found on floodplains, in backwater areas, and in the channels of rivers and sloughs.

Freshwater emergent marsh in the aquatic RSA is generally associated with perennial drainages, sloughs, and irrigation canals. The density of freshwater emergent marsh vegetation varies from small, scattered clumps to large, dense stands. The dominant vegetation in freshwater emergent marsh consists of erect, herbaceous hydrophytes (water-adapted plants), including cattails and bulrushes, that are rooted in saturated or inundated soils. Other species that may be observed in freshwater emergent marsh are watercress, willow smartweed, and seep monkeyflower. Freshwater emergent marsh wetlands are classified by Cowardin et al. (1979) as palustrine emergent wetlands (PEM). A total of 51.47 acres of freshwater marsh were identified in the aquatic RSA.

2.4.1.3.1.5 Mixed Riparian-Natural Watercourse

Mixed riparian-natural watercourse communities are located within the ordinary high-water mark (OHWM) of natural watercourses and have persistent emergent vegetation that covers 30 percent or more of the area (Cowardin et al. 1979: page 44), and therefore are considered wetlands. These riparian wetlands are generally characterized by a prevalence of hydrophytic vegetation and occur on soils intermittently or seasonally flooded or saturated by the watercourse within which they occur. Mixed riparian wetlands are dominated by shrub species, and a tree canopy is absent. The shrub layer is typically very dense and dominated by willow shrubs. The understory of mixed riparian wetlands is usually absent because of the dense shrub layer; however, emergent annual vegetation, such as seaside barley and perennial rye grass, can occur as associates.

Twelve mixed riparian-natural watercourse wetlands were mapped in the aquatic RSA. These features are located within the OHWM of natural watercourses, including Coyote Creek, Pacheco Creek, Romero Creek, and some of the smaller tributaries. Mapping methods included using aerial photography and Light Detection and Ranging (LiDAR) to determine the OHWM of the natural watercourses and then analyzing areas where the vegetation cover meets or exceeds 30 percent of the area. Mixed riparian-natural watercourse wetlands are classified by Cowardin et al. (1979) as palustrine scrub-shrub wetlands (PSS). A total of 15.61 acres of mixed riparian-natural watercourse were identified in the aquatic RSA.

2.4.1.3.1.6 Palustrine Forested Wetland

Palustrine forested wetlands are classified by the *Manual of California Vegetation* as *Populus fremontii* Forest Alliance (Fremont cottonwood forest), and the biological community is equivalent to the valley foothill riparian community as defined by the CWHR System. Fremont cottonwood forest is considered a special-status plant community as identified on the CDFW Sensitive Community List (Authority 2020c). Palustrine forested wetlands are considered an aquatic resource.

Palustrine forested wetland communities are located on the banks of natural waterways, including streams, sloughs, and rivers, and, in some cases, constructed waterway features. These riparian areas are generally characterized by a prevalence of hydrophytic vegetation and occur on soils intermittently or seasonally flooded or saturated by freshwater systems. The tree canopy is dominated by Fremont cottonwood or mixed with other tree species, including box elder, Oregon ash, northern California black walnut, or California sycamore. The shrub layer within this community type is typically dominated by willow species and California wild grape. The understory of palustrine forested wetlands may support emergent perennial vegetation, such as cattails, sedges, and rushes.

Forty-five Palustrine forested wetlands were mapped in the aquatic RSA. These wetlands are concentrated in two areas associated with Coyote Creek near the Metcalf Energy Center and about 1 mile southeast of San Felipe Lake, associated with its watershed. Access was not granted in the two areas where the palustrine forested wetlands were mapped; they were identified on the basis of ponding visible from the road and aerial imagery.

Palustrine forested wetlands in the aquatic RSA are dominated by dense woody and herbaceous vegetation. Typically, the canopy is dominated by Fremont cottonwood and willow species. The understory is composed of vine and small shrub species, such as mulefat, narrowleaf willow, and California wild grape, with an understory of herbaceous species, such as sedge and rush.

Palustrine forested wetland hydrology is associated mainly with river and stream channels. The dominant water sources are overbank flow from the channel or subsurface hydraulic connections between the stream channel and other wetlands. Palustrine forested wetlands are classified by Cowardin et al. (1979) as palustrine forested wetlands (PFO). A total of 30.10 acres of palustrine forested wetland were mapped in the aquatic RSA.

2.4.1.3.1.7 Palustrine Forested Wetland-Natural Watercourse

Palustrine forested wetland-natural watercourse communities are located within the OHWM of natural watercourses. The vegetation characteristics are the same as those of the palustrine forested wetland; however, this wetland type is found within natural watercourses in which the water velocity is slow enough for wetland forests to persist.

Eighteen palustrine forested wetland-natural watercourse wetlands were mapped in the aquatic RSA. These features are located within the OHWM of natural watercourses, including Coyote Creek, Pacheco Creek, and tributaries to the Soap Lake area. Mapping methods included using aerial photography and LiDAR to determine the OHWM of the natural watercourses and then analyzing areas where vegetation cover meets or exceeds 30 percent of the area. Palustrine forested wetland-natural watercourse wetlands are classified by Cowardin et al. (1979) as palustrine forested wetlands (PFO). A total of 23.93 acres of palustrine forested wetland-natural watercourse were mapped in the study area.

2.4.1.3.1.8 Seasonal Wetland

Seasonal wetland communities are classified by the *Manual of California Vegetation* as *Lolium perenne* Herbaceous Semi-Natural Alliance (perennial rye grass fields), and the biological community is equivalent to the wet meadow community as defined by the CWHR System. Seasonal wetland communities in the habitat study area could include two sensitive marsh communities as identified on the CDFW Sensitive Community List (Authority 2020c): *Leymus triticoides* Herbaceous Alliance (creeping rye grass turfs) and *Mimulus (guttatus) Herbaceous* Alliance (common monkey flower seeps). Additionally, seasonal wetland communities are wetlands that are considered an aquatic resource.

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 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.

Delineators mapped 60 seasonal wetlands in the aquatic RSA. Seasonal wetlands are scattered throughout the aquatic RSA but are most common in the Gilroy area. They are typically associated with seasonal runoff from creeks and rivers. Seasonal wetlands were mapped based on visible ponding from road rights-of-way and from aerial imagery. Seasonal wetlands are a subclass of depressional wetlands and are classified by Cowardin et al. (1979) as palustrine emergent seasonally flooded (PEMC). A total of 95.27 acres of seasonal wetland were identified in the aquatic RSA.

2.4.1.3.1.9 Vernal Pool

Vernal pool areas are wetlands that are classified by the *Manual of California Vegetation* as *Lasthenia fremontii—Distichlis spicata* Herbaceous Alliance (Fremont's goldfields—salt grass alkaline vernal pools), and the biological community is equivalent to the annual grassland as defined by the CWHR System. Fremont's goldfields—salt grass alkaline vernal pool communities are considered a special-status plant community as identified on the CDFW Sensitive Community List (Authority 2020c). Additionally, vernal pools are wetlands that are considered an aquatic resource.

Vernal pools are a type of seasonal wetland characterized by a low amphibious, herbaceous community dominated by annual forbs and grasses. They 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 with clay soils. California annual grasslands can occur on similar soils but are not exclusively associated with vernal pools.

Common vernal pool plant species include woolly marbles, popcorn flower, water pigmy-stonecrop, annual hairgrass, purslane speedwell, and toad rush. Shallow vernal pools are often characterized by an abundance of nonnative grasses and forbs, such as seaside barley and hyssop-loosestrife, but these areas also typically contain relatively high cover of native vernal pool plants, such as coyote thistle. Deeper parts of vernal pools are often characterized by creeping spikerush.

Two vernal pools were mapped in the aquatic RSA. The vernal pools are located within an annual grassland area on the south side of Henry Miller Road on either side of the Santa Fe Grade canal. Based on soil survey mapping (Authority 2020b), these vernal pools are underlain by a very slowly permeable claypan subsoil. Access was not granted in the two areas where the vernal pools were mapped; they were identified on the basis of ponding visible from the road and aerial imagery. Vernal pools are a subclass of depressional wetlands and are classified by Cowardin et al. (1979) as palustrine emergent seasonally flooded (PEMC). A total of 1.22 acres of vernal pool were identified in the aquatic RSA.

2.4.1.3.2 Non-Wetland Waters Occurring in the Aquatic Resource Study Area

Five non-wetland water types were mapped in the aquatic RSA: constructed basin, constructed watercourse, freshwater pond, natural watercourse, and reservoir. These non-wetland waters are described in the subsections that follow.

2.4.1.3.2.1 Constructed Basin

Constructed basins in the habitat 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 vary. 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 types; both are considered potentially jurisdictional under the Preliminary Jurisdictional Delineation format (USACE 2008).

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 habitat 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. Constructed basins on average do not retain perennial water sources.

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 then either is 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, tall flat sedge, sprangletop, and fireweed.

Thirty constructed basins were mapped in the aquatic RSA. The constructed basins consist of stormwater basins and agricultural tailwater ponds that appear to have year-round, or nearly year-round, standing water. Some of these features function as irrigation water storage ponds, which are fed by pumped water. They generally have less than 5 percent cover by hydrophytic vegetation. Constructed basins are classified by Cowardin et al. (1979) as palustrine unconsolidated bottom (PUB). A total of 75.99 acres of constructed basins were identified in the aquatic RSA.

2.4.1.3.2.2 Constructed Watercourse

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 are routinely maintained by removing vegetation (e.g., by clearing or spraying). Constructed basins on average do not retain perennial water sources.

Many new watercourses have been constructed as a result of agricultural supply and drainage. In addition, many of the constructed watercourses have ephemeral or intermittent hydrology, flowing only during periods of agricultural demand or drainage. Constructed waterways within the study area are considered potentially jurisdictional under the Preliminary Jurisdictional Delineation format (USACE 2008).

Five hundred and forty-eight individual segments of constructed watercourses were mapped in the aquatic RSA. Constructed watercourses include artificial drainage ditches and irrigation canals. Constructed watercourses may occur as unvegetated features or as vegetated features that are regularly maintained (i.e., vegetation is periodically removed to maintain flow capacity). Constructed watercourses are classified by Cowardin et al. (1979) as riverine upper perennial (R3). A total of 130.44 acres of constructed watercourses were identified in the aquatic RSA.

2.4.1.3.2.3 Freshwater Pond

Freshwater pond aquatic cover type does not have a corresponding *Manual of California Vegetation* type. The biological community is equivalent to the lacustrine type as defined by the CWHR System. Freshwater ponds are non-wetland waters that are considered an aquatic resource.

Forty-nine freshwater ponds were mapped in the aquatic RSA. Most freshwater ponds in the aquatic RSA are excavated depressions associated with natural watercourses or topographic swales. They are supported by incident precipitation and runoff and are mostly located in the Pacheco Pass area. Freshwater ponds are classified by Cowardin et al. (1979) as palustrine unconsolidated bottom (PUB).

Freshwater ponds in the habitat study area are most commonly ephemeral constructed water features. They are inland depressions or dammed riverine channels containing standing water (Cowardin et al. 1979). A total of 29.83 acres of freshwater ponds were identified in the aquatic RSA.

2.4.1.3.2.4 Natural Watercourse

The natural watercourse aquatic cover type does not have a corresponding *Manual of California Vegetation* type; the biological community is equivalent to the riverine type as defined by the

CWHR System. Natural watercourses are non-wetland waters that are considered an aquatic resource.

Natural watercourses include perennial rivers and several intermittent to ephemeral sloughs and creeks. Additionally, natural watercourses can have ephemeral hydrology either because of their small watershed size or because they have been impounded or diverted upstream into other watercourses for agricultural purposes.

Natural watercourses have also been historically influenced by the anthropogenic stressors affecting streams elsewhere in the San Joaquin Valley, such as agricultural land conversions of floodplains and associated water diversions combined with more than a century of exotic fish and invertebrate introductions (Authority 2020c).

Three hundred and sixty-seven individual segments of natural watercourse were mapped in the aquatic RSA. The named natural watercourse features from east to west include Bear Creek, Los Banos Creek, San Joaquin River, Cottonwood Creek, Pacheco Creek, Pajaro River, Llagas Creek, Fischer Creek, Coyote Creek, Guadalupe River, and Los Gatos Creek. These watercourses may have perennial, intermittent, or ephemeral water flows, and some contain hydrophytic vegetation within their OHWM. They may support wetland vegetation, a riparian corridor, or both along their banks. Natural watercourses are classified by Cowardin et al. (1979) as riverine upper perennial (R3). A total of 142.25 acres of natural watercourse were identified in the aquatic RSA.

2.4.1.3.2.5 Reservoir

The reservoir aquatic cover type does not have a corresponding *Manual of California Vegetation* type. This biological community is equivalent to the lacustrine type as defined by the CWHR System. Reservoirs are non-wetland waters that are considered an aquatic resource.

Four portions of reservoirs were mapped in the aquatic RSA. The reservoirs mapped are associated with Coyote Creek, located north and south of Coyote. They receive flow from Anderson Lake, located approximately 3.5 miles to the southeast. Reservoirs are classified by Cowardin et al. (1979) as lacustrine limnetic (L1).

Reservoirs in the habitat study area are permanently flooded constructed water features. They are inland depressions or dammed riverine channels containing standing water (Cowardin et al. 1979). A total of 14.04 acres of reservoir were identified in the aquatic RSA.

2.4.1.4 Aquatic Resources Impact Evaluation Approach

The impact evaluation approach used in this Summary Report evaluates the effects on aquatic resources that would potentially result from construction and operation of the San Jose to Merced Section alternatives. The impacts to aquatic resources set out in this Summary Report (described later in the chapter) allow for comparison of the estimated effects across all San Jose to Merced Section alternatives.

For the purpose of this Summary Report, effects on aquatic resources are grouped in four categories: direct permanent, direct temporary, indirect, and indirect-bisected. Figure 2-23 illustrates three of the four types of effects, and Figure 2-24 illustrates indirect-bisected effects specific to vernal pool features.

The four impact categories are defined as follows (Table 2-3):

Direct Permanent: “Direct permanent” effects refer to the permanent loss of jurisdictional waters resulting from the discharge of dredge or fill material. These impacts are generally caused by the construction of permanent infrastructure, including the HSR tracks, stations, and supporting infrastructure. For the purpose of this analysis, it is assumed that any jurisdictional water located within the project section’s footprint will be permanently impacted. As such, the impact analysis should include a quantification of the impacts (in acres affected) and a qualitative narrative that describes the nature of those impacts.

Direct Temporary: "Direct temporary" effects refer to the temporary loss of jurisdictional waters that result primarily from short-term construction activities, such as laydown and storage areas. Areas affected by these short-term activities will be restored to pre-project conditions following the completion of construction. Temporary effects that last more than one year will be treated as permanent effects. The analysis of direct temporary effects should follow the same format as the analysis of direct permanent effects—i.e., quantify the impacts (in acres affected) and describe the nature of the impacts in a qualitative narrative.

Indirect or Secondary: "Indirect or secondary" effects are those effects on jurisdictional waters associated with the discharge of dredged or fill material, but not resulting from the actual placement of the dredged or fill material. Indirect effects occur later in time (after the discharge) or are farther removed in distance from the discharge but are reasonably foreseeable. Such adverse effects could include construction-related actions, such as the modification of hydrology, degradation of water quality or habitat conditions, or other adverse changes in environmental conditions that result from a discharge. Potential indirect effects are assessed only for those resources that occur within the 250-foot area established by the WSA. The analysis of indirect or secondary effects should be presented only by a qualitative narrative.

Indirect-Bisected: In certain circumstances, a vernal pool or vernal swale may fall partly within and partly outside the project section's footprint. The portion within the footprint is considered to be directly affected (i.e., direct effect), while the remaining portion that falls outside the footprint—and potentially extends beyond the WSA—is also assumed to be both directly and permanently affected. The effect on the portion of the vernal pool or vernal swale outside the footprint is referred to as an "indirect-bisected" effect. An indirect-bisected effect is mitigated for the entirety of the vernal pool or vernal swale, including the portion of the feature that extends beyond the WSA. Vernal pools or vernal swales located entirely within the WSA, but outside the project section's footprint, are evaluated to determine whether discharges within the footprint may result in an indirect effect to the resource.

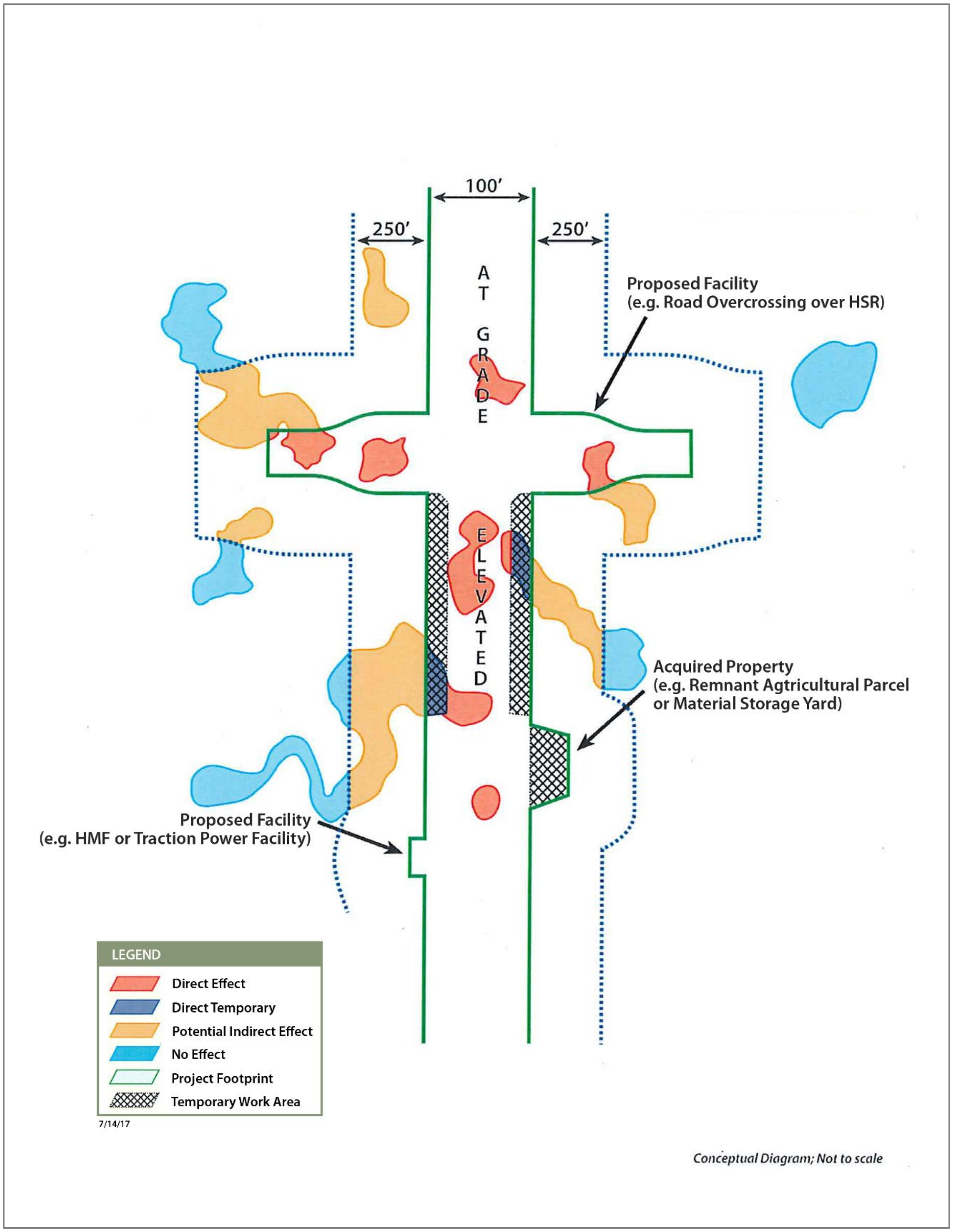
Table 2-3 Aquatic Resource Impact Analysis Methodology

Effect Type	Area of Effect	
Direct effects[1]	Project footprint	All waterbodies in the permanent footprint are assumed to be directly affected ("**direct permanent**"). Waterbodies in temporary laydown storage areas inside the footprint are treated as temporary impacts ("**direct temporary**") unless the effect lasts more than one year in which case it is assumed to be permanent.
Indirect effects[1]	250-foot buffer outside the project footprint	**Indirect effects** are qualitatively assessed for features that occur outside the footprint but within a 250' buffer beyond the footprint.
Indirect-bisected effects[2]	Occurs when vernal pools occur partially inside and partially outside the project footprint.	If a vernal pool or vernal swale falls partially inside and partially outside the project footprint it is treated as **indirect-bisected**. The Authority assumes the entire feature is permanently lost. If the vernal pool or swale occurs entirely outside the footprint but within 250' of the footprint it is qualitatively assessed for impacts per the indirect effects methodology above.

Source: Authority 2020a

1. Vernal pools located within the project footprint, and those partially located within the footprint, are considered directly and permanently affected in their entirety (i.e., the entire vernal pool is considered permanently affected if any part of the vernal pool is directly affected). Vernal pools located within 250 feet of the project footprint, but not within the project footprint, are considered potentially indirectly affected out to the 250-foot distance from the project footprint. This method was used because it is the most inclusive of the potential project effects and considering limitations on field surveys and direct observations.
2. Indirect bisected effects apply in circumstances where a vernal pool falls partially within the project footprint and extends into adjacent areas, including areas beyond 250 feet, and to capture the effects on both aquatic resources as well as vernal pool wildlife and plant species.

Figure 2-22 and Figure 2-23 below illustrate these concepts.



Source: Authority and FRA 2018b *FINAL– MARCH 10, 2017*

Figure 2-22 Approach for the Assessment of Direct and Indirect Impacts to Non-Vernal Pool Aquatic Resources

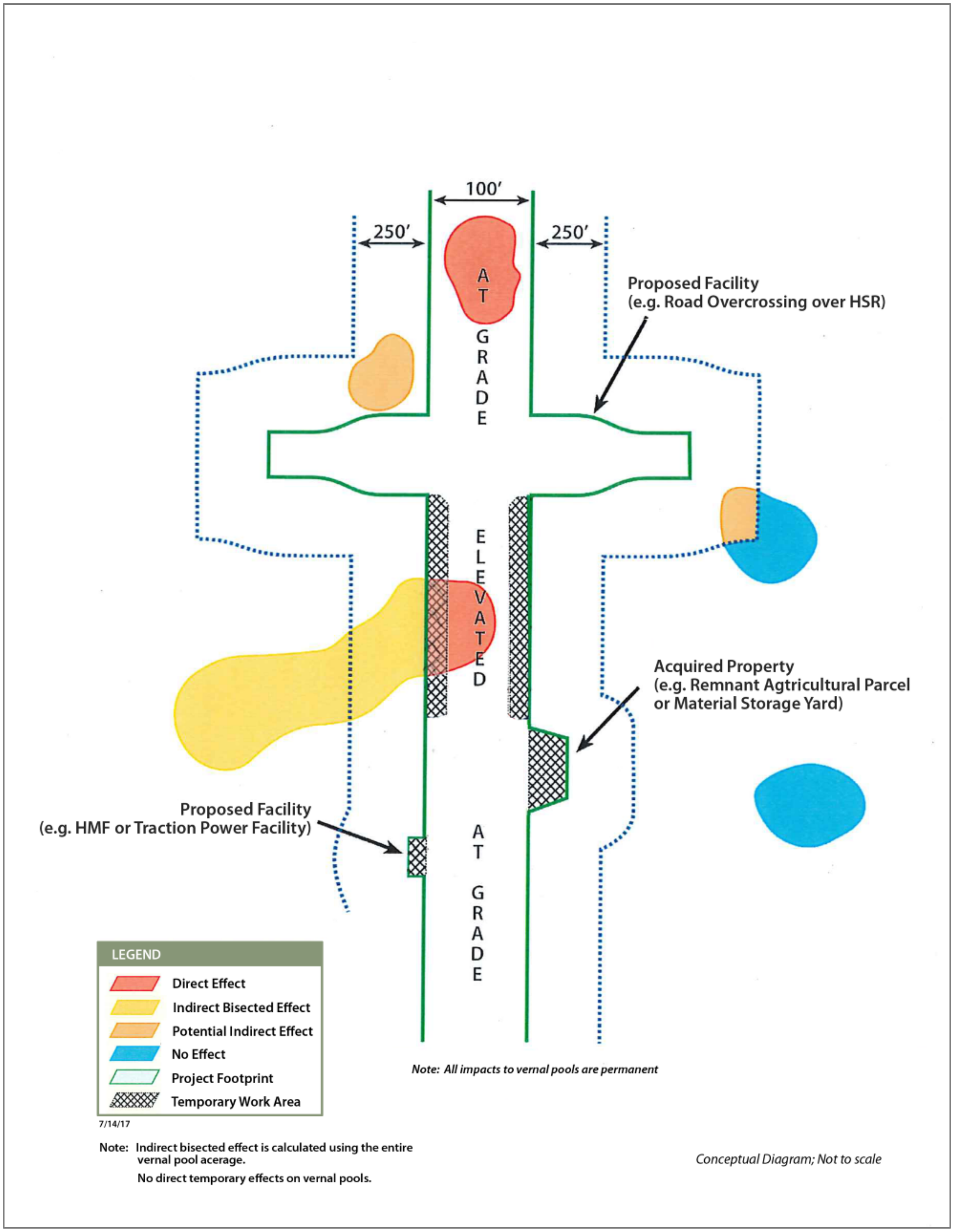


Figure 2-23 Approach for the Assessment of Direct and Indirect Impacts to Vernal Pool Aquatic Resources

2.4.2 Biological Resources

2.4.2.1 Definition of the Study Areas for Biological Resources

The Authority has established various specific biological RSAs. These RSAs are illustrated on Figure 2-24. The *Biological and Aquatic Resources Technical Report* (Authority 2020c) provides additional details.

The Core Habitat Study Area for biological resources encompasses the project footprint, including the proposed HSR right-of-way and associated facilities and a buffer of 250 feet on either side of the permanent footprint. This is the zone in which information is gathered to support analysis of direct effects on biological resources are analyzed as described below in Section 2.4.2.11.

Biologists conduct reconnaissance field surveys of the project extent within the core habitat study area. During these visits, biologists collect qualitative information on vegetation and wildlife habitat quality using geotagged digital photographs and field notes. Biologists also collect geospatial information on incidental observations of special-status wildlife using smartphones or tablets (Collector for ArcGIS). At the time of writing, approximately 75 percent of the project extent has been accessed or viewed from adjacent roadways during reconnaissance surveys.

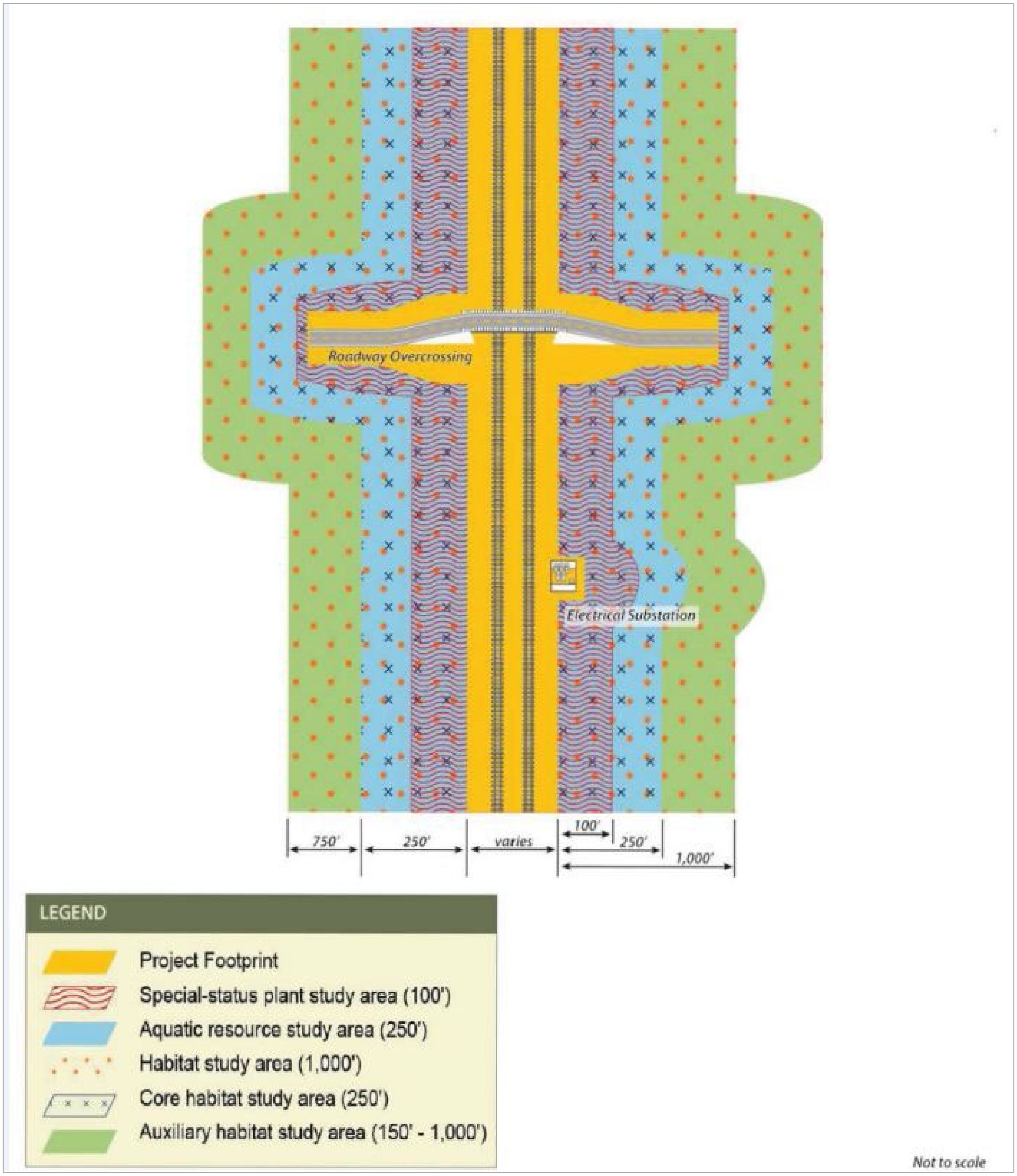
The Auxiliary Habitat Study area extends from 250 feet on either side of the project footprint to 1,000 feet from the edge of the project footprint. This is the zone in which information is gathered to support analysis of indirect effects on biological resources are analyzed as described in Section 2.4.2.11.

The Special-Status Plant Study Area consists of the area within which information is gathered to support analysis of impacts on special-status plants (note that impacts on vernal pool species subject to indirect effects are qualitatively assessed within 250 feet of the project footprint).

The Regional RSA consists of the area used for developing habitat and landcover models to assess opportunities for compensatory mitigation.

The Wildlife Movement Study Area and the Local Permeability Analysis Study Area consist of the areas used to model the qualitative and quantitative degree of movement capability for wildlife (“permeability”) respectively.

Once relevant data such as landcover types, conservation areas, and wildlife movement corridors were identified this information was used to build habitat models and evaluate impacts as described below in Section 2.4.2.11.



Source: Authority 2020c

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Figure 2-24 Schematic of Biological Resource Study Areas

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

Land cover mapping was conducted by using a combination of reconnaissance-level fieldwork, review of existing geographic information system (GIS) land cover mapping data, and interpretation of aerial photographs. The classification of the land cover and vegetation communities was adapted from previous HSR sections or identified using the *Manual of California Vegetation* or the CWHR System (Authority 2020c). Table 2-4 provides the area of land cover within each of the project alternatives. Land cover maps for the habitat study area are provided in Appendix C, Species Accounts and Plant Communities and Land Cover Types within the Habitat Study Area.

Table 2-4 Land Cover Types in the San Jose to Merced Section Footprint (acres)[1]

Land Cover Type	Alternative 1 Project Footprint	Alternative 2 Project Footprint	Alternative 3 Project Footprint	Alternative 4 Project Footprint
Tree-Dominated				
Blue oak–foothill pine woodland	0.0	0.0	0.0	0.0
California sycamore woodland	12.6	12.6	12.6	12.6
Coast oak woodland	603.2	604.3	607.1	603.4
Mixed riparian	26.3	27.6	30.3	20.9
Palustrine forested wetland	16.3	15.9	11.6	12.9
Subtotal	*658.4*	*660.4*	*661.6*	*649.8*
Shrub-Dominated				
Alkali scrub wetland	0.8	0.8	0.8	0.8
Coastal scrub	0.9	4.6	0.9	3.5
Mixed chaparral	35.9	35.9	35.3	35.9
Subtotal	*37.6*	*41.3*	*37.0*	*40.2*
Herbaceous-Dominated				
Alkali marsh	9.7	9.7	9.7	9.7
Alkali vernal pool[1]	27.1	27.1	27.1	27.1
California annual grassland	1,246.7	1,274.6	1,252.8	1,200.0
Freshwater marsh	2.3	2.4	11.3	2.3
Seasonal wetland	15.9	16.3	13.9	11.7
Vernal pool	0.4	0.4	0.4	0.4
Subtotal	*1,302.1*	*1,330.5*	*1,315.2*	*1,251.2*

Land Cover Type	Alternative 1 Project Footprint	Alternative 2 Project Footprint	Alternative 3 Project Footprint	Alternative 4 Project Footprint
Aquatic				
Freshwater pond	5.4	5.4	4.5	5.4
Natural watercourse	31.5	32.2	33.1	28.6
Reservoir	0.1	0.2	0.1	0.0
Subtotal	*37.0*	*37.8*	*37.7*	*34.0*
Developed				
Commercial/industrial	62.1	66.3	80.9	60.9
Constructed basin	56.6	63.3	41.3	40.7
Constructed watercourse	35.3	38.7	35.8	33.0
Ornamental woodland	17.4	22.0	25.2	0.9
Urban	1,079.5	1,498.3	960.1	801.3
Urban landscaping	33.6	28.7	33.8	3.6
Subtotal	*1,284.5*	*1,717.3*	*1,177.1*	*940.3*
Agricultural				
Agricultural field crop	813.6	874.5	822.8	812.7
Orchard	269.3	249.3	257.1	165.7
Row crop	499.2	680.0	680.2	426.3
Vineyard	37.7	37.7	39.3	37.7
Subtotal	*1,619.8*	*1,841.5*	*1,799.4*	*1,442.4*
Nonvegetated				
Rock outcrop	2.2	2.2	2.2	2.2
Subtotal	*2.2*	*2.2*	*2.2*	*2.2*
Total	**4,941.6**	**5,631.0**	**5,030.2**	**4,360.1**

Source: Authority 2020c
Calculations generated using ESRI ArcGIS 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.
Each acreage total includes acreages of utility upgrades, which are mapped from the project footprint to the limit of the core habitat study area (250 feet from the project footprint boundary).
[1] The alkali vernal pool type includes areas mapped as vernal pool complexes. Acreage provided is an estimate of the wetted vernal pool area within vernal pool complexes. For this resource category alone [AVP] we identify the total acreage affected, which extends not only beyond the footprint, but beyond the edge of the wetland study area because this is the acreage that may be indirectly bisected, consistent with the aquatic impact methodology.

2.4.2.2.1 Tree-Dominated Cover Types

Five tree-dominated cover types were identified in the habitat study area: blue oak-foothill pine, California sycamore woodland, coastal oak woodland, mixed riparian, and palustrine forested wetland. Of these types, California sycamore woodland, mixed riparian, and palustrine forested wetland are considered both special-status plant communities and aquatic resources.

2.4.2.2.1.1 Blue Oak-Foothill Pine

Blue oak-foothill pine woodlands are classified by the *Manual of California Vegetation* as *Quercus douglasii—Pinus sabiniana* Association within the *Quercus douglasii* Woodland Alliance (blue oak woodland), and by the CWHR System as blue oak-foothill pine. The dominant tree canopy contains blue oaks, with a minimum of 10-percent canopy cover containing foothill pine. Codominant and associate tree species include coast live oak, valley oak, and California buckeye. The understory includes a clumping to open shrub composition of *Ceanothus* spp., redberry, California coffeeberry, poison-oak, silver lupine, blue elder, California yerba-santa, rock gooseberry, and California redbud. Patches of open canopy allow for interspersed areas of annual grasses and forbs (Authority 2020c).

2.4.2.2.1.2 California Sycamore Woodland

California sycamore woodlands are classified by the *Manual of California Vegetation* as *Platanus racemosa* Woodland Alliance (California sycamore woodlands), and the biological community is equivalent to the valley foothill riparian community as defined by the CWHR System. California sycamore woodlands are considered a special-status plant community as identified on the CDFW Sensitive Community List (Authority 2020c).

California sycamore woodlands are dominated by a tree canopy which contains greater than 30 percent of western sycamore with valley oak and cottonwood as associates. The understory can be open to intermittently dense with willows, California bay, button bush, and rushes. California sycamore woodlands are located adjacent to floodplains that are subject to high-intensity flooding, as well as intermittent streams, seeps, and stream banks (Authority 2020c).

2.4.2.2.1.3 Coastal Oak Woodland

Coastal oak woodlands are classified by the *Manual of California Vegetation* as *Quercus agrifolia* Woodland Alliance (coast live oak woodland), and the biological community is coastal oak woodland as defined by the CWHR System. Coast live oak is the dominant or codominant species in the tree canopy with California bay, madrone, tanbark oak, canyon live oak, valley oak, blue oak, foothill pine. The understory is sparse to intermittent with creeping snowberry, toyon, bracken fern, bush monkeyflower, coyote brush, black sage, California sagebrush, and grassland species in openings. Coastal oak woodlands are located on alluvial terraces, canyon bottoms, stream banks, slopes, and flats.

2.4.2.2.1.4 Mixed Riparian

Mixed riparian communities are classified by the *Manual of California Vegetation* as *Salix lasiolepis* Shrubland Alliance (arroyo willow thickets), and the biological community is equivalent to the valley foothill riparian community as defined by the CWHR System. Mixed riparian communities in the habitat study area could include two sensitive riparian communities as identified on the CDFW Sensitive Community List (Authority 2020c): *Rosa californica* Shrubland Alliance (California rose briar patches) and *Sambucus nigra* Shrubland Alliance (blue elderberry stands). Additionally, mixed riparian areas are considered to be wetlands.

Mixed riparian is dominated or codominated by a tall shrub or low tree canopy containing greater than 50 percent of arroyo willow. Emergent trees such as California sycamore, valley oaks, and cottonwoods may be present at a low cover. Understories or rushes and wetland grasses are variable in density. Mixed riparian occurs along the banks of major rivers and streams and is generally characterized by a prevalence of hydrophytic vegetation. In some locations this plant community occurs below OHWM and is classified as a water of the United States.

2.4.2.2.1.5 Palustrine Forested Wetland

Palustrine forested wetlands are considered a water of the U.S. and are therefore described in Section 2.4.1.3, Existing Conditions: Jurisdictional Resources.

2.4.2.2.2 Shrub-Dominated Cover Types

Three shrub-dominated cover types were identified in the habitat study area: alkali scrub wetland, coastal scrub, and mixed chaparral.

2.4.2.2.2.1 Alkali Scrub Wetland

Alkali scrub wetlands are considered a water of the U.S. and are therefore described in Section 2.4.1.3, Existing Conditions: Jurisdictional Resources.

2.4.2.2.2.2 Coastal Scrub

Coastal scrub includes areas classified by the *Manual of California Vegetation* as *Baccharis pilularis* Shrubland Alliance (coyote brush scrub) and potentially other scrub alliances. The biological community is coastal scrub as defined by the CWHR System.

Coastal scrub in the habitat study area is dominated by coyote brush with associates of bush monkeyflower, bush lupine, California sagebrush, and grassland species in openings. Coastal scrub areas are located on flats, ridgetops, and stony slopes on granitic, sedimentary, or serpentine substrates.

2.4.2.2.2.3 Mixed Chaparral

Mixed chaparral includes areas classified by the *Manual of California Vegetation* as *Quercus berberidifolia* Shrubland Alliance (scrub oak chaparral) or *Eriogonum wrightii* Dwarf Shrubland Alliance (Wright's buckwheat patches) and potentially other chaparral alliances. The biological community is mixed chaparral as defined by the CWHR System. Wright's buckwheat patches chaparral community is considered a special-status plant community as identified on the CDFW Sensitive Community List (Authority 2020c).

Scrub oak is the dominant or codominant species in the shrub canopy or buckwheat with chamise, manzanita, buck brush, and poison oak. Emergent trees may be present at low cover, including California buckeye, foothill pine, or coast live oak. Grassland species occur in openings. Mixed chaparral areas are located on primarily north-facing, steep slopes. Soils are deep to shallow and are well to extensively drained.

2.4.2.2.3 Herbaceous-Dominated Habitats

Six herbaceous-dominated cover types were identified in the habitat study area: alkali marsh, alkali vernal pool, California annual grassland, freshwater marsh, seasonal wetland, and vernal pool.

2.4.2.2.3.1 Alkali Marsh

Alkali marsh areas are considered a water of the U.S. and are therefore described in Section 2.4.1.3, Existing Conditions: Jurisdictional Resources.

2.4.2.2.3.2 Alkali Vernal Pool

Alkali vernal pool areas are considered a water of the U.S. and are therefore described in Section 2.4.1.3, Existing Conditions: Jurisdictional Resources.

2.4.2.2.3.3 California Annual Grassland

California annual grassland communities are described in Section 2.5.1.3, Existing Conditions: Jurisdictional Resources, because they occur as part of the alkali vernal pool/California annual grassland complex.

2.4.2.2.3.4 Freshwater Marsh

Freshwater marsh communities are considered a water of the U.S. and are therefore described in Section 2.4.1.3, Existing Conditions: Jurisdictional Resources.

2.4.2.2.3.5 Seasonal Wetland

Seasonal wetland communities are considered a water of the U.S. and are therefore described in Section 2.4.1.3, Existing Conditions: Jurisdictional Resources.

2.4.2.2.3.6 Vernal Pool

Vernal pool areas are considered a water of the U.S. and are therefore described in Section 2.4.1.3, Existing Conditions: Jurisdictional Resources.

2.4.2.2.4 Aquatic Cover Types

Aquatic cover types, for the purposes of this section, are areas inundated with water and, for the most part, void of vegetation. Three aquatic cover types were identified in the habitat study area: freshwater pond, natural watercourse, and reservoir. These are all considered waters of the U.S. and are therefore described in Section 2.4.1.3, Existing Conditions: Jurisdictional Resources.

2.4.2.2.5 Developed Cover Types

Six developed habitat types were identified in the habitat study area: commercial/industrial, constructed basin, constructed watercourse, ornamental woodland, urban, and urban landscaping. Developed areas in the habitat study area include various types of urban and rural developed land use, such as urban areas, commercial and industrial buildings, transportation corridors, and barren areas where vegetation has been removed or is absent.

2.4.2.2.5.1 Commercial/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.

2.4.2.2.5.2 Constructed Basin

Constructed basins are considered a water of the U.S. and are therefore described in Section 2.4.1.3, Existing Conditions: Jurisdictional Resources.

2.4.2.2.5.3 Constructed Watercourse

Constructed watercourses are considered a water of the U.S. and are therefore described in Section 2.4.1.3, Existing Conditions: Jurisdictional Resources.

2.4.2.2.5.4 Ornamental Woodland

Ornamental woodlands are most closely classified by the *Manual of California Vegetation* as the *Eucalyptus* (*globulus*, *camaldulensis*) Woodland Semi-Natural Alliance (Eucalyptus groves), and the biological community is eucalyptus as defined by the CWHR System. These areas are characterized by relatively dense stands of eucalyptus trees or other ornamental trees planted as groves and windbreaks. The planted communities have naturalized and are located on uplands and stream courses. The understory vegetation typically comprises introduced annual grasses such as ripgut brome and Bermuda grass with goose grass and dovefoot geranium. In some areas, giant reed is also a common associated understory species.

2.4.2.2.5.5 Urban

Urban habitat includes roads, railways, relatively high-density residential areas, and parks that may include landscaped areas, yards, gardens, and various buildings.

2.4.2.2.5.6 Urban Landscaping

Urban landscaping includes developed and maintained open, grassy areas, picnic facilities, and children's playgrounds. Many urban areas include large landscape and shade trees, such as ash, cedar, eucalyptus, London plane, maple, redwood, and pine.

2.4.2.2.6 Agricultural Cover Types

Four agricultural cover types were identified in the habitat study area: agricultural field crop, orchard, row crop, and vineyard. Water features, such as canals, drainages, and constructed basins, are associated with agriculture. Agricultural lands provide limited plant and wildlife habitat value relative to natural and semi-natural cover types as a result of lower species diversity 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, and 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. The following sections describe the agricultural types identified in the habitat study area.

2.4.2.2.6.1 Agricultural Field Crop

Agricultural field crops consist of monocultures that are intensely managed and frequently harvested and replanted, often on a seasonal rotational basis. Agriculture field crops include dry land grain crops and irrigated hay crops. Dry land grain crops include nonirrigated annual grass crops such as wheat, barley, and rye. Other annual grasses and herbaceous weeds are frequently interspersed along the margins of dry crop fields. Common irrigated hay crops include species such as oats, ryegrass, wheat, Sudan grass, and alfalfa. Within the habitat study area, these crops are planted as monocultures in large, predominantly flood-irrigated fields.

2.4.2.2.6.2 Orchard

Deciduous orchard crops in the habitat study area include almond trees, cherry trees, and walnut trees. Evergreen orchards of olives are also present. Orchards consist of monocultures of evenly spaced, generally low bushy trees that are similar in canopy size and tree height. Canopy cover ranges from open to dense depending on the age of the trees, with saplings and young trees having relatively open canopies and older trees providing more closed canopy cover. Depending on management levels, the understory is either devoid of vegetation or composed of various weedy annual grasses and forbs. Where herbaceous vegetation is present, it is often mowed, sprayed, or tilled to facilitate harvest and conserve water.

2.4.2.2.6.3 Row Crop

Irrigated row crops in the habitat study area include sweet potatoes, cotton, tomatoes, lettuce, beans, and garlic. Most field and row crops in the habitat study area are flood-irrigated, although sprinkler irrigation is used in some areas. Nonnative annual grasses and herbaceous weeds are uncommon as a result of active cultivation and herbicide application.

2.4.2.2.6.4 Vineyard

Vineyards include cultivated wine, table, and raisin grapes grown in evenly spaced rows that are variable in canopy cover depending on the age and growth of the vines. The understory vegetation is variable depending on management practices. In some vineyards, herbaceous vegetation is nearly absent, and in other areas weedy annual grasses and forbs are common. Where herbaceous vegetation is present, it is often managed with herbicides, mowing, and tilling. Drip methods are most commonly used to irrigate the vineyards in the habitat study area.

2.4.2.2.7 Nonvegetated Cover Types

One nonvegetated cover type was identified in the habitat study area: rock outcrop.

2.4.2.2.7.1 Rock Outcrop

Rock outcrop areas consist of large rock formations on the surface of the surrounding land. They can be an exposure of bedrock or deposited rocks and are visible from aerial photographs.

2.4.2.3 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), or California Native Plant Protection Act or if they meet the definitions of rare, threatened, or endangered under CEQA Guidelines Sections 15380 and 15125. This includes species with California Rare Plant Rankings of 1A, 1B, 2A, 2B, and 3. Special-status plant species include the following species, which are described in Appendix C:

- Colusa grass (*Neostapfia colusana*);
- Coyote ceanothus (*Ceanothus ferrisiae*);
- Greene's tuctoria (*Tuctoria greenei*);
- Hairy Orcutt grass (*Orcuttia pilosa*);
- Hoover's spurge (*Euphorbia hooveri*, formerly known as *Chamaesyce hooveri*);
- Metcalf Canyon jewelflower (*Streptanthus albidus* ssp. *albidus*);
- Palmate-bracted bird's-beak (*Chloropyron palmatum*, formerly known as *Cordylanthus palmatus*);
- San Joaquin Orcutt grass (*Orcuttia inaequalis*);
- Santa Clara Valley dudleya (*Dudleya abramsii* ssp. *setchellii*, formerly known as *Dudleya setchellii*);
- Succulent owl's-clover (*Castilleja campestris* var. *succulenta*); and
- Tiburon paintbrush (*Castilleja affinis* var. *neglecta*).

2.4.2.4 Special-Status Wildlife Species

Special-status wildlife species are defined as species meeting one or more of the following criteria: (1) proposed or candidates for listing or listed as threatened or endangered under the FESA; (2) candidates for listing or listed as threatened or endangered under CESA; (3) California fully protected species or species of special concern; or (4) species with a special status established by a federal or State agency with the authority to make such a designation

Special-status wildlife species include the following species, which are described in Appendix C:

- Bay checkerspot butterfly (*Euphydryas editha bayensis*),
- Crotch's bumble bee (*Bombus crotchii*),
- Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*),
- Conservancy fairy shrimp (*Branchinecta conservatio*),
- Longhorn fairy shrimp (*Branchinecta longiantenna*),
- Vernal pool fairy shrimp (*Branchinecta lynchi*),
- Vernal pool tadpole shrimp (*Lepidurus packardi*),
- Pacific lamprey (*Entosphenus tridentatus*),
- Chinook salmon (Central Valley Fall-run) (*Oncorhynchus tshawytscha*),
- Central California coast (CCC) and south-central California coast (SCCC) steelhead (*Oncorhynchus mykiss*),
- California red-legged frog (*Rana draytonii*),
- California tiger salamander (CTS) (*Ambystoma californiense*),
- Foothill yellow-legged frog (*Rana boylii*),
- Blunt-nosed leopard lizard (*Gambelia sila*),
- Giant garter snake (*Thamnophis gigas*),
- Bald eagle (*Haliaeetus leucocephalus*),
- California condor (*Gymnogyps californianus*),
- Greater sandhill crane (*Antigone canadensis tabida*),
- Lesser sandhill crane (*A. c. canadensis*),
- Least Bell's vireo (*Vireo bellii pusillus*),
- Swainson's hawk (*Buteo swainsoni*),
- Tricolored blackbird (*Agelaius tricolor*),
- Fresno kangaroo rat (*Dipodomys nitratoides exilis*), and
- San Joaquin kit fox (*Vulpes macrotis mutica*).

2.4.2.5 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 term *corridor* is used by ecologists and conservation biologists in a variety of ways. Hilty et al., as cited by the Authority (2020c), define a corridor as “any space, usually linear in shape, that improves the ability of organisms to move among patches of their habitat.” Similarly, Beier and Loe, as cited by the Authority (2020c), define wildlife corridors as linear habitat features that connect two or more habitat areas and are intended to provide connectivity and movement function for wildlife between larger core habitat areas. Wildlife corridors may be naturally existing, or they may be created to facilitate wildlife movement and connectivity in a fragmented landscape.

Wildlife corridors serve to reduce some of the effects of habitat fragmentation by facilitating dispersal and distribution of individuals between functional patches of remaining habitat, genetic and demographic exchange, and re-colonization of habitat patches from which populations have been locally extirpated. Without functional connectivity between habitat areas, wildlife may be subject to population collapse and in severe cases, extinction events. Corridors can be viewed over broad spatial scales, from those connecting continents (e.g., Isthmus of Panama) to structures crossing canals or roads. Most wildlife corridors analyzed within the context of land use planning, including those in this document, are moderate in scale and facilitate regional wildlife movement among habitat patches and through human-dominated landscapes.

For the purposes of this document, *wildlife corridor* refers to an area that has been identified in regional or statewide reports or identified by the wildlife agencies (i.e., U.S. Fish and Wildlife Service (USFWS) or CDFW) as important for the preservation of connectivity for federally listed or state-listed species. The term *connectivity* in this document refers to “the extent to which a species or population can move among landscape elements in a mosaic of habitat types” (Authority 2020c).

The *Coyote Valley Landscape Linkage* report recommends specific actions to improve wildlife movement across Coyote Valley. Recommendations include enhancements to existing crossings (e.g., Fisher Creek), new crossings (culverts and overpasses), conservation of land, and additional research (Authority 2020c).

The project extent crosses several wildlife corridors of regional importance. Although corridors occur in all subsections, those in the Santa Clara Valley (specifically, the Coyote Valley) and San Joaquin Valley (GEA) have been identified by the CDFW and local stakeholders as particularly important to wildlife movement and habitat connectivity at the regional and state scale. Further details on existing wildlife corridors within the regional RSA are provided in Chapter 5 of the Wildlife Corridor Assessment Report (Appendix C of Authority 2020c).

2.4.2.6 Special-Status Plant Communities

Special-status plant communities identified as potentially occurring in the special-status plant study area based on California Natural Diversity Database search results. Fourteen special-status plant communities identified as potentially occurring in the regional RSA based on California Natural Diversity Database search results (Authority 2020c) were identified as having the potential to occur within the special-status plant study area. Land cover types that qualify as special-status plant communities, or that could contain unmapped occurrences of a special-status plant community, are listed in Table 2-5.

Table 2-5 Special-Status Plant Communities Occurring in the Special-Status Plant Study Area

Land Cover Type	Corresponding CDFW Natural Community Name
Alkali marsh	*Frankenia salina* Herbaceous Alliance
Alkali scrub wetland	*Allenrolfea occidentalis* Shrubland Alliance
Alkali vernal pool	*Cressa truxillensis – Distichlis spicata* Herbaceous Alliance
California annual grassland	*Nassella pulchra* Herbaceous Alliance
California sycamore woodland	*Platanus racemosa* Woodland Alliance
Freshwater marsh	*Carex barbarae* Herbaceous Alliance
Mixed chaparral	*Eriogonum wrightii* Dwarf Shrubland Alliance
Mixed riparian	*Rosa californica* Shrubland Alliance *Quercus lobata* Woodland Alliance *Sambucus nigra* Shrubland Alliance
Palustrine forested wetland	*Populus fremontii* Forest Alliance
Seasonal wetland	*Leymus triticoides* Herbaceous Alliance *Mimulus (guttatus) Herbaceous* Alliance
Vernal pool	*Lasthenia fremontii – Distichlis spicata* Herbaceous Alliance

Source: Authority 2020c
CDFW = California Department of Fish and Wildlife

2.4.2.7 Essential Fish Habitat

The habitat study area contains designated essential fish habitat (EFH) for Pacific coast salmon. Specifically, Amendment 14 to the Pacific Salmon Fishery Management Plan identifies freshwater EFH for Chinook salmon in the Coyote Creek hydrologic unit (Hydrologic Unit Code (HUC)-8 18050003), which is composed of the Saratoga Creek, Guadalupe River, Upper Coyote Creek, and Lower Coyote Creek hydrologic areas (Authority 2020c). Freshwater EFH for Chinook salmon supports four major activities: (1) spawning and incubation, (2) juvenile rearing, (3) juvenile migration, and (4) adult migration and adult holding. Chinook salmon essential freshwater habitat includes "all those streams, lakes, ponds, wetlands, tributaries, and other waterbodies currently viable and most of the habitat historically accessible to Chinook salmon within Washington, Oregon, Idaho and California" (Authority 2020c).

Chinook salmon have spawned in Coyote Creek since at least the mid-1980s. Most spawning has been observed in the lowermost reaches, but adults have been observed as far upstream as Metcalf Dam at Anderson Reservoir. Chinook salmon is assumed to occur in the habitat study area. although it is currently unknown if spawning is successful. The Santa Clara Valley Water District last captured a few juveniles in both Coyote Creek and the Guadalupe River during a trapping effort in the late 1990s (Authority 2020c).

2.4.2.8 Critical Habitat

Areas designated as critical habitat and EFH consist of geographic areas or features that USFWS and the National Marine Fisheries Service (NMFS) deemed important for the conservation of federally listed fish species or federally managed fisheries, respectively.

Designated critical habitat for several federally listed species would fall within the project footprint. These critical habitat units are shown in Table 2-6.

Table 2-6 Critical Habitat Designations[1] by Subsection

Resource	San Jose Diridon Station Approach	Monterey Corridor	Morgan Hill and Gilroy	Pacheco Pass	San Joaquin Valley
Bay checkerspot butterfly	–	–	Tulare Hill Unit (6) San Martin Unit (12)	–	–
Central California coast steelhead	Santa Clara Hydrologic Unit (Coyote Creek, Guadalupe River)	Santa Clara Hydrologic Unit (Coyote Creek, Guadalupe River)	Santa Clara Hydrologic Unit (Coyote Creek)	–	–
South-central California coast steelhead	–	–	Pajaro River Hydrologic Unit (Miller's Canal, Llagas Creek, Uvas Creek, Pacheco Creek, Pajaro River)	Pajaro River Hydrologic Unit (Cedar Creek, North Fork Pacheco Creek, Pacheco Creek, South Fork Pacheco Creek)	–
Central Population of California tiger salamander	–	–	San Felipe Unit (EB-12) Lions Peak Unit (10a and 10b)	–	–
California red-legged frog	–	–	Wilson Peak Unit (STC-2)	Wilson Peak Unit (STC-2)	–

Source: Authority 2020c
[1] *Critical habitat designations = critical habitat unit or hydrologic unit names assigned by USFWS or NMFS in the Federal Register, followed by numerical descriptor or streams in parentheses.*

2.4.2.9 Biological Resources Impact Evaluation Approach

The biological resources impact evaluation focuses on species for which the impacts differ between alternatives. Landcover mapping was used as one of the primary sources of information for modeling of species habitat which in turn was used as the basis for evaluating impacts. The land cover types and natural communities discussed above were associated with the range of individual species and habitat types they are known to use to build models as described below.

2.4.2.9.1 Species Modeling Methods

Habitat models bring together information about environmental attributes, species life history, and environmental requirements to create a spatially explicit model of suitable habitat at a regional scale. The models are created and displayed using GIS software (ArcGIS 10.3). Once in GIS, the habitat models can be intersected with the project footprint and resource layers to determine impacts and assess mitigation opportunities. As used in this document habitat means "suitable habitat" because protocol surveys to confirm presence or absence were not conducted.

The *San Jose to Merced Project Section: Biological and Aquatic Resources Technical Report* (Biological and Aquatic Resources Technical Report) (Authority 2020c) provides detailed information regarding the species for which models were developed, the type of model developed, the iterative process through which models were developed, and the source of the model, if applicable. Habitat was modeled for species determined to have potential to be affected by the project. Species chosen for modeling have range, modeled habitat, and occurrences that overlap with or are near the project footprint.

2.4.2.9.1.1 Impact Types and Mechanisms

Project impacts may be direct (i.e., caused by the activity and occurring in the same time and place) or indirect (i.e., caused by the activity but removed in time or distance, but still reasonably foreseeable). Direct impacts would occur within the project footprint during construction and could be temporary (e.g., habitat loss or disturbance resulting from construction staging and activities but restored to pre-project conditions following construction) or permanent (e.g., removal and conversion of existing habitat to HSR facilities). Direct impacts would also occur during operations and would be intermittent (i.e., not continuous but recurring during rail operations on an episodic or occasional basis throughout the life of the system). Indirect impacts could occur both within and adjacent to the project footprint.

Direct construction impacts on special-status species habitat, special-status plant communities, and conservation areas were quantified using GIS. Specifically, GIS analysts calculated areas of impact by intersecting biological resource feature layers (e.g., special-status species habitat models) with feature layers in the project design drawings (i.e., project activities). Feature layers for special-status species habitat are equivalent to the species habitat models developed specifically for the project.

Direct and indirect construction impacts on wildlife movement and certain groups of non-special-status wildlife (i.e., waterfowl, shorebirds, and wading birds) were evaluated using a variety of quantitative and qualitative methods, including selection and scoring of focal species (i.e., species whose movement needs are representative of a wider variety of species in a given landscape) and permeability modeling.

Indirect construction impacts and direct intermittent and indirect operations impacts are described qualitatively because it is difficult to measure or predict species' or plant community response to future or far-removed environmental factors, especially at the scale of individual plants or animals. Indirect impacts were assessed based on biologists' understanding of the best available science for a given resource and proposed construction and operations activities.

A key component of describing impacts from construction and operations are the impact mechanisms (i.e., the physical activities associated with the project that could result in effects on biological and aquatic resources). The following categories of impact mechanisms were identified:

- **Permanent**—Project activities that would permanently alter land cover from its existing condition
- **Short-Term Temporary**—Project activities with a duration of 1 year or less that would result in temporary disturbance to existing land cover. Affected areas would be restored to pre-disturbance conditions after work completed.
- **Long-Term Temporary**—Project activities with a duration of 1–5 years that would result in temporary disturbance to existing land cover. Affected areas would be restored to pre-project conditions. Effects lasting longer than 5 years would be considered to be permanent.

Indirect and direct intermittent effects on biological and aquatic resources are described qualitatively because it is difficult to measure or predict species' or plant community response to future and/or far-removed environmental factors, especially at the scale of individual plants or animals. Indirect effects were assessed based on biologists' understanding of the best available science for a given resource and proposed construction and operations activities.

A key component of describing effects from construction and operations is the effect mechanisms (i.e., the physical activities associated with the project that could result in effects on biological and aquatic resources). The following categories of effect mechanisms were identified:

- **Ground disturbance**
  - **Construction**—Grading, clearing, and excavation needed to construct the project

  - **Operations**—Minor grading, clearing, and excavation necessary to maintain the project right-of-way
- **Vegetation removal**
  - **Construction**—Removal of trees and other vegetation as part of site preparation
  - **Operations**—Tree pruning or weed management along the right-of-way
- **Structure modification/demolition**
  - **Construction**—Modification or removal of existing buildings, bridges, roadways, or other structures
  - **Operations**—Not applicable: no existing structures would be removed during operations
- **Hazardous material and pollutant release**
  - **Construction**—Inadvertent release of hazardous materials (e.g., oils and fluids from construction equipment) into sensitive habitat or aquatic resources
  - **Operations**—Same as for construction
- **Hydrologic modification**
  - **Construction**—Changes to the hydrology of an aquatic resource, either from a change in topography or temporarily to divert water from a work area
  - **Operations**—Not applicable: minor ground disturbance during operations would not alter topography to an extent that would result in hydrologic change
- **Noise**
  - **Construction**—Noise generated by heavy equipment and workers
  - **Operations**—Noise generated by passing trains and maintenance activities
- **Vibration**
  - **Construction**—Vibration generated by heavy equipment and tunnel-boring activities
  - **Operations**—Vibration generated by passing trains and maintenance activities
- **Visual disturbance**
  - **Construction**—Visual perception of construction activities and human presence by wildlife (e.g., birds, nesting raptors)
  - **Operations**—Visual perception of passing trains and maintenance activities by wildlife
- **Artificial light**
  - **Construction**—Light generated by nighttime construction activities, including tunnel portals
  - **Operations**—Light generated by passing trains and security at HSR facilities
- **Vehicle Strike**
  - **Construction**—Movement of construction vehicles (e.g., trucks on temporary access roads)
  - **Operations**—Movement of passing trains

Table 2-7 below illustrates the methods used to identify impacts within the various biological RSAs.

Table 2-7 Biological Resource Study Areas

Name/Function	Area of Impact or Analysis	General Description
Habitat Study Area		
Core Habitat Study Area		
Direct Impacts[1]	Project footprint (includes permanent and temporary impacts)	Area in which potential direct and indirect impacts on special-status wildlife species and their habitat were evaluated. Ground-based site assessments or surveys were conducted in this area, if accessible.
Indirect Impacts[1]	Project footprint plus 250-foot buffer	
Auxiliary Habitat Study Area		
Indirect Impacts	250- to 1,000-foot buffer (i.e., 750 feet outside core habitat study area)	Area in which indirect impacts on special-status wildlife species and their habitat were evaluated. Habitat assessed through extrapolation of field observations made in the core habitat study area, aerial photograph interpretation, or windshield surveys.
Special-Status Plant Study Area[2]		
Direct Impacts[1]	Project footprint	Area in which direct and indirect impacts on upland sensitive plant resources (including special-status plants, special-status plant communities, and protected trees) were evaluated. For vernal pool plant species, the aquatic RSA and auxiliary study area (if applicable) are used to evaluate impacts.
Indirect Impacts[1]	Project footprint plus 100-foot buffer	
Regional Resource Study Area (Used for Identification of Mitigation Opportunities)		
Compensatory Mitigation Opportunities (not impact analysis)	Habitat study area plus larger area defined by ecoregion and/or county boundaries as follows: ▪ North—mostly Santa Clara, Stanislaus, and Merced County boundaries ▪ East—San Joaquin Basin ecoregion boundary, Merced County boundary, and Southern Hardpan Terraces ecoregion boundary ▪ South—Merced County boundary and the following ecoregion boundaries from east to west: Upper Santa Clara Valley, East Bay Hills/Western Diablo Range, Westside Alluvial Fans and Terraces, and San Joaquin Basin ▪ West—Santa Clara County boundary	Area used for developing species habitat models and identifying potential mitigation options. Biologists designed the regional RSA to encompass the habitat study area and to meet the following additional criteria: ▪ The regional RSA should capture a sufficient portion of each species' range, suitable habitat, and known occurrences to enable evaluation of an array of viable mitigation opportunities. ▪ Mitigation should be provided in geographic proximity to project impacts. ▪ Mitigation of project impacts on aquatic resources should primarily occur in or near the watersheds in which they occur. ▪ The regional RSA should be broad enough to allow for a landscape-level analysis of impacts and mitigation options that consider wildlife linkages, priority acquisition areas, proximity to existing conservation lands, and other key attributes. ▪ The regional RSA should be sufficiently focused to limit unnecessary data collection and processing for species modeling and mitigation analysis.

Name/Function	Area of Impact or Analysis	General Description
Wildlife Movement Resource Study Areas		
***Wildlife Movement Study Area*[3]**		
Direct and Indirect Impacts	Project footprint plus 5- to 15-mile buffer	Area in which wildlife movement permeability was analyzed on a local scale using a (1) GIS-based resistance-surface model for terrestrial species and (2) a qualitative assessment for aquatic and aerial species.
Local Permeability Analysis Study Area		
Direct and Indirect Impacts	Project footprint plus 1.9-mile buffer	Area in which wildlife movement permeability was quantitatively modeled using GIS. As identified in Authority (2020c), recommendation of 6-kilometer minimum distance between source and destination locations in GIS models.

Source: Authority 2020c
RSA = resource study area
GIS = geographic information system
[1] Vernal pools located within the project footprint, and those partially located within the footprint, were considered to be directly and permanently affected in their entirety. Vernal pools located within 250 feet of the project footprint, but not within the project footprint, were considered to be potentially indirectly affected out to 250 feet from the project footprint. This method was used because it identifies the greatest number of potential project impacts and considers limitations on field surveys and direct observations.
[2] Impacts on special-status plant species occurring in vernal pools are also considered in the context of the aquatic RSA and the auxiliary habitat study area (as applicable).
[3] A detailed description of the Wildlife Movement Study Area and the methods used to determine its parameters is presented in Appendix C, Wildlife Corridor Analysis, of the Biological and Aquatic Resources Technical Report (Authority 2020c).

2.4.3 Other Environmental Resources

2.4.3.1 Agricultural Farmlands

2.4.3.1.1 Resource Study Areas

The RSAs used to assess potential impacts of the HSR on agricultural farmland encompass those areas where Important Farmland could potentially be lost on a temporary or permanent basis.

2.4.3.1.2 Affected Environment

2.4.3.1.2.1 Important Farmland

Over the 12-year period from 2002 to 2014, Santa Clara County experienced a loss of approximately 37 percent of its Important Farmland. San Benito County lost approximately 29 percent of its Important Farmland. Merced County gained approximately 2 percent of Important Farmland. The amount of urban and other developed land in the three counties increased between 2 and 18 percent over this period.

2.4.3.1.2.2 Agricultural Farmland Infrastructure

Agricultural infrastructure supporting agricultural use of Important Farmland includes utilities—energy transmission and gas lines, telecommunication systems, and irrigation infrastructure—and transportation infrastructure.

2.4.3.1.3 Agricultural Resources Impact Evaluation Approach

The impact evaluation approach for agricultural lands identified permanent conversion and temporary use, both of which are considered direct effects. Permanent conversion would occur when Important Farmland is converted to hardscape or otherwise permanently lost as a result of the development of the HSR. Temporary conversion caused by a temporary use, would occur in a TCE when the agricultural land use is temporarily displaced but not permanently lost. Temporary impacts related to disruption of agricultural infrastructure serving Important Farmland may occur in and adjacent to the TCE.

2.4.3.2 Parks, Recreation, and Open Space

2.4.3.2.1 Resource Study Areas

The RSAs delineated to assess potential impacts on publicly owned parks, recreation, open space, and public school district play areas encompass those areas with the potential to be directly and indirectly affected by construction and operation of the HSR. The RSAs used to evaluate potential impacts from the track alignment on parks, recreation, open space, and school district play areas available for public use during non-school hours encompass the project footprint[6] for each of the project alternatives plus 1,000 feet from track centerline, while the RSAs for stations and maintenance facilities include the project footprint for these facilities plus 0.5 mile.

2.4.3.2.2 Affected Environment

2.4.3.2.2.1 Parks, Recreation, and Open Space Resources

There are 44 parks, recreational facilities, and open space resources (including wildlife and waterfowl refuges) in the RSA. Each identified resource is publicly accessible. Most of these resources are parks—ranging from small neighborhood parks to larger community parks—with facilities such as open areas, play equipment, sports fields, picnic benches, and walking/biking trails in or near urban areas of the cities of Santa Clara, San Jose, Morgan Hill, and Gilroy. Additionally, four larger open space areas in more rural areas of Santa Clara and Merced Counties that fall partly within the RSA are considered in this analysis: Anderson Lake County Park, San Luis Reservoir Wildlife Management Area, San Luis Reservoir State Recreation Area, and Cottonwood Creek Wildlife Area. There are fewer parks, recreational facilities, and open space resources within the Alternative 3 RSA in Gilroy than Alternatives 1, 2, and 4 because Alternative 3 would avoid the city's developed areas.

2.4.3.2.2.2 School District Play Areas

There are several school district play areas in four school districts: San Jose Unified, Oak Grove, Morgan Hill, and Gilroy. Each identified resource is accessible to the public, although not all schools have a joint-use agreement with the City or County in which it is located. The only school with a joint-use agreement is Caroline Davis Intermediate School (Oak Grove School District). The play areas contain various playgrounds and sports facilities, such as basketball courts, baseball fields, football fields, tennis courts, pools, and tracks, that are open to the public after school hours. Given facilities provided at each of the play areas in the RSA, these resources lend themselves primarily to active use. In the Morgan Hill and Gilroy Subsection, where the most school district play areas are located, the Alternative 3 RSA has two fewer school district play areas in Gilroy than those of Alternatives 1, 2, and 4 because Alternative 3 would avoid the developed part of the city.

2.4.3.2.3 Impact Evaluation Approach

The impact evaluation approach consisted of 1) using GIS to identify resources that could be temporarily affected and 2) determining if the resource would be permanently or temporarily acquired, or temporarily affected such as a temporary restriction or reduction in access to the facility.

2.4.3.3 Cultural Resources

2.4.3.3.1 Resource Study Areas

The 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

[6] The project footprint includes all areas required to construct, operate, and maintain all permanent HSR facilities, including permanent right-of-way, permanent utility and access easements, and TCEs.

such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking" (36 CFR Section 800.16[d]). The Section 106 process uses the term "area of potential effect" for the RSA for cultural resources surveys and analyses. The APE is the same as the RSA. The APE for impacts on cultural resources includes the project footprint for each of the project alternatives. Two distinct APEs are delineated for the project, one for archaeology and one for historic built resources.

The archaeological APE includes the area of ground to be disturbed before, during, and after project construction, as well as during operation. This area includes, but is not limited to, the area excavated for the vertical and horizontal profiles of the alignment, station location footprints, geotechnical drilling areas, grading areas, cut-and-fill areas, easements, staging/laydown areas, utility relocation areas, borrow sites, spoils areas, temporary and permanent road construction areas, grade separation features, infrastructure demolition areas, biological mitigation areas, and all permanent rights-of-way (i.e., the project footprint). In areas where project activities would take place below the surface, the vertical extent of the archaeological APE would extend to the anticipated depth of these activities. Tunnels would be excavated at greater depths (up to 1,200 feet below the ground surface) and would pass under buried archaeological resources, except at tunnel portal locations where massive excavation and levelling are required. These areas were included in the APE for the purposes of the records search and to inform the historic context. The vertical archaeological APE was delineated in coordination with project engineers and includes maximum depth of ground disturbance for various features of the project.

The historic built resources APE includes all legal parcels intersected by the proposed HSR right-of-way for all project alternatives, including proposed ancillary features, such as grade separations, stations, maintenance facilities, utilities, and construction staging areas. The APE includes properties where historic materials or associated landscape features would be demolished, moved, or altered by construction. The types of resources encountered in the project vicinity and the proposed project construction activities guided the delineation of the APE. The historic built resources APE is larger than the project footprint. It is delineated to take into consideration visual, audible, or atmospheric intrusions onto a property; the potential for vibration-induced damage; or isolation of a property from its setting. Visual and audible changes have the potential to affect character-defining features of some historic built resources.

2.4.3.3.2 Affected Environment

2.4.3.3.2.1 Pre-Contact and Historic Archaeological Sites

Pre-contact archaeological sites in California are locations where human activities were carried out during the exclusive Native American occupation of the area. This period is generally defined as beginning with the arrival of humans in North America—thought to be about 13,000 years ago—and ending with European contact, often stated to be in 1769 A.D., the date of the arrival of Spanish missionaries in California. Historical archaeological sites in California are locations where human activities were carried out during the historical period, generally defined as beginning with European contact in the mid-18th century and ending approximately 50 years ago.

Based on the records search, a total of 177 previously recorded archaeological sites are within the search radius, which included a radius of 0.25 mile from the centerline of the project alternatives. Of these previously recorded sites, 35 are in the archaeological APE.

2.4.3.3.2.2 Historic Architectural Resources

Historic properties and historical resources are elements of the built environment that are listed in, or eligible for, the NHRP or California Register of Historical Resources (CRHR) or are considered historical resources for the purposes of CEQA. These elements reflect important aspects of local, state, or national history. Examples of the types of historic properties (per the National Register of Historic Places (NRHP)) or historical resources (per CEQA) within the APE include: residential, institutional (e.g., churches, schools), agricultural (e.g., orchards, dairies, barns, ranches), railroad (e.g., train depot, underpasses), water conveyance infrastructure, roads and highways, and commercial buildings.

The surveys conducted in the APE identified 554 built resources that were 50 years old or at the time the intensive survey was initiated and were evaluated using the NRHP and CRHR significance criteria, and in compliance with the Section 106 Programmatic Agreement (PA) (Authority et al. 2011), its attachments, and subsequent guidance. The Historic Architectural Survey Report provides the evaluation of these resources (Authority 2020a) as required by the Section 106 PA. Of the evaluated resources, 519 were determined to be ineligible for listing in the NRHP, with State Historic Preservation Officer (SHPO) concurrence.

Five previously NRHP-listed properties were field verified to check their current level of historic integrity and to document any changes since they were originally recorded. The remaining 30 were determined eligible for listing on the NRHP and CRHR as a result of this study. In addition to being historic properties under Section 106 and NEPA, these 35 properties are considered to be historical resources for the purposes of CEQA.

2.4.3.3.2.3 Cultural Resources

The impact evaluation approach for cultural resources consisted of identifying the potential for the following impact mechanisms:

- the potential for permanent disturbance of known and unknown archaeological resources (because archaeological resources are unique and non-renewable all disturbance is considered permanent);
- the potential for permanent demolition, destruction, relocation, or alteration of built resources or their setting. Demolition, destruction, relocation, and alteration of built environment resources are all potential impact mechanisms. Demolition or destruction removes the resource entirely. Relocation or alteration can change either the character defining elements that contribute to the eligibility of the resource, or remove it from its setting, which may also reduce the significance of the resource by removing its association with a setting that contributes to its feeling, association, and character. Changes to the setting itself also may alter the feeling or association of the resource; and
- the potential for visual, auditory, or atmospheric intrusions to alter characteristics that contribute to the significance of the resource and qualify the resource for listing in the NRHP or CRHR.

2.5 Impact Avoidance and Minimization Measures

The Authority has developed avoidance and minimization measures (AMMs) to address potential effects of the project on resources. AMMs include design and engineering features of the project and other measures that will be implemented to avoid or reduce potential impacts This report uses the same nomenclature as is used in the NEPA/CEQA environmental documents for ease of tracking and cross-referencing measures. Impact Avoidance and Minimization Features (IAMFs) are standard practices, actions, and design features that are incorporated into the project design. Project-level IAMFs and AMMs are described in Section 2.5.1 through Section 2.5.3.

2.5.1 Summary of Avoidance and Minimization Measures for Aquatic Resources

USACE may not permit a discharge unless appropriate and practicable steps have been taken to minimize adverse effects on the aquatic ecosystem (40 CFR Section 230.10(d)). The following AMMs would be implemented during the construction and operation of the San Jose to Merced section alternatives. Appendix D contains the full text of the AMMs:

- BIO-IAMF#1: This commitment reduces potential biological resource impacts through designating USFWS-, NMFS-, and CDFW-approved Project Biologist(s), Designated Biologist(s), Species-Specific Biological Monitor(s), and General Biological Monitor(s) to conduct biological resource monitoring and implement AMMs. The positions provide on-the-ground field inspection to verify that the project is implemented consistent with all biological resource terms and conditions.
- BIO-IAMF#3: This action reduces potential unplanned biological resource impacts from construction activities by providing regularly updated mandatory training on regulatory agency terms and conditions contained in permits and approvals, federal and state environmental

regulations (e.g., FESA, CESA, Bald and Golden Eagle Protection Act, Migratory Bird Treaty Act, and CWA), and project avoidance features and mitigation measures to project construction crews.

- BIO-IAMF#5: This commitment of preparing a Biological Resources Management Plan (BRMP) would reduce potential impacts on biological resources by detailing an implementation strategy for biological resource conservation and mitigation features and tying implementation of the features to discrete steps in the construction process. The BRMP would define responsibilities and timing to allow for the timely and appropriate implementation of conservation and mitigation features.
- BIO-IAMF#8: Committing to locating equipment staging areas within areas ultimately to be occupied by permanent HSR facilities avoids the potential for increased impacts on sensitive biological resource areas and is a basis for regulatory agency permit approvals.
- BIO-IAMF#9: Obligating contractors to temporarily store construction waste materials at or near the construction site and within the construction footprint reduces potential impacts on biological resources by decreasing construction truck trips and the potential for encounters with wildlife traversing the construction area. Storing the materials within the construction footprint avoids unnecessary temporary impacts outside the project footprint evaluated in environmental documents and regulatory permits and approvals.
- BIO-IAMF#10: Committing to cleaning construction equipment prior to moving equipment onto and off the construction site reduces potential impacts on biological resources by removing mud and plant materials containing seeds that could introduce noxious and invasive weeds into adjacent natural areas.
- HYD-IAMF#3: This measure requires compliance with the State Water Resources Control Board (SWRCB) Construction General Permit requirement to prepare and implement a stormwater pollution prevention plan (SWPPP) during construction activities. The Construction SWPPP would propose best management practices (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.
- BIO-MM#1: This measure requires that, prior to any ground-disturbing activity, the Project Biologist will prepare a restoration and revegetation plan to address temporary impacts resulting from ground-disturbing activities within areas that potentially support special-status species, wetlands, and/or other aquatic resources.
- BIO-MM#3: This measure requires that, prior to any ground-disturbing activity in a Work Area, the Project Biologist will use flagging to mark Environmentally Sensitive Areas (ESA) that support special-status species or aquatic resources and are subject to seasonal restrictions or other AMMs. The Project Biologist will also direct the installation of Wildlife Exclusion Fencing (WEF) by the contractor to prevent special-status wildlife species from entering Work Areas.
- BIO-MM#4: This measure requires that, during any initial ground-disturbing activity, the Project Biologist will be present in the Work Area to verify compliance with AMMs, to establish ESAs, and to direct the installation of WEF and construction exclusion fencing (exclusion fencing) by the contractor.
- BIO-MM#5: This measure requires that, prior to any ground-disturbing activities, the Project Biologist will ensure that appropriate measures have been instituted to restrict project vehicle traffic within the construction footprint to established roads, construction areas, and other permissible areas. The Project Biologist will establish vehicle speed limits of no more than 15 mph for unimproved access roads and for temporary and permanent construction areas within the construction footprint.
- BIO-MM#6: This measure requires that the Project Biologist prepare monthly and annual reports documenting compliance with all IAMFs, mitigation measures, and requirements set forth in regulatory agency authorizations.
- BIO-MM#71: This measure requires that within 90 days of completing construction in a Work Area, the Project Biologist will direct the revegetation of any riparian areas temporarily

disturbed as a result of the construction activities, using appropriate native plants and seed mixes.

- BIO-MM#73: This measure requires that the Authority begin to restore aquatic resources that were temporarily affected by construction within 90 days of completion of construction activities in a Work Area. The Authority will need to conduct maintenance and monitoring consistent with the provisions of the restoration and revegetation plan.

2.5.1.1 Design Features for Construction Stormwater Pollution Prevention Plan

Under the federal CWA, entities discharging stormwater from construction sites must comply with the conditions of a National Pollutant Discharge Elimination System (NPDES) permit. SWRCB, which is the permit authority in California, has adopted the Construction General Permit, which applies to projects that would disturb 1 or more acres of soil. For projects disturbing more than 1 acre of soil—which all four alternatives would—SWRCB requires permittees to prepare a SWPPP. The SWPPP provides 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. The details of the measures that would be identified in the SWPPP are presented in Appendix E (HYD-IAMF#3, Prepare and Implement a Construction Stormwater Pollution Prevention Plan).

2.5.1.2 Design Features for Stormwater Management and Treatment

In addition to implementing a SWPPP to minimize stormwater runoff from construction sites, the contractor would develop a stormwater management and treatment plan consistent with applicable CWA Section 402 NPDES permits to avoid potential permanent impacts on hydrology, such as increased flows in receiving waterbodies and hydromodification (HYD-IAMF#1). A stormwater management and treatment plan that complies with the Phase II Municipal Separate Storm Sewer System permit would maintain pre-project hydrology with respect to the volume, flow rate, and duration of runoff. Development of the stormwater management and treatment plan would involve evaluating the capacity of the receiving drainage systems during the design phase to design drainage systems that can handle anticipated flows in light of project construction.

If anticipated flows exceed the capacity of existing drainage systems, on-site stormwater management measures, such as detention, or selected upgrades to the receiving drainage system would be designed to maintain existing drainage capacity. BMPs would be implemented to manage the expected runoff from impervious surfaces.

2.5.2 Project-Level Avoidance and Minimization of Impacts on Biological Resources

This section summarizes the AMMs and mitigation measures specific to biological resources. For a full description of the design features and mitigation measures, see Appendix D:

- BIO-IAMF#1: This commitment reduces potential biological resource impacts through designating USFWS-, NMFS-, and CDFW-approved Project Biologist(s), Designated Biologist(s), Species-Specific Biological Monitor(s), and General Biological Monitor(s) to conduct biological resource monitoring and implement AMMs.
- BIO-IAMF#3: This action reduces potential unplanned biological resource impacts from construction activities by providing regularly updated mandatory training on regulatory agency terms and conditions contained in permits and approvals, federal and state environmental regulations (e.g., FESA, CESA, Bald and Golden Eagle Protection Act, Migratory Bird Treaty Act, and CWA), and project avoidance features and mitigation measures to project construction crews.
- BIO-IAMF#4: This obligation reduces potential unplanned biological resource impacts during operations and maintenance activities by providing training on regulatory agency terms and conditions contained in permits and approvals, federal and state environmental regulations, and project avoidance features and mitigation features to HSR operations and maintenance employees.

- BIO-IAMF#5: This commitment of preparing a BRMP would reduce potential impacts on biological resources by detailing an implementation strategy for biological resource conservation and mitigation features and tying implementation of the features to discrete steps in the construction process. The BRMP would define responsibilities and timing to allow for the timely and appropriate implementation of conservation and mitigation features.
- BIO-IAMF#6: Enacting monofilament restrictions in erosion control materials reduces impacts on biological resources by eliminating a source of monofilament debris that can result in injury or death to wildlife through entanglement or ingestion.
- BIO-IAMF#7: Committing to management practices that avoid the possibility of wildlife entrapment reduces potential impacts on biological resources by reducing the potential for wildlife to become trapped in construction trenches or enter stored construction pipe, culverts, or similar structures that would eventually be buried, moved, or capped.
- BIO-IAMF#8: Committing to locating equipment staging areas within areas ultimately to be occupied by permanent HSR facilities avoids the potential for increased impacts on sensitive biological resource areas.
- BIO-IAMF#9: Obligating contractors to temporarily store construction waste materials at or near the construction site and within the construction footprint reduces potential impacts on biological resources by decreasing construction truck trips and the potential for encounters with wildlife traversing the construction area.
- BIO-IAMF#10: Committing to cleaning construction equipment prior to moving equipment onto and off the construction site reduces potential impacts on biological resources by removing mud and plant materials containing seeds that could introduce noxious and invasive weeds into adjacent natural areas.
- BIO-IAMF#11: The measure requires preparing a construction site BMP field manual to be implemented by the contractor. The manual shall identify BMPs for temporary soil stabilization, temporary sediment control, wind erosion control, tracking control, non-storm water management, and waste management and materials control and identify other, general measures related to construction site cleanliness.
- BIO-IAMF#12: This measure requires the Authority to evaluate the catenary system, masts, and other structures for designs that are safe for raptors and other birds in accordance with the applicable standards.
- HMW-IAMF#3: This action reduces potential impacts resulting from hazardous materials and waste by requiring additional construction procedures that limit the potential release of subsurface containments during construction.
- HMW-IAMF#6: This measure reduces potential impacts related to hazardous materials and waste by requiring a written Compensatory Mitigation Plan (CMP), including a construction period spill prevention plan. The plan would identify construction BMPs designed to contain and prevent accidental spills, including procedures to clean up any accidental hazardous material release.
- HYD-IAMF#5: This measure requires that the Authority design and construct tunnels to avoid or minimize groundwater inflows into the tunnel during construction that may affect surface water resources in areas overlying the tunnel alignment.
- NV-IAMF#1: This measure would reduce potential noise and vibration impacts from construction by requiring the contractor to document how federal guidelines for minimizing noise and vibration would be employed when construction is occurring near sensitive receptors (such as hospitals, residential neighborhoods, and schools).
- BIO-MM#1: This measure requires that, prior to any ground-disturbing activity, the Project Biologist will prepare a restoration and revegetation plan to address temporary impacts resulting from ground-disturbing activities within areas that potentially support special-status species, wetlands, and/or other aquatic resources.
- BIO-MM#2: This measure requires that, prior to any ground-disturbing activity during the construction phase, the Project Biologist will develop a weed control plan, subject to review and approval by the Authority. The purpose of the plan is to establish approaches to minimize and avoid the spread of invasive weeds during ground-disturbing activities during construction and operations and maintenance.

- BIO-MM#3: This measure requires that, prior to any ground-disturbing activity in a Work Area, the Project Biologist will use flagging to mark ESAs that support special-status species or aquatic resources and are subject to seasonal restrictions or other AMMs. The Project Biologist will also direct the installation of WEF by the contractor to prevent special-status wildlife species from entering Work Areas.
- BIO-MM#4: This measure requires that, during any initial ground-disturbing activity, the Project Biologist will be present in the Work Area to verify compliance with AMMs, to establish ESAs, and to direct the installation of WEF and construction exclusion fencing (exclusion fencing) by the contractor.
- BIO-MM#5: This measure requires that, prior to any ground-disturbing activities, the Project Biologist will ensure that appropriate measures have been instituted to restrict project vehicle traffic within the Construction Footprint to established roads, construction areas, and other permissible areas. The Project Biologist will establish vehicle speed limits of no more than 15 mph for unimproved access roads and for temporary and permanent construction areas within the Construction Footprint.
- BIO-MM#6: This measure requires that the Project Biologist will prepare monthly and annual reports documenting compliance with all IAMFs, mitigation measures, and requirements set forth in regulatory agency authorizations.
- BIO-MM#7: This measure requires that, prior to any ground-disturbing activity, the Project Biologist will conduct presence/absence botanical field surveys for special-status plant species and special-status plant sensitive natural communities within the Work Area in all potentially suitable habitats. The Project Biologist will flag and record in GIS the locations of any observed special-status plant species and special-status plant sensitive natural communities.
- BIO-MM#8: This measure requires that, where relocation or propagation is required by authorizations issued under the FESA and/or CESA, the Project Biologist will collect seeds and plant materials and stockpile and segregate the top 4 inches of topsoil from locations within the Work Area prior to any ground-disturbing activities where special-status plant species (i.e., those listed as threatened, endangered, or candidate under the FESA; threatened, endangered, or candidate for listing under CESA; state-designated “Rare” species; and California Rare Plant Rank 1B and 2 species) were observed during surveys conducted under BIO-MM#1. The Project Biologist will prepare a plant species salvage plan to address monitoring, salvage, relocation, and/or seed banking of federally listed or state-listed plant species.
- BIO-MM#9: This measure requires that the Authority prepare and implement a groundwater adaptive management and monitoring plan for tunnel construction to monitor groundwater-dependent biological resources and detect and remediate adverse effects on habitat function in a timely manner.
- BIO-MM#11: This measure requires that, prior to ground-disturbing activities associated with habitat restoration, enhancement, and/or creation actions at a mitigation site, the Authority will conduct a site assessment of the Work Area to identify biological and aquatic resources, including plant communities, land cover types, and the distribution of special-status plants and wildlife.
- BIO-MM#13: This measure requires that in the event that any special-status wildlife species is found in a Work Area, the Project Biologist will have the authority to halt work to prevent the death of or injury to individuals of the species. Any such work stoppage will be limited to the area necessary to protect the species, and work may be resumed after the Project Biologist determines that the individuals of the species have moved out of harm’s way, or the Project Biologist has relocated them out of the Work Area in accordance with authorizations issued under the FESA and CESA.
- BIO-MM#14: This measure requires that, prior to construction, the Project Biologist will survey for Bay checkerspot larval host plants, dwarf plantain and purple owl’s-clover, within suitable habitat. If host plants are found, the Project Biologist will conduct surveys for adult butterflies during the peak of the flight period to determine presence/absence. Where adult

butterflies are present, host plants outside permanent impact areas will be avoided by construction personnel.

- BIO-MM#15: This measure requires that, prior to final design, the Authority will incorporate features to minimize impacts on Bay checkerspot butterfly dispersal consistent with regulatory authorizations issued under the FESA.
- BIO-MM#23: This measure requires that, within 1 year prior of the start of construction, presence/absence surveys of Crotch's bumble bee be conducted in suitable habitat. If occupied habitat is identified in the project footprint, pre-construction surveys would be conducted no more than 30 days prior to construction, and no-work buffers would be established around active nest colonies and floral resources.
- BIO-MM#25: This measure requires that, prior to initiating any construction activity that occurs within open or flowing water, or streamside activities, the Authority will prepare a dewatering plan, which will be subject to the review and approval by the applicable regulatory agencies. It is also required that, prior to dewatering, the Project Biologist will conduct pre-activity surveys to determine the presence or absence of special-status species. If special-status species are detected during pre-activity surveys, the Project Biologist will relocate the species (unless the species is Fully Protected under state law), consistent with any regulatory authorizations applicable to the species.
- BIO-MM#26: This measure requires that, if cofferdam construction or stream dewatering is required, the Authority or a contractor on behalf of the Authority will develop a fish rescue plan outlining the methods for removing fish and relocating them to adjacent waterways. USFWS, NMFS, and CDFW will be notified prior to the start of fish rescue efforts, and a report will be submitted to CDFW, USFWS, and NMFS within 30 days of the fish rescue.
- BIO-MM#27: This measure requires that the Authority or a contractor on behalf of the Authority will develop an underwater sound control plan to avoid and minimize potential adverse impacts from in-water pile-driving activities on federally listed salmonid species.
- BIO-MM#29:This measure requires that prior to any ground-disturbing activity scheduled to occur during the dry season (June 1–October 15), the Project Biologist will conduct a pre-construction survey of suitable upland habitat within the Work Area and extending out 100 feet from the boundary of the Work Area, where access is available, to determine whether CTS are present. If ground-disturbing activities are scheduled to occur during the rainy season (October 15–June 1), in addition to upland surveys, the Project Biologist will survey potential breeding habitat in the Work Area for the presence of CTS.
- BIO-MM#30: This measure requires that prior to any ground-disturbing activity, the contractor, under the direction of the Project Biologist, will install WEF along the boundary of the Work Area containing CTS suitable habitat or will implement similar measures as otherwise required pursuant to regulatory authorizations issued under the FESA or CESA.
- BIO-MM#32: This measure requires that prior to any ground-disturbing activity scheduled to occur during the dry season (June 1–October 15), the Project Biologist will conduct a pre-construction survey of modeled suitable potential breeding habitat within the Work Area and extending out 100 feet from the boundary of the Work Area, where access is available, to determine whether California red-legged frogs are present. Appropriate AMMs will be implemented based on authorizations issued under the FESA.
- BIO-MM#34: This measure requires that prior to any ground-disturbing activity scheduled to occur during the dry season (June 1–October 15), the Project Biologist will survey potential breeding habitat (as identified by species modeling) in the project footprint for the presence of foothill yellow-legged frogs. Surveys will be conducted no more than 30 days before the start of ground-disturbing activities and will be spatially phased to precede construction activities.
- BIO-MM#36: This measure requires that prior to any ground-disturbing activities, the Project Biologist will conduct pre-construction surveys in suitable habitat to determine the presence or absence of special-status reptile and amphibian species within the Work Area.
- BIO-MM#37: This measure requires that the Project Biologist monitor all initial ground-disturbing activities that occur within suitable habitat for special-status reptiles and amphibians and conduct clearance surveys of suitable habitat in the Work Area on a daily basis. If a special-status reptile or amphibian is observed, the Project Biologist will identify

actions, to the extent feasible, sufficient to avoid impacts on the individual and to allow it to leave the area on its own volition.

- BIO-MM#43: This measure requires that prior to any ground-disturbing activity, including vegetation removal, scheduled to occur during the bird breeding season (February 1–September 1), the Project Biologist will conduct visual pre-construction surveys within the Work Area for nesting birds and active nests of non-raptor species protected under the Migratory Bird Treaty Act and/or the Fish and Game Code.
- BIO-MM#45: This measure requires that no more than 30 days but no less than 14 days prior to any ground-disturbing activity in burrowing owl habitat, the Project Biologist will conduct pre-construction surveys for burrowing owl within suitable habitat located in the Work Area and/or extending 250 feet from the boundary of the Work Area, where access is available.
- BIO-MM#46: This measure requires that occupied burrowing owl burrows found during pre-construction surveys will be avoided in accordance with the Santa Clara Valley Habitat Plan's condition of approval for covered activities in burrowing owl habitat.
- BIO-MM#48: This measure requires that in the nesting season (January–May) of the calendar year before construction is expected to commence, qualified agency-approved biologists will conduct a pre-construction survey for occupied bald and golden eagle nests in and within 0.5 mile of the project footprint.
- BIO-MM#49: This measure requires that the Authority implement a 1-mile line-of-sight and 0.5-mile no-line-of-sight no-work buffer during the breeding season (January 1–August 31) around occupied nests so that construction activities do not result in injury or disturbance to eagles. Buffers around occupied nests may be reduced if the Project Biologist determines that smaller buffers would be sufficient to avoid impacts on nesting eagles. This restriction will be in effect from January 1 through August 31 unless nest monitoring by a qualified agency-approved biologist reveals that the nest is no longer active.
- BIO-MM#52: This measure requires that if construction or other vegetation removal activities are scheduled to occur during the breeding season for raptors (January 1–August 31), the Project Biologist will conduct pre-construction surveys for nesting raptors in areas where suitable habitat is present. If breeding raptors with active nests are found, the Project Biologist will delineate a 500-foot buffer (or as modified by regulatory authorizations for species listed under the FESA or CESA) around the nest to be maintained until the young have fledged from the nest and are no longer reliant on the nest or parental care for survival or until such time as the Project Biologist determines that the nest has been abandoned.
- BIO-MM#53: This measure requires that the Project Biologist will conduct surveys for Swainson's hawk during the nesting season (March 1–August 31) within both the Work Area and a 0.5-mile buffer surrounding the Work Area. No sooner than 30 days prior to any ground-disturbing activity, the Project Biologist will conduct pre-construction surveys of nests identified during the earlier surveys to determine if any are occupied.
- BIO-MM#54: This measure requires that any active Swainson's hawk nests found within 0.5 mile of the boundary of the Work Area during the nesting season (March 1–August 31) will be monitored daily by the Project Biologist to assess whether the nest is occupied. If the nest is occupied, the Project Biologist will establish no-work areas, and the status of the nest will be monitored until the young fledge or for the length of construction activities, whichever occurs first.
- BIO-MM#56: This measure requires that prior to initiation of construction at any location within 300 feet of suitable nesting habitat for tricolored blackbird, pre-construction surveys will be conducted to establish use of nesting habitat by tricolored blackbird colonies, where access allows, during the nesting season (generally, March 15–July 31).
- BIO-MM#59: This measure requires that within 30 days prior to the start of any ground-disturbing activity, the Project Biologist will conduct pre-construction surveys in suitable kit fox habitat in the Work Area between May 1 and September 30 to identify potential San Joaquin kit fox dens.
- BIO-MM#60: This measure requires that the Authority implement USFWS's Standardized Recommendations for Protection of the San Joaquin Kit Fox Prior to or During Ground Disturbance (USFWS 2011) to minimize impacts on this species.

- BIO-MM#64: This measure requires that prior to any ground-disturbing activity, the Project Biologist will conduct pre-construction surveys no more than 30 days prior to the start of ground-disturbing activities for American badger den sites within suitable habitat located within a Work Area.
- BIO-MM#65: This measure requires that prior to any ground-disturbing activity, the Project Biologist will conduct pre-construction surveys for ringtail and ringtail den sites in suitable habitat within a Work Area, no more than 30 days before the start of ground-disturbing activities.
- BIO-MM#66: This measure requires that prior to any ground-disturbing activity, the Project Biologist will conduct pre-construction surveys for woodrat stick houses within suitable habitat located within a Work Area, no more than 14 days before the start of ground-disturbing activities.
- BIO-MM#67: This measure requires that no more than 1 year before the replacement or modification of any bridges modeled as bat habitat and where access is available, the Project Biologist will conduct a survey of the bridges for evidence of roosting bats.
- BIO-MM#68: This measure requires that if active hibernacula or maternity roosts are identified in the Work Area or 500 feet extending from the Work Area during pre-construction surveys, they will be avoided to the extent feasible. If avoidance of hibernacula is not feasible, the Project Biologist will prepare a relocation plan to remove the hibernacula and provide for construction of an alternative bat roost outside of the Work Area.
- BIO-MM#69: This measure requires that if non-breeding or non-hibernating individuals or groups of bats are found roosting within the Work Area, the Project Biologist will facilitate the eviction of the bats by either opening the roosting area to change the lighting and airflow conditions or installing one-way doors or other appropriate methods.
- BIO-MM#70: This measure requires that the Authority prepare an annual vegetation control plan that generally follows the procedures established in Chapter C2 of the California Department of Transportation Maintenance Manual.
- BIO-MM#71: This measure requires that within 90 days of completing construction in a Work Area, the Project Biologist will direct the revegetation of any riparian areas temporarily disturbed as a result of the construction activities, using appropriate native plants and seed mixes.
- BIO-MM#76: This measure requires that to the extent feasible, the Authority will avoid placing fencing, either temporarily or permanently, within known movement routes for wildlife in those portions of the alignment where the tracks are elevated (e.g., viaducts or bridges). The Authority will avoid conducting ground-disturbing activities within known wildlife movement routes during nighttime hours, to the extent feasible, and will shield nighttime lighting to avoid illuminating wildlife movement corridors in circumstances where feasible.
- BIO-MM#77: This measure requires that the Authority design all wildlife crossings created specifically for terrestrial species consistent with the guidelines and recommendations in the Wildlife Corridor Assessment (WCA).
- BIO-MM#78: This measure requires that the Authority create dedicated wildlife crossings to accommodate wildlife movement across permanently fenced infrastructure in the western portion of the Pacheco Pass Subsection near Casa de Fruta, where wildlife movement would be significantly reduced.
- BIO-MM#80: This measure requires that, to address the permanent intermittent impact of noise, visual disturbance, and train strike on wildlife movement in the Upper Pajaro River (UPR) and GEA Important Bird Areas (IBAs), the Authority would build additional structures in these areas to minimize or avoid such impacts. Structures would be designed with the goal of reducing or eliminating the visual presence of the moving train and exceedance of the established quantitative noise thresholds.
- BIO-MM#81: This measure requires that, to address the permanent intermittent impact of operations on terrestrial wildlife movement from train strike and entrapment, the Authority would implement an array of exclusion features for terrestrial species. Features include chain-link fencing, angled barbed wire, and jump out exit features that allow large mammals to exit the right-of-way.

- BIO-MM#82: This measure requires that, to address the permanent intermittent impact of operations on aerial wildlife movement from train strike and entrapment, the Authority would implement an array of deterrent and diversion features for avian species. Features include pigeon wire, pole caps, and flight barriers.
- BIO-MM#83: This measure would require automated monitoring and inspections to detect carrion in the right-of-way so it could be removed. The measure would apply to certain alternatives between certain stations.

Compensatory mitigation includes:

- BIO-MM#10: This measure requires that the Authority prepare and implement a CMP that sets out the compensatory mitigation that will be provided to offset permanent and temporary impacts on federally listed and state-listed species and their habitat, fish and wildlife resources regulated under Section 1600 et seq. of the Fish and Game Code, and certain other special-status species.
- BIO-MM#12: This measure requires that the Authority will provide compensatory mitigation for direct impacts on federally listed and state-listed plant species based on the number of acres of occupied plant habitat directly affected. Compensatory mitigation will be provided using one or more of the methods described in BIO-MM#10.
- BIO-MM#16: This measure requires that the Authority, in accordance with authorizations issued under the FESA, will determine the compensatory mitigation required to offset impacts on habitat, including critical habitat, for Bay checkerspot butterfly.
- BIO-MM#24: This measure requires that the Authority would provide compensatory mitigation at a ratio of 3:1 (unless a higher ratio is required though a CESA authorization) for Crotch's bumble bee habitat.
- BIO-MM#28: This measure requires that the Authority will provide compensatory mitigation for permanent impacts on habitat for CCC steelhead that is commensurate with the type (spawning, rearing, migratory, or critical habitat) and amount of habitat lost. The Authority or a contractor on behalf of the Authority will purchase riparian and aquatic habitat credits at a NMFS-approved anadromous fish conservation bank, or another NMFS-approved conservation option, for the areal extent of riparian and suitable aquatic habitat affected by the action.
- BIO-MM#31: This measure requires that the Authority will provide compensatory mitigation to offset the loss of modeled CTS habitat. Compensatory mitigation will be provided for impacts on habitat occupied or presumed occupied by CTS.
- BIO-MM#33: This measure requires that the Authority, in accordance with authorizations issued under the FESA, will compensate for impacts on habitat, including critical habitat, for California red-legged frog.
- BIO-MM#35: This measure requires that the Authority, in keeping with the state incidental take permit, will provide compensatory mitigation for impacts on occupied or presumed occupied aquatic habitat for foothill yellow-legged frog.
- BIO-MM#47: This measure requires that to compensate for permanent impacts on occupied burrowing owl breeding habitat, the Authority will provide compensatory mitigation at a 1:1 ratio.
- BIO-MM#50: This measure requires that if pre-construction surveys identify active eagle nests in the permanent impact area, or it is determined through monitoring that train operations resulted in nest abandonment, the Authority, in consultation with USFWS, will develop a nest relocation or replacement plan for the affected nest(s).
- BIO-MM#55: This measure requires that in order to compensate for permanent impacts on active Swainson's hawk nest trees (i.e., trees in which Swainson's hawks were observed building nests during protocol-level surveys described in BIO-MM#49) and foraging habitat, the Authority will provide compensatory mitigation that replaces affected nest trees and provides foraging habitat.
- BIO-MM#57: This measure requires that the Authority provide compensatory mitigation required to offset impacts on tricolored blackbird. Compensatory mitigation will replace

permanent loss of habitat with habitat that is commensurate with the type (nesting, roosting, and foraging) and amount of habitat lost.

- BIO-MM#58: This measure requires that the Authority provide compensatory mitigation required to offset impacts on waterfowl and shorebirds in the UPR and GEA Audubon IBAs. Compensatory mitigation will replace habitat permanently lost with habitat that is commensurate with the type (nesting, roosting, or foraging) and amount of habitat lost.
- BIO-MM#61: This measure requires that the Authority provide compensatory mitigation for impacts on San Joaquin kit fox habitat through the acquisition of suitable habitat.
- BIO-MM#72: This measure requires that the Authority compensate for permanent impacts on riparian habitats at a ratio of 2:1 (mixed riparian and palustrine forested wetland) or 4:1 (California sycamore woodland), unless a higher ratio is required by agencies with regulatory jurisdiction over the resource.
- BIO-MM#74: This measure requires the Authority to prepare and implement a CMP that identifies mitigation to address temporary and permanent loss, including functions and values, of aquatic resources defined as waters of the U.S. under the federal CWA or waters of the state under the Porter-Cologne Water Quality Control Act. Specific ratios for compensatory mitigation are also provided.
- BIO-MM#79: This measure requires that, within 2 years of the start of construction at the MOWF, the Authority would conserve or improve wildlife movement between the Santa Cruz Mountain and the Diablo Range wildlife linkage (Authority 2020a) by conserving natural or agricultural lands that provide for wildlife movement, enhancing wildlife movement between the Santa Cruz Mountains and the Diablo Range, or both.

2.5.3 Project-Level Avoidance and Minimization of Impacts on Other Resources

This section summarizes the AMMs specific to avoiding and minimizing impacts on agricultural farmlands; parks, recreation, and open space; and cultural resources.

2.5.3.1 Agricultural Farmlands

- AG-IAMF#1: This action reduces temporary impacts on Important Farmland by stockpiling the top 18 inches of soil from the farmland being temporarily affected or occupied during construction activities and then using that soil to restore the farmlands to pre-project conditions after construction is completed.
- AG-IAMF#3: This commitment reduces impacts on agricultural farmland by administering a farmland consolidation program to sell remnant agricultural parcels to neighboring landowners that can be combined with adjacent farmland properties to provide for continued agricultural use on the maximum feasible amount of remnant parcels.
- AG-IAMF#4: This obligation reduces impacts on agricultural farmland by providing property owners or leaseholders immediately adjacent to the HSR Project Section disturbance limits advance notification regarding the intent to begin construction.

Compensatory mitigation includes:

- AG-MM#1: This measure would preserve Important Farmland in an amount commensurate with the quantity and quality of converted farmlands in the same agricultural regions where the impacts would occur, at a replacement ratio of not less than 1:1 for lands that are permanently converted to nonagricultural use by the project. The Authority will also fund the purchase of an additional increment of acreage for agricultural conservation easements at a ratio of not less than 0.5:1 for Important Farmland within a 25-foot-wide area adjacent to permanently fenced HSR infrastructure.

2.5.3.2 Parks, Recreation, and Open Space

- NV-IAMF#1: This measure would reduce potential noise and vibration impacts from construction by requiring the contractor to document how federal guidelines for minimizing noise and vibration would be employed when construction is occurring near sensitive receptors (such as hospitals, residential neighborhoods and schools).

- AQ-IAMF#1: This action reduces construction-related air quality emissions by requiring the preparation of a fugitive dust control plan that identifies the minimum features that would be implemented during ground-disturbing activities.
- AQ-IAMF#2: This commitment reduces overall construction emissions by limiting the type of paint to be used during construction to paint with a volatile organic compound content of less than 10 percent (low).
- AQ-IAMF#4: This commitment would reduce criteria exhaust emissions from construction equipment.
- AQ-IAMF#5: This commitment would reduce criteria exhaust emissions from on-road construction equipment.
- PK-IAMF#1: This measure would reduce potential impacts on parks, recreation, and open space by requiring the contractor to incorporate design features into HSR design that provide for safe and attractive access to existing park and recreation facilities.
- SOCIO-IAMF#1: This commitment would require the development of a construction management plan.
- AVR-IAMF#1: This commitment would require the development of aesthetic options.
- AVR-IAMF#2: This commitment would require an aesthetic review process.
- TR-IAMF#2: This commitment would reduce potential impacts on transportation by requiring the contractor to prepare a detailed construction transportation plan for minimizing the impact of construction and construction traffic on adjoining and nearby roadways.
- TR-IAMF#4: This action would reduce potential impacts on transportation by requiring the contractor to prepare and implement specific construction management plans to address maintenance of pedestrian access during the construction period.
- TR-IAMF#5: This measure would reduce potential impacts on transportation by requiring the contractor to prepare and implement specific construction management plans to address maintenance of bicycle access during the construction period.
- TR-IAMF#7: This measure would reduce potential impacts on transportation by requiring the contractor to deliver all construction-related equipment and materials on the appropriate truck routes, avoiding impacts on streets not designed to accommodate truck traffic.
- LU-IAMF#3: This measure would reduce impacts on land use and communities by requiring land used temporarily during construction to be returned to a condition equal to the pre-construction staging condition.
- NV-MM#1: This measure would require that the contractor prepare a noise monitoring program for Authority approval prior to ground-disturbing activities. The noise-monitoring program would describe how during construction the contractor would monitor construction noise to reduce noise levels to the noise limits (an 8-hour energy-equivalent noise level (L_{eq}) of 80 A-weighted decibels (dBA) during the day and 70 dBA at night for residential land use, 85 dBA for both day and night for commercial land use, and 90 dBA for both day and night for industrial land use) where a noise-sensitive receptor is present and wherever feasible.
- NV-MM#2: This measure requires that the contractor provide the Authority with a vibration technical memorandum prior to impact pile driving within 50 feet of any building. The memorandum will document vibration reduction measures, as well as documentation of pre-construction building conditions in case damage is reported during or after construction.
- NV-MM#3: The Authority would implement noise and vibration guidelines to reduce or offset severe noise impacts using a multifactor implementation approach that considers structural safety, number of receptors, and effectiveness. The goal of this measure is to reduce operational noise from severe to moderate.
- NV-MM#4: This measure supports the potential implementation of quiet zones by local jurisdictions.
- NV-MM#8: This measure requires the implementation of project vibration mitigation measures.
- PR-MM#1: This measure requires the contractor to provide alternative access when construction activities will affect existing trails, including detour signage and lighting.
- PR-MM#2: This mitigation measure will provide and maintain alternative access to the park, recreation, open space, and school district play area resources by requiring the contractor to

prepare, prior to construction activities affecting park access, a technical memorandum that documents how connections to unaffected park portions or nearby roadways will be maintained during construction.

- PR-MM#3: This mitigation measure will provide and maintain access to the park, recreation, open space, and school district play area resources to reduce permanent changes to access or use of parks.
- PR-MM#4: Upon approval by the Authority, the contractor will implement the project design features identified in the technical memorandum. The project design features will be incorporated into the design specifications and will be a pre-condition requirement.
- PR-MM#5: This measure requires the implementation of measures to reduce impacts associated with the relocation of important facilities.
- SS-MM#2: This measure requires the construction of temporary access roads and driveways for the Morgan Hill Charter School.
- SS-MM#3: This measure requires the construction of temporary access roads and driveways for the Gilroy Preparatory School.
- AQ-MM#1: This measure requires the reduction of criteria exhaust emissions from construction equipment.
- AQ-MM#2: This measure requires the reduction of criteria exhaust emissions on-road construction equipment.

  AQ-MM#3: This measure requires the reduction of the potential impact of concrete batch plants.

2.5.3.3 Cultural Resources

- CUL-IAMF#1: This measure requires the completion of a geospatial data layer and archaeological sensitivity map.
- CUL-IAMF#2: This measure requires the implementation of worker environmental awareness program training sessions.
- CUL-IAMF#3: This measure requires the completion of pre-construction cultural resource surveys.
- CUL-IAMF#4: This measure requires the relocation of project features when possible.
- CUL-IAMF#5: This measure requires the development and implementation of an archaeological monitoring plan.
- CUL-IAMF#6: This measure, calling for a *Pre-Construction Conditions Assessment, Plan for Protection of Historic Built Resources and Repair of Inadvertent Damage*, reduces potential impacts on historic cultural resources by identifying techniques to minimize inadvertent damage. If damage occurs, the plan calls for establishing standards of repair consistent with Secretary of the Interior’s Standards for the Treatment of Historic Properties.
- CUL-IAMF#7: This commitment to prepare and implement a built environment monitoring plan would reduce potential impacts on cultural resources by detailing an implementation strategy for monitoring historic structures and tying implementation of the measures to discrete steps in the construction process.
- CUL-IAMF#8: This commitment to stabilize and protect historic buildings and structures susceptible to damage during construction reduces potential impacts on cultural resources. Temporary stabilization and protection measures would be removed after construction is completed. Properties would be restored to their pre-construction condition.
- CUL-MM#1: This measure would decrease the potential for impacts on any newly discovered archaeological or historic built resources through specific protections and compliance requirements as stipulated in the PA, Memorandum of Agreement (MOA), Archaeological Treatment Plan (ATP), and Built Environment Treatment Plan.
- CUL-MM#2: This measure includes identifying unanticipated discoveries, conducting archaeological training, monitoring during construction, stopping work if resources are encountered to allow for assessment of the find, and developing treatment plans, in compliance with the PA, MOA, and ATP and all state and federal laws.
- CUL-MM#3: This measure includes specific requirements to mitigate impacts on pre-contact archaeological resources through agreed-upon measures, which include protocols for the

identification, evaluation, treatment, and data-recovery mitigation of as-yet-unidentified archaeological resources.

- CUL-MM#4: This measure requires the development of plans for relocation and the implementation of relocation of identified historic buildings and structures prior to construction within 1,000 feet of the properties. The plan would be subject to review and approval by the Authority, in consultation with the MOA signatories and concurring parties. The relocation would be implemented according to the plan.
- CUL-MM#6: This measure requires the recordation and documentation of specific historical resources that would be physically altered, damaged, relocated, or destroyed by the project, as stipulated in the MOA and described in the Built Environment Treatment Plan. The specific mitigation for each property would be determined in consultation with the MOA signatories and concurring parties.
- CUL-MM#7: This measure requires the historic interpretation or preparation of educational materials for historic properties or resources. Interpretive and educational materials would address the significance of the properties that would be affected by the project.
- CUL-MM#10: This measure requires that HSR stations constructed adjacent to or on the site of NRHP- or CRHR-listed or -eligible railroad stations, within historic districts, or in close proximity to other historic properties incorporate context sensitive designs that meet the Secretary of the Interior's Standards for the Treatment of Historic Properties.
- CUL-MM#11: This measure requires that, for Alternatives 1, 2, and 3, the ATC site be moved to avoid demolition of an NRHP-eligible site in San Jose.

2.6 Comparative Analysis of Project Alternatives

2.6.1 Alternative 1

2.6.1.1 Impacts on Aquatic Resources

2.6.1.1.1 Direct Effects

Construction of Alternative 1 would result in the permanent discharge of fill of 100.5 acres and temporary fill of 87.5 acres, as shown in Table 2-9 (see Section 2.7). This is the third highest acreage of permanent impacts after Alternative 3 (highest) and Alternative 2 (second highest). The temporary impacts are the second highest after Alternative 2. Alternative 1 would result in the discharge of permanent fill of 58.2 acres of wetlands and temporary fill of 19.3 acres of wetlands. Alternative 1 would result in permanent placement of fill in non-wetland waters of 42.3 acres and temporary fill in 68.3 acres of non-wetland waters.

The Authority relied upon California Rapid Assessment Method (CRAM) methodology to assess the relative function and value of waterbody types in the aquatic RSA. The CRAM analysis and Watershed Evaluation Report are appended to this document as Appendix B.[7] Across all alternatives, all waterbodies were ranked within the "fair" category with the exception of constructed watercourses, which were ranked poor across all alternatives.

The Authority would implement BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#8, BIO-IAMF#9, BIO-IAMF#10, BIO-MM#1, BIO-MM#3, BIO-MM#4, BIO-MM#5, BIO-MM#6, and BIO-MM#73 to reduce impacts.

2.6.1.1.2 Indirect Effects

The Authority applied the methodology for identification of potential indirect effects on jurisdictional resources within 250 feet of the footprint caused by placement of fill.[8] Because potential indirect effects would occur where alternatives share the same alignment, there would be no differentiation of these effects between the alternatives. The following discussion describes

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[7] The CRAM methodology assigns a numeric score from 25 to 100 to waterbodies based upon their biological integrity (25–50 is ranked "poor," while 51–75 is ranked "fair," and "75–100" is ranked "good").

[8] Potential indirect effects were identified only in areas where the alternatives share a common alignment because these locations have higher concentrations of jurisdictional features potentially sensitive to indirect effects.

the potential for indirect effects to occur on waters of the U.S. and the measures or local conditions that would allow for such potential impacts to be minimized or avoided. The potential for indirect effects to occur were identified at the following locations:

- Alternative 1 would cross Pacheco Creek near Casa de Fruta in the Pacheco Pass Subsection. Construction activities would occur in the vicinity of Pacheco Creek. While the track itself will be on viaduct, the earthworks have the potential to cause indirect effects. During construction, earthmoving has the potential to cause increased erosion and contribute sediment in runoff to Pacheco Creek, which is within 250 feet of the footprint. These impacts would be addressed by HYD-IAMF#3.
- The alternative would involve construction activities near Romero Creek in the Pacheco Pass Subsection. Construction of the cuts has the potential to increase erosion and runoff of sediment into the creek and alter the local hydrology at locations where the creek occurs within 250 feet of the alignment. The potential for erosion and increased sediment during construction of the cuts would be addressed by HYD-IAMF#3.
- The alternative crosses a large vernal pool complex near McCabe Road in the Pacheco Pass Subsection. Construction at this location would include realignment and widening of an existing road that bisects these pools. While approximately 45 percent of the pools are calculated as direct impacts because they occur in the footprint or would be indirectly bisected, the remaining portion of the complex within 250 feet of the footprint may be subject to indirect effects, such as increased sedimentation during construction or permanent alterations of local hydrology. The potential for erosion and increased sediment during construction would be addressed by HYD-IAMF#3. The complex occurs below ridgelines that would continue to contribute runoff to the feature; for this reason, local hydrology would be maintained.
- The portion of the alternative in the San Joaquin Valley Subsection would be located near a large alkali vernal pool complex along Henry Miller Road east of Mud Slough and Baker Road. The complex occurs on the north side of Henry Miller Road but is within 250 feet of the permanent project footprint. Hydrology for these features is provided through locally high groundwater conditions. Consequently, construction of the alternative would not cause indirect effects on hydrologic conditions. Any potential contribution of sediment would be addressed by HYD-IAMF#3.
- Vernal pools occur within 250 feet of the alternative in the San Joaquin Valley Subsection off Henry Miller Road east of the Santa Fe Grade. The proximity of the alignment to the features indicates that construction could result in increased discharge of sediment from earth moving in the vicinity. This potential effect would be addressed by HYD-IAMF#3. Construction would not cause the features to lose hydrology, because the landscape is relatively flat, and hydrology for the pools is maintained through high groundwater conditions and poorly drained soils.
- The alternative would occur near an alkali marsh complex on either side of Henry Miller Road in the San Joaquin Valley Subsection east of the Santa Fe Grade. Portions of this complex that are outside of the permanent footprint but within 250 feet of the footprint would not be subject to indirect effects, such as loss of hydrology, because the marsh hydrology is created by high groundwater conditions. Any potential contribution of sediment would be addressed by HYD-IAMF#3.

2.6.1.1.3 Cumulative Effects

Construction of the planned projects in the region would result in temporary and permanent impacts on aquatic resources. Examples of planned development projects that could affect aquatic resources include The Villages of Laguna San Luis Community Plan and Fox Hills Community Specific Plan Update development projects in Merced County. Planned transportation projects, such as the widening of SR 25 between Gilroy and Hollister, construction of the Los Banos Bypass (Segments 1, 2, and 3), and construction of the HSR Central Valley Wye, would also affect aquatic resources in the Santa Clara and San Joaquin Valleys. Alternative 1 would contribute the third highest permanent acreage of impacts (100.5 acres) to the cumulative setting and the second highest temporary acreage of impacts (87.5 acres).

Construction of all four alternatives would have identical impacts on vernal pools (both a special-status plant community and an aquatic resource) because that community is present only in the Pacheco Pass and San Joaquin Valley Subsections, where the alternatives are identical. Each alternative would make the same contribution to the cumulative condition for this resource type.

Operations of planned projects, including the HSR project, would include inspection and maintenance activities. Aquatic resources inside the project footprint that were avoided during construction (e.g., natural watercourses spanned by viaducts) and outside but adjacent to the project footprints (e.g., seasonal wetlands outside the footprint of facilities and staging areas) would remain unaffected. No cumulative impacts on aquatic resources are anticipated during operations because workers would avoid sensitive areas during operations, would avoid the introduction and spread of invasive nonnative species, and would be required to attend worker environmental awareness program training about sensitive biological resources.

Both the project and other foreseeable projects in the region would require the discharge of fill to waters. The cumulative effect of these activities, however, would be moderated as a result of "no net loss" policies adopted at the state and federal level.[9]

2.6.1.2 Impacts on Biological Resources

This section provides an overview of effects of Alternative 1 on special-status plant communities, special-status plant species, special-status fish and wildlife species, and wildlife movement corridors.

2.6.1.2.1 Special-Status Plant Communities

2.6.1.2.1.1 Direct Construction Effects

Construction of Alternative 1 would take place in habitat that supports special-status plant communities. Construction would result in the conversion and degradation of such communities. These impacts would include removal or disruption (e.g., trampling and crushing) of special-status plant communities by construction vehicles and personnel. With respect to vegetation removal, vegetation within the HSR right-of-way would largely be permanently removed. As shown in Table 2-10 (see Section 2.7), Alternative 1 would permanently affect a total of 867.8 acres of special-status plant communities. Alternative 1 would also temporarily affect 401.8 acres of special-status plant communities.

To address these potential impacts on special-status plant communities, AMMs would be implemented. Applicable AMMs include BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#8, BIO-IAMF#9, BIO-IAMF#10, BIO-IAMF#11, BIO-MM#1, BIO-MM#3, BIO-MM#4, BIO-MM#5, BIO-MM#6, BIO-MM#7, and BIO-MM#71. Compensatory mitigation would be implemented per BIO-MM#72.

2.6.1.2.1.2 Indirect Construction Effects

Construction of Alternative 1 would alter topography (e.g., by constructing embankments), which would also affect local drainage patterns and infiltration of precipitation. This change in the physical environment could degrade special-status plant communities at some locations by making those locations less suitable for the establishment or persistence of dominant or characteristic species of a special-status plant community. Extensive movement of equipment and materials into and out of the project footprint would also facilitate the spread of invasive species by facilitating the dispersal of their propagules to the disturbed areas in the project footprint. Construction of Tunnels 1 and 2 could have temporary indirect impacts on the hydrology of groundwater-dependent surface water features, including land cover types that qualify as special-status plant communities (e.g., California sycamore woodland) or that could contain unmapped occurrences of a special-status plant community (i.e., freshwater marsh, palustrine forested wetland, and seasonal wetland). In addition, groundwater depletion could affect deep-rooted oak trees outside of riparian zones, such as valley oaks in areas with relatively shallow

[9] 40 Code of Federal Regulations Section 230.93(f)(1), Executive Order W-59-93 (California)

groundwater tables. Any reductions in groundwater supply to such features could result in the desiccation of vegetation and eventual degradation of the affected community. Applicable AMMs include HYD-IAMF#5, BIO-MM#2, and BIO-MM#9.

2.6.1.2.1.3 Direct and Indirect Operations Effects

Project operations would include inspection and maintenance activities along the HSR right-of-way. Right-of-way maintenance activities would include minor grading, clearing, and excavation needed to maintain adequate drainage or repair infrastructure; vegetation management, including potential trimming of trees within special-status communities (e.g., riparian) growing adjacent to the right-of-way and application of herbicide to invasive weeds within the right-of-way; and vehicle traffic along maintenance roads. Permanently affected stands of special-status plant communities in the project footprint would have been eliminated during construction, and therefore would not be affected further. However, special-status plant communities inside the right-of-way that were avoided during construction and outside but within 100 feet of the right-of-way (i.e., special-status plant study area) could potentially be affected by these activities. To address potential operations impacts on special-status plant communities, AMMs would be implemented. Applicable AMMs include BIO-IAMF#4 and BIO-MM#70.

2.6.1.2.2 Special-Status Plant Species

2.6.1.2.2.1 Direct Construction Effects

Construction of Alternative 1 would cause direct impacts on special-status plant species through 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). As shown in Table 2-11 (see Section 2.7), Alternative 1 would permanently affect 1,179.3 acres of non-overlapping special-status plant species habitat. Alternative 1 would also temporarily affect 460.1 acres of non-overlapping special-status plant species habitat.

To address these potential impacts on special-status plant species, AMMs would be implemented. Applicable AMMs include BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#8, BIO-IAMF#9, BIO-IAMF#11, BIO-MM#1, BIO-MM#3, BIO-MM#4, BIO-MM#5, BIO-MM#6, BIO-MM#7, BIO-MM#8, BIO-MM#10, and BIO-MM#11. Compensatory mitigation would be implemented per BIO-MM#12.

2.6.1.2.2.2 Indirect Construction Effects

Construction of Alternative 1 would alter topography (e.g., by constructing embankments), which would also modify local drainage patterns and infiltration of precipitation. This change in the physical environment could degrade special-status plant communities at some locations by making those locations less suitable for the establishment or persistence of special-status plants. Extensive movement of equipment and materials into and out of the project footprint would also facilitate the spread of invasive species by facilitating the dispersal of their propagules to the disturbed areas in the project footprint. Construction of Tunnels 1 and 2 could have temporary indirect impacts on the hydrology of groundwater-dependent surface water features, including land cover types that include special-status plant species. Any reductions in groundwater supply to such features could result in the desiccation of vegetation and eventual degradation of the affected community. To address these potential impacts on special-status plant species, AMMs would be implemented. Applicable AMMs include BIO-IAMF#10, HYD-IAMF#5, BIO-MM#2, and BIO-MM#9.

2.6.1.2.2.3 Direct and Indirect Operations Effects

Right-of-way maintenance activities would include minor grading, clearing, and excavation needed to maintain adequate drainage or repair infrastructure; vegetation management, including application of herbicide to invasive weeds growing within the right-of-way; and vehicle traffic along maintenance roads. These activities may cause reduced survival of special-status plants inside the right-of-way that were avoided during construction, as well as any occurring outside of but within 100 feet of the right-of-way (i.e., special-status plant study area). Minor ground disturbance within the right-of-way may result in minor direct (filling, sedimentation, inadvertent release of oils and chemicals from parked vehicles or equipment) or indirect (hydrological interruption, introduction of invasive species) effects on special-status plant habitat in and adjacent to the right-of-way. If applied during high winds, herbicides could drift onto and cause mortality of special-status plants. Dust generated from maintenance vehicles could settle on the leaves of special-status plants, increasing the rate of water loss (i.e., transpiration). Such direct and indirect effects would degrade special-status plant habitat within the special-status plant study area and could lead to the eventual extirpation of special-status plant occurrences.

To address these potential impacts on special-status plant species, AMMs would be implemented. Applicable AMMs include BIO-IAMF#4 and BIO-MM#70.

2.6.1.2.3 Special-Status Fish and Wildlife Species

2.6.1.2.3.1 Direct Construction Effects

2.6.1.2.3.1.1 Invertebrates

Construction of Alternative 1 would cause direct (permanent and temporary) impacts on suitable habitat for Bay checkerspot butterfly (including critical habitat), which could result in impacts on individuals (i.e., injury, mortality, or disturbance), if any are present in affected habitat. As shown in Table 2-12 (see Section 2.7), Alternative 1 would permanently affect 9.8 acres of suitable habitat, of which 4.3 acres are within critical habitat. Alternative 1 would also temporarily affect 22.6 acres of suitable habitat, of which 21.7 acres are within critical habitat.

Construction of Alternative 1 would cause direct impacts on suitable habitat for Crotch's bumble bee. Construction activities would convert and disturb habitat and could result in the mortality of individual bees if underground nest colonies or overwintering queens are present in the project footprint at the time of construction. As shown in Table 2-12 (see Section 2.7), Alternative 1 would permanently affect 1,147.2 acres of suitable habitat. Alternative 1 would also temporarily affect 436.4 acres of suitable habitat. None of the acreage affected is critical habitat.

To address potential effects on Bay checkerspot butterfly and Crotch's bumble bee, AMMs would be implemented. Applicable AMMs for Bay checkerspot butterfly include BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#8, BIO-IAMF#9, BIO-IAMF#10, BIO-IAMF#11, BIO-MM#1, BIO-MM#2, BIO-MM#3, BIO-MM#4, BIO-MM#5, BIO-MM#6, BIO-MM#10, BIO-MM#13, BIO-MM#14, and BIO-MM#15. Compensatory mitigation would be implemented per BIO-MM#16. Applicable AMMs for Crotch's bumble bee include BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#8, BIO-IAMF#9, BIO-IAMF#10, BIO-IAMF#11, BIO-MM#1, BIO-MM#2, BIO-MM#3, BIO-MM#4, BIO-MM#5, BIO-MM#6, BIO-MM#12, and BIO-MM#23. Compensatory mitigation would be implemented per BIO-MM#24.

2.6.1.2.3.1.2 Fish

The primary project activities affecting special-status fish would be bridge and viaduct construction and channel realignment, temporary construction activities, utility activities, construction of bike lane/pedestrian bridges, and construction of new culverts. Construction of HSR track and systems in all subsections except the San Joaquin Valley Subsection would take place in habitat for steelhead (CCC/SCCC) distinct population segment (DPS)), Pacific lamprey, and Chinook salmon (Central Valley Fall-run) (collectively referred to as special-status fish). Construction activities would result in permanent conversion of some habitat to transportation uses and could cause injury or mortality to individual fish that are present in work areas. The project would also intersect designated critical habitat for CCC and SCCC steelhead.

As shown in Table 2-12 (see Section 2.7), Alternative 1 would permanently affect 157.3 acres of special-status fish habitat. This acreage consists of 3.3 acres for Chinook salmon, 19.9 acres for steelhead (of which 5.1 acres are critical habitat for steelhead), and 138.8 for Pacific lamprey. Alternative 1 would also temporarily affect 82.9 acres of special-status fish species. This acreage consists of 6.5 acres for Chinook salmon, 14.1 acres for steelhead (of which 3.1 acres are within critical habitat for steelhead), and 68.6 acres for Pacific lamprey.

To address these potential effects on special-status fish, AMMs would be implemented. Applicable AMMs include BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#8, BIO-IAMF#9, BIO-IAMF#10, BIO-IAMF#11, HMW-IAMF#3, HMW-IAMF#6, BIO-MM#1, BIO-MM#3, BIO-MM#4, BIO-MM#6, BIO-MM#10, BIO-MM#13, BIO-MM#25, BIO-MM#26, and BIO-MM#27. Compensatory mitigation would be implemented for steelhead per BIO-MM#28.

2.6.1.2.3.1.3 Amphibians

Direct impacts on CTS could include injury and mortality of individual salamanders as a result of activities such as vehicle strikes, entrapment in construction areas or materials, and crushing or entombment of salamanders in burrows. As shown in Table 2-12 (see Section 2.7), Alternative 1 would permanently affect 2,249.1 acres of suitable habitat for CTS, of which 213.1 acres are located within critical habitat. Alternative 1 would also temporarily affect 910.6 acres of suitable habitat, of which 65.4 acres are within critical habitat.

Construction of the HSR track and systems in all subsections except the San Joaquin Valley Subsection would take place in suitable habitat for the California red-legged frog, resulting in the loss or degradation of such habitat and potential injury or mortality of individual red-legged frogs, if any are present in the affected area. As shown in Table 2-12 (see Section 2.7), Alternative 1 would permanently affect 1,990.4 acres of California red-legged frog habitat, of which 739.5 are located within critical habitat. Alternative 1 would also temporarily affect 847.2 acres of California red-legged frog habitat, of which 184.1 acres are within critical habitat.

Construction of the HSR track and systems in all subsections except the San Joaquin Valley Subsection would take place in suitable habitat for foothill yellow-legged frog, resulting in loss and degradation of such habitat and potential injury or mortality of individual foothill yellow-legged frog. As shown in Table 2-12 (see Section 2.7), Alternative 1 would permanently affect 91.7 acres of foothill yellow-legged frog habitat. Alternative 1 would also temporarily affect 41.3 acres of foothill yellow-legged frog habitat. None of these acreages overlap with critical habitat.

Construction of the HSR track and systems in the Morgan Hill and Gilroy, Pacheco Pass, and San Joaquin Valley Subsections would take place in suitable habitat for western spadefoot, resulting in the loss of and degradation of such habitat and the potential injury or mortality of spadefoot individuals. As shown in Table 2-12 (see Section 2.7), Alternative 1 would permanently affect 528.7 acres of western spadefoot habitat. Alternative 1 would also temporarily affect 212.1 acres of western spadefoot habitat. None of these acreages are in critical habitat.

To address these potential impacts on amphibians, AMMs would be implemented. Applicable AMMs include BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#6, BIO-IAMF#7, BIO-IAMF#8, BIO-IAMF#9, BIO-IAMF#10, BIO-IAMF#11, BIO-MM#1, BIO-MM#2, BIO-MM#3, BIO-MM#4, BIO-MM#5, BIO-MM#6, BIO-MM#13, BIO-MM#29 (CTS), BIO-MM#30 (CTS), BIO-MM#32 (California red-legged frog), BIO-MM#34 (foothill yellow-legged frog), BIO-MM#36 (western spadefoot), and BIO-MM#37 (western spadefoot). Compensatory mitigation would be implemented per BIO-MM#31 (CTS), BIO-MM#33 (California red-legged frog), BIO-MM#35 (foothill yellow-legged frog), and BIO-MM#74 (western spadefoot).

2.6.1.2.3.1.4 Reptiles

Construction of the HSR track and systems would take place in suitable habitat for western pond turtle. Construction activities would convert suitable habitat and reduce the quality of the remaining suitable habitat and could result in the injury or mortality of individual pond turtles. As shown in Table 2-12 (see Section 2.7), Alternative 1 would permanently affect 2,610.6 acres of western pond turtle habitat. Alternative 1 would also temporarily affect 1,290.4 acres of western pond turtle habitat. No critical habitat would be affected.

To address these potential effects on western pond turtle, AMMs would be implemented. Applicable AMMs include BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#6, BIO-IAMF#7, BIO-IAMF#8, BIO-IAMF#9, BIO-IAMF#10, BIO-IAMF#11, BIO-MM#1, BIO-MM#2, BIO-MM#3, BIO-MM#4, BIO-MM#5, BIO-MM#6, BIO-MM#13, BIO-MM#36, and BIO-MM#37. Compensatory mitigation would be implemented for CTS per BIO-MM#31 and for California red-legged frog per BIO-MM#33; these measures are also expected to benefit western pond turtles.

2.6.1.2.3.1.5 Birds

Construction of the HSR track and systems in all five subsections would take place in suitable habitat for burrowing owl. Construction activities would result in the conversion and temporary disturbance of habitat and could result in injury and mortality of individual owls and eggs, as well as nest abandonment. Ground disturbance and vehicle traffic could injure or kill burrowing owls by crushing occupied burrows or collapsing burrow entrances, trapping any owls inside. As shown in Table 2-12 (see Section 2.7), Alternative 1 would permanently affect 1,541.5 acres of burrowing owl habitat. Alternative 1 would also temporarily affect 635.3 acres of burrowing owl habitat.

Construction of the HSR track and systems in all five subsections would take place in suitable habitat for bald and golden eagles, although there are no known eagle nests in the RSA. Construction activities would convert and temporarily disturb suitable habitat and could result in disturbance, injury, or mortality of nesting eagles if any are present in the vicinity. As shown in Table 2-12 (see Section 2.7), Alternative 1 would permanently affect 1,179.8 acres of eagle habitat. Alternative 1 would also temporarily affect 499.0 acres of eagle habitat.

Construction of the HSR track and systems in all five subsections would take place in suitable habitat for three special-status raptor species: American peregrine falcon, northern harrier, and white-tailed kite. Construction activities would convert and temporarily disturb suitable habitat and could result in disturbance, injury, or mortality of nesting raptors if any are present in the vicinity. As shown in Table 2-12 (see Section 2.7), Alternative 1 would permanently affect 6,151.5 acres of special-status raptor habitat. Alternative 1 would also temporarily affect 2,819.5 acres of special-status raptor habitat. None of this acreage is critical habitat.

Construction of the HSR track and systems in all subsections except the San Jose Diridon Station Approach Subsection would take place in suitable habitat for Swainson’s hawk. Construction activities would convert and temporarily disturb habitat and could result in disturbance, injury, or mortality of nesting Swainson’s hawks if any are present in the vicinity. As shown in Table 2-120 (see Section 2.7), Alternative 1 would permanently affect 955.5 acres of Swainson’s hawk habitat. Alternative 1 would also temporarily affect 578.9 acres of Swainson’s hawk habitat.

Construction of the HSR track and systems in all five subsections would take place in suitable habitat for three special-status tree-nesting species: purple martin, olive-sided flycatcher, and loggerhead shrike. Construction activities would convert and temporarily disturb suitable habitat and could result in disturbance, injury, or mortality of nesting birds and the destruction of eggs and nests. As shown in Table 2-12 (see Section 2.7), Alternative 1 would permanently affect 2,334.3 acres of special-status tree-nesting species habitat. Alternative 1 would also temporarily affect 941.5 acres of special-status tree-nesting species habitat.

Construction of the HSR track and systems would take place in suitable habitat for three special-status riparian species: least Bell’s vireo, yellow warbler, and yellow-breasted chat. Construction activities would convert and temporarily disturb suitable habitat and could result in disturbance, injury, or mortality of nesting birds and the destruction of eggs and nests. As shown in Table 2-12 (see Section 2.7), Alternative 1 would permanently affect 126.2 acres of special-status riparian species habitat. Alternative 1 would also temporarily affect 94.3 acres of special-status riparian species habitat.

Construction of the HSR track and systems in all five subsections would take place in suitable habitat for tricolored blackbird and yellow-headed blackbird. Construction activities would convert and temporarily disturb habitat and could result in disturbance, injury, or mortality of nesting birds and the destruction of eggs and nests. As shown in Table 2-12 (see Section 2.7), Alternative 1 would permanently affect 1,763.8 acres of tricolored blackbird and yellow-headed blackbird habitat. Alternative 1 would also temporarily affect 877.2 acres of tricolored blackbird and yellow-headed blackbird habitat.

To address these potential effects on avian species, AMMs would be implemented. Applicable AMMs include BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#8, BIO-IAMF#10, BIO-IAMF#11, BIO-MM#1, BIO-MM#2, BIO-MM#3, BIO-MM#4, BIO-MM#5, BIO-MM#6, BIO-MM#12, BIO-MM#13 (eagles, Swainson's hawk, least Bell's vireo, yellow warbler, yellow-breasted chat, tricolored blackbird), BIO-MM#45 (burrowing owl), BIO-MM#46 (burrowing owl), BIO-MM#48 (eagles), BIO-MM#49 (eagles), BIO-MM#52 (raptors), BIO-MM#53 (Swainson's hawk), BIO-MM#54 (Swainson's hawk), BIO-MM#43 (purple martin, olive-sided flycatcher, loggerhead shrike, least Bell's vireo, yellow warbler, yellow-breasted chat), and BIO-MM#56 (tricolored blackbird). Compensatory mitigation would be implemented per BIO-MM#47 (burrowing owl), BIO-MM#50 (eagles), BIO-MM#55 (Swainson's hawk), BIO-MM#72 (least Bell's vireo, yellow warbler, yellow-breasted chat), and BIO-MM#57 (tricolored blackbird).

2.6.1.2.3.1.6 Mammals

Construction of the HSR track and systems in the eastern portion of the Morgan Hill and Gilroy Subsection and throughout the Pacheco Pass and San Joaquin Valley Subsections would take place in suitable habitat for San Joaquin kit fox. Construction activities would convert and temporarily disturb habitat and could result in the disturbance, injury, and mortality of individual foxes. As shown in Table 2-12 (see Section 2.7), Alternative 1 would permanently affect 2,021.5 acres of San Joaquin kit fox habitat. Alternative 1 would also temporarily affect 860.1 acres of San Joaquin kit fox habitat.

Construction of the HSR track and systems would take place in suitable habitat for American badger. Construction activities would convert and temporarily disturb habitat and could result in the disturbance, injury, and mortality of individual badgers. As shown in Table 2-12 (see Section 2.7), Alternative 1 would permanently affect 798.6 acres of American badger habitat. Alternative 1 would also temporarily affect 374.5 acres of American badger habitat.

Construction of the HSR track and systems in all subsections except the San Joaquin Valley Subsection would take place in suitable habitat for San Francisco dusky-footed woodrat and ringtail. Construction activities would convert and temporarily disturb habitat and could result in the disturbance, injury, and mortality of individual woodrats and ringtails. As shown in Table 2-12 (see Section 2.7), Alternative 1 would permanently affect 400.1 acres of San Francisco dusky-footed woodrat and ringtail habitat. Alternative 1 would also temporarily affect 102.3 acres of San Francisco dusky-footed woodrat and ringtail habitat.

Construction of the HSR track and systems in all subsections would take place in suitable habitat for pallid bat, Townsend's big-eared bat, western mastiff bat, and western red bat. Construction activities would convert and temporarily disturb habitat and could result in the disturbance, modification, or loss of both night and maternity roost sites, as well as associated injury and mortality of roosting individuals. Ground-disturbing activities (including tunnel boring), vegetation removal, and structure demolition (e.g., removal or modification of culverts, bridges, and old buildings) in suitable habitat for these species could destroy occupied roost sites, resulting in injury or mortality of adults and young. Construction-generated noise and vibration near potential roost sites, including caves or mines in or near the project footprint for Tunnels 1 and 2, could disturb maternity roosts and cause bats to abandon their young. As shown in Table 2-12 (see Section 2.7), Alternative 1 would permanently affect 3,383.1 acres of special-status bat habitat and would temporarily affect 1,612.8 acres of special-status bat habitat.

To address these potential effects on mammals, AMMs would be implemented. Applicable AMMs include BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#7, BIO-IAMF#8, BIO-IAMF#9, BIO-IAMF#10, BIO-IAMF#11, BIO-MM#1, BIO-MM#2, BIO-MM#3, BIO-MM#4, BIO-MM#5, BIO-MM#6, BIO-MM#13, BIO-MM#59 (San Joaquin kit fox), BIO-MM#60 (San Joaquin kit fox), BIO-MM#64 (American badger), BIO-MM#65 (ringtail), BIO-MM#66 (dusky-footed woodrat), BIO-MM#67 (bats), BIO-MM#68 (bats), and BIO-MM#69 (bats). Compensatory mitigation would be implemented per BIO-MM#61 (San Joaquin kit fox) and BIO-MM#72 (riparian habitat, which would benefit San Francisco dusky-footed woodrat and ringtail).

2.6.1.2.3.2 Indirect Construction Effects

2.6.1.2.3.2.1 Invertebrates

No indirect impacts from Alternative 1 on Bay checkerspot butterfly have been identified. Noise and vibration caused by both construction and operations may cause indirect effects on Crotch's bumble bee by temporarily disrupting normal foraging or behavioral patterns; however, the extent of occupied habitat is expected to be small, and effects would be distributed on the landscape.

2.6.1.2.3.2.2 Fish

Indirect impacts from Alternative 1 (changes in channel morphology, long-term discharge of sediment and hazardous pollutants) are assumed to take place in areas comparable to those subject to direct impacts; however, because of the nature of aquatic systems, the impacts could extend downstream. Construction of Tunnels 1 and 2 could have temporary indirect impacts on the hydrology of groundwater-dependent surface waters, including habitat and designated critical habitat for SCCC steelhead in Pacheco Creek near Casa de Fruta (i.e., northeast of Tunnel 1 and northwest of Tunnel 2). A drop in groundwater inflow to Pacheco Creek (directly or via upstream tributaries) could alter instream habitat conditions and fish movement potential. The duration of this impact would depend on hydrologic conditions, subsurface conditions, and the amount of lowering of groundwater tables or tunnel dewatering discharge, none of which can be estimated at this time.

In addition, if tunnel dewatering discharges at the Tunnel 2 west portal were routed to Pacheco Creek, such discharges could affect fish movement through the scour of creeks or banks, which could alter channel conditions, as well as through the introduction of abnormally warm water that could be a thermal barrier to safe fish passage. To meet water quality standards for beneficial reuse, settling ponds, storage tanks, and a series of treatment systems may be necessary. Only treated groundwater that meets appropriate water quality standards would be beneficially reused or discharged into receiving waterbodies. The application of regulatory discharge controls would avoid water quality effects related to fish habitat conditions and fish movement.

While pre-construction and construction actions to protect habitat for special-status fish species are part of the project, these actions would not prevent the conversion and disturbance of aquatic habitat where work must be conducted. In addition to habitat loss and temporary disturbance, construction activities could temporarily remove riparian vegetation, resulting in decreased stream shading; ground-disturbing activities could result in increased sediment discharge; and dewatering could result in stranding and death of individual fish. To address these potential effects on relevant fish, AMMs would be implemented. Applicable AMMs include those discussed for direct impacts, as well as BIO-MM#9 and HYD-IAMF#5.

2.6.1.2.3.2.3 Amphibians

If construction in the project footprint for Alternative 1 alters a hydrologic regime that supplies water to vernal pools or aquatic features within 250 feet of the footprint, such hydrological modifications could indirectly affect habitat by altering the pools' ponding duration and rendering aquatic habitat unsuitable to support breeding behavior and the development of eggs and larvae. The introduction of nonnative plant species to upland habitat could reduce dispersal to nonbreeding sites (i.e., burrows) because dense herbaceous vegetation could impede movement.

Construction of Tunnels 1 and 2 could have temporary indirect impacts on the hydrology of groundwater-dependent surface waters, including ponds, wetlands, and streams that provide habitat for California red-legged frog, CTS, and foothill yellow-legged frog. Any reduction in groundwater hydrology that supplies water to features that function as habitat could cause adverse effects, including reduced reproductive success, degradation of habitat, and potential mortality. AMMs would be implemented. Applicable AMMs include those discussed for direct impacts, as well as BIO-MM#9 and HYD-IAMF#5.

2.6.1.2.3.2.4 Reptiles

If construction in the project footprint alters a hydrologic regime, such hydrological modifications could indirectly affect habitat by rendering aquatic habitat unsuitable to support pond turtle populations. The use of chemicals and hazardous substances during construction (e.g., oils, gasoline) may cause mortality if individuals enter aquatic habitat that has been contaminated by spills or other vehicle and equipment leaks. Construction of Tunnels 1 and 2 could have temporary indirect impacts on the hydrology of groundwater-dependent surface waters, including those that provide aquatic habitat for western pond turtle. Because western pond turtles are associated with ponds or streams that hold water year-round, any reductions in groundwater supply to occupied ponds and streams could reduce the availability of foraging and basking habitat for the affected population. Sudden decreases in water levels could strand basking individuals, forcing them to move to other aquatic habitat, if any is available nearby. To address these potential impacts on western pond turtle, AMMs would be implemented. Applicable AMMs include those discussed for direct impacts, as well as BIO-MM#9 and HYD-IAMF#5.

2.6.1.2.3.2.5 Birds

Increased cover of invasive weeds could reduce habitat suitability for burrowing owls because they prefer areas with short, sparse vegetation.

The project could cause indirect impacts on special-status riparian birds. Ground disturbance and vegetation removal in riparian habitat would create areas of bare soil susceptible to colonization by nonnative invasive plant species, such as giant reed, tamarisk, and perennial pepperweed. Dense stands of these species would degrade riparian habitat for least Bell's vireos and other riparian birds by outcompeting willows and other native plants that provide nest sites. Construction of Tunnels 1 and 2 could have temporary indirect impacts on the hydrology of groundwater-dependent surface water features, including riparian vegetation along Pacheco Creek that provides habitat for least Bell's vireo and other riparian birds. Reductions in groundwater supply to riparian vegetation could result in the desiccation of vegetation and degradation of habitat for these species. To address these potential impacts on these avian species, AMMs would be implemented. Applicable AMMs include those discussed for direct impacts, as well as BIO-MM#9 and HYD-IAMF#5.

2.6.1.2.3.2.6 Mammals

Introduction of invasive nonnative vegetation could alter the structure of the vegetation community, making it less suitable to support kit foxes, woodrats, and ringtails, and could adversely affect the productivity of the prey base. To address these potential impacts on mammals, AMMs would be implemented. Applicable AMMs include those discussed for direct impacts.

2.6.1.2.3.3 Direct and Indirect Operations Effects

HSR operations would include inspection and maintenance activities along the HSR right-of-way. Right-of-way maintenance activities would include minor grading, clearing, and excavation needed to maintain adequate drainage or repair infrastructure; vegetation management, including application of herbicide to invasive weeds growing within the right-of-way; and vehicle traffic along maintenance roads. Because much of the right-of-way would already have been subjected to extensive ground disturbance and construction activities and converted to HSR track and systems, the areas within the right-of-way would provide limited habitat for most special-status wildlife. Nevertheless, these activities may further degrade habitat areas inside the right-of-way that were avoided during construction, as well as habitat outside of but within 250 feet of the right-of-way (i.e., core habitat study area). Minor ground disturbance within the right-of-way may result in minor direct (filling, sedimentation, inadvertent release of oils and chemicals from parked vehicles or equipment) or indirect (hydrological interruption, introduction of invasive species) impacts on special-status wildlife habitat in and adjacent to the right-of-way. If applied during high winds, herbicides could drift into and contaminate aquatic habitat features (e.g., ponds and wetlands). Such direct and indirect impacts would degrade special-status wildlife habitat in the habitat study area. Some habitat areas may be degraded to the extent that they no longer support the resources necessary for species survival and reproduction, and therefore cease to function as habitat for those species.

To address these potential effects on special-status animal species, AMMs would be implemented. Applicable AMMs include BIO-IAMF#4 and BIO-MM#70.

2.6.1.2.4 Wildlife Corridors

2.6.1.2.4.1 Construction Impacts

Construction of Alternative 1 would temporarily and permanently affect regional and local wildlife movement patterns. Construction of the HSR track and systems in all subsections would temporarily affect wildlife movement in several ways. Construction fencing and dewatering would create temporary barriers to movement, precluding the normal movement of animals. Noise, vibration, and visual disturbance from construction vehicles and pile driving may alter or delay movement of individuals as they attempt to avoid the construction area. Nighttime construction or security lighting could cause animals to delay or alter movement patterns because they may avoid lit areas.

Construction of the project would permanently affect regional and local wildlife movement patterns by creating new barriers to local and regional wildlife movement and fragmenting habitat. While project design would provide for wildlife movement across the alignment in Coyote Valley, the Soap Lake floodplain, most of Pacheco Pass, and the Central Valley, barriers to movement would remain on the west slope of Pacheco Pass where the rail alignment parallel to Pacheco Creek would be placed on a series of continuous cut-and-fill slopes. Barriers to movement and habitat fragmentation reduce resource availability and isolate breeding groups; both conditions can ultimately lead to reduced reproductive success and inbreeding depression. Terrestrial species are most vulnerable to permanent movement impacts. Birds and bats are able to move over patches of unsuitable habitat.

To address these potential effects on wildlife movement patterns, AMMs would be implemented. Applicable AMMs include BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#8, NV-IAMF#1, BIO-MM#3, BIO-MM#25, BIO-MM#76, BIO-MM#77, BIO-MM#78, and BIO-MM#79.

2.6.1.2.4.2 Operation Impacts

Alternative 1 would result in noise from operations that can affect wildlife movement. The analysis detailed in the WCA (Authority 2020c) determined that only wildlife within a particular screening distance would be vulnerable to these impacts. The analysis detailed in the WCA determined that only terrestrial wildlife within the screening distance from the HSR centerline (e.g., within 70 feet of an at-grade section with a train traveling at 220 mph) would experience noise effects. The WCA determined that for birds and bats, three aerial species focal groups—waterfowl, shorebirds, and wading birds (collectively waterbirds)—were vulnerable to noise and were present in populations and concentrations substantial enough to be adversely affected. In the regional RSA, these focal groups are known to congregate in two primary locations: the UPR and GEA IBAs. Within the UPR IBA, Alternative 1 would affect 1,075 acres through impacts such as temporary hearing damage, masking, and arousal. Within the GEA IBA, Alternative 1 would affect 1,205 acres through the same kinds of impacts.

Vibration from train operations may also affect wildlife movement. Vibration effects are most likely to be perceived by species such as reptiles and amphibians, some of which—specifically snakes—are the most vibration-sensitive wildlife species known. However, because the affected species are reasonably common and the impacts would be brief and primarily diurnal (snakes are chiefly nocturnal predators), these vibration impacts are unlikely to cause substantial or long-lasting impacts. Amphibians are also highly sensitive to vibration, using ground vibration for communication, especially in the process of mate selection; thus, vibration generated by project operations at the time of amphibian breeding has the potential to affect the success of amphibian breeding activities and thereby to affect their population status. Burrowing rodents, notably kangaroo rats, are potentially sensitive to vibration influences on behavior and on the risk of vibration-caused burrow collapse. Studies involving intensive seismic exploration (Cypher et al. 2016), which generates extensive ground vibrations, did not find evidence of burrow collapse; however, minimization measures, including avoiding kangaroo rat burrows by a buffer distance of at least 10 meters (33 feet), may have avoided such effects. In the context of proposed operations, these findings suggest that exclusion fencing would limit impacts on kangaroo rats by excluding species’ use of habitat within a distance of up to 13 meters (42 feet) from the tracks.

Train operations can also cause intermittent visual disturbance of wildlife. The literature identifies two distances at which response to visual stimuli occurs for waterfowl: flight initiation distance (average 269 feet) and minimum approach distance (average 404 feet). The flight initiation distance is assumed to have potential for the greatest impact and was applied as a threshold to determine acres of affected habitat. Alternative 1 would affect 173 acres of habitat (i.e., habitat within the 269-foot flight initiation distance) in the Soap Lake 10-year floodplain and 524 acres in the GEA IBA. For raptors, the flight initiation distance from motor vehicles is 262 feet on average. If a raptor nest is within this distance of the rail alignment, there is potential for train operations to cause nest abandonment.

Project lighting can also affect wildlife using corridors during train operations. Conversely, nighttime lighting impacts are expected to be greatest in natural settings, where baseline light levels are low, and in locations where wildlife is known to move. In addition, light impacts from trains are expected to be greatest where the rail is at grade. However, the impacts on movement from train light are likely to be less than those from noise and vibration because noise and vibration travel farther from the centerline than light (which is directed in front of the train). For aerial species, few quantitative studies are available to determine the distance at which this impact may occur; however, published analyses confirm some potential for impact. For example, hunting owls may perch on overhead contact system (OCS) structures and become disoriented by the headlight of the approaching train, resulting in train strike. Also, birds may become “trapped” by a cone of light, unwilling to exit into darkness. This behavior may elevate train strike risk for birds lit by the headlight of an approaching train.

Operations also have the potential to cause mortality by train strike, although at-grade sections would have fencing to reduce wildlife access. Because terrestrial species are not expected to gain access to elevated sections, it is only at-grade sections that present risk of train strike to terrestrial species. Train operations also pose the risk of injury and mortality to aerial species by striking birds or bats flying in the path of passing trains. Nevertheless, quantifying the severity of the impact is difficult. For special-status species with low reproductive rates, such as California condor, Swainson’s hawk, sandhill crane, and golden eagle, the loss of one individual would be a substantial impact. For more common species, the injury or mortality of a small portion of the local or regional population is not likely to be a substantial impact.

Within the GEA IBA specifically, waterfowl, shorebirds, and wading birds are known to congregate in relatively large numbers, and intermittent strike of these special-status species could affect the abundance and local or regional populations of these species over time. While condor numbers are very low in the region, and there is no evidence of nesting, train strike has potential to affect the distribution and abundance of local or regional populations of the species. CDFW tracking data confirm condor flights over the proposed rail alignment in western Pacheco Pass near Casa de Fruta; consequently, there is potential for individuals to be struck by the train while attempting to forage on carrion on the tracks.

Collisions with power lines or OCS facilities pose the risk of injury and mortality to bird and bat species. Prior to construction, the Authority would design the OCS and other structures (e.g., fencing) to be bird- and raptor-safe in accordance with applicable Avian Power Line Interaction Committee (APLIC) recommendations (Authority 2020c).

To address these potential effects on wildlife corridors and movement, AMMs would be implemented. Applicable AMMs include BIO-IAMF#12, BIO-MM#77, BIO-MM#78, BIO-MM#80, BIO-MM#81, BIO-MM#82, and BIO-MM#83. Compensatory mitigation would be implemented per BIO-MM#58.

2.6.1.3 Other Environmental Consequences

2.6.1.3.1 Agricultural Farmlands

2.6.1.3.1.1 Temporary Use of Important Farmland During Construction

Construction of Alternative 1 would require the temporary use of 617.6 acres of Important Farmland. This land would be leased from the landowner and temporarily removed from agricultural use for the duration of construction. In addition, reconductoring activities as part of the network upgrades would require temporary use of Important Farmland.

Although Alternative 1 would temporarily use Important Farmland, the land would be restored following the cessation of construction activities and would not be permanently converted to nonagricultural use. The Authority would implement AG-IAMF#1 and AG-IAMF#4 to reduce impacts.

2.6.1.3.1.2 Permanent Conversion of Important Farmland to Nonagricultural Use

Direct permanent conversion of Important Farmland to nonagricultural use would occur where the project footprint of an alternative overlaps Important Farmland. Alternative 1 would result in permanent conversion of 1,035.5 acres of Important Farmland. The Authority would acquire and use the land in the project footprint for the HSR right-of-way, access easement, stations, and maintenance facilities. The Authority would implement AMM AG-MM#1 to reduce impacts.

2.6.1.3.1.3 Permanent Creation of Remnant Parcels of Important Farmland

Alternative 1 would result in the indirect creation of remnant parcels of Important Farmland in and adjacent to the TCE because of severance by the project. Some parcels could be severed from a larger parcel because the guideway alignment would bisect the parcel, and some parcels could be severed because roadway access would be restricted or eliminated. Some remnant parcels would remain in agricultural use because of adjacency to other farmland with access, sufficient size, or farmable shape. However, remnant parcels of 20 acres or less have the potential to become unfarmable because of lack of access, size, shape, location, or other constraint. These are referred to as nonviable remnant parcels and would result in conversion to nonagricultural use. Alternative 1 would convert 162.9 acres of Important Farmland to nonagricultural use through creation of nonviable remnant parcels, with acreage spread across 139 remnant parcels. The Authority would implement AG-IAMF#3 to reduce impacts.

2.6.1.3.2 Parks, Recreation, and Open Space

2.6.1.3.2.1 Temporary Changes from Noise, Vibration, and Construction Emissions on Use and User Experience of Parks, Recreational Facilities, and Open Space Resources

Construction of the San Jose to Merced Section has the potential to disrupt use and user experience at parks, recreational facilities, and open spaces due to temporary and localized noise, vibration, and construction emissions. Alternative 1 would affect the user experience at 36 park, recreation, and open space resources.

The project would comply with the Federal Transit Administration and FRA guidelines for minimizing construction noise and vibration impacts when work is conducted within 1,000 feet of sensitive receptors, which includes the parks, recreation facilities, and open space resources (FRA 2012) where uses are noise and vibration sensitive. The Authority would implement AMMs NV-IAMF#1, AQ-IAMF#1, and AQ-IAMF#2 to reduce impacts.

2.6.1.3.2.2 Temporary Changes to Access or Use of Parks

Construction of the project would require TCEs to facilitate placement of construction equipment and construction activities that could reduce access to roadways or otherwise temporarily affect access to and use of parks. Project construction would likely occur over a period of 4 years, with 1.5 years of continuous construction activity at any one location. Alternative 1 would limit access to 10 park, recreation, and open space resources. The Authority would implement AMMs PK-IAMF#1, TR-IAMF#2, TR-IAMF#4, TR-IAMF#5, TR-IAMF#7, PR-MM#1, PR-MM#2, and PR-MM#4.

Additionally,, under Alternative 1, construction of the project would result in temporary visual changes, but they would not create a perceived barrier to use. The Authority would implement SOCIO-IAMF#1 to minimize impacts on residents and businesses.

2.6.1.3.2.3 Permanent Acquisition of Parks, Recreation, and Open Space Resources

Construction of Alternative 1 would result in the permanent acquisition of portions of eight park, recreation, and open space resources. The Authority would implement AMMs to reduce impacts, including LU-IAMF#3, PK-IAMF#1, and PR-MM#3.

2.6.1.3.2.4 Additional Permanent Changes to Parks, Recreation, and Open Space Resources

Construction of Alternative 1 would result in permanent changes to access or circulation at three resources. The Authority would implement PK-IAMF#1 and PR-MM#3 to reduce impacts.

Construction of Alternative 1 would not result in permanent visual changes that could create an actual or perceived barrier to use, even though the user experience at certain resources would be altered. The Authority would implement AVR-IAMF#1 and AVR-IAMF#2 to reduce impacts.

Construction of Alternative 1 would result in permanent effects from operational noise on one resource and no permanent effects from vibration on any resource. The Authority would implement NV-MM#3, NV-MM#4, and NV-MM#8 to reduce impacts.

Construction of Alternative 1 would not result in the permanent closure or relocation of any parks, recreational facilities, or open space areas. Therefore, no new parks or other recreational facilities would need to be constructed to accommodate demand, and no mitigation measures would be required.

2.6.1.3.2.5 Temporary Changes to Access or Use of School District Play Areas

Construction of the project would require TCEs for placement of construction equipment and construction activities; such TCEs could reduce access to roadways or otherwise temporarily affect access to and use of school district play areas. Project construction would likely occur over a period of 4 years, with 1.5 years of continuous construction activity at any one location. It is assumed that TCEs could be in place for up to 4 years. The location of TCEs adjacent to the project alignment would temporarily affect access to three school district play areas. The Authority would implement AMMs to minimize impacts, including TR-IAMF#2, TR-IAMF#4, TR-IAMF#5, and TR-IAMF#7.

2.6.1.3.2.6 Additional Temporary Changes to School District Play Areas

Construction of Alternative 1 would generate temporary and localized noise, vibration, and construction emissions affecting school district play areas within 1,000 feet of the project footprint, but they would not preclude the use of these play areas. The Authority would implement NV-IAMF#1 and AQ-IAMF#1 to minimize these impacts.

Construction of Alternative 1 would result in temporary visual changes, but they would not create a perceived barrier to access or continued use of school district play areas. The Authority would implement SOCIO-IAMF#1 to reduce impacts.

2.6.1.3.2.7 Permanent Acquisition of School District Play Areas

Under Alternative 1, the project would result in the permanent acquisition of 8 percent of the play area at South Valley Middle School in Gilroy. The project would manage acquisition of real property to minimize permanent impacts from acquisition of school district play areas. The Authority would implement AMM PK-IAMF#1.

2.6.1.3.2.8 Permanent Changes from Noise and Vibration on School District Play Area Character and Use

No moderate or severe operational noise impacts for school district play areas would occur under Alternative 1.

2.6.1.3.2.9 Permanent Changes Affecting Access to School District Play Areas

Construction of Alternative 1 would not result in permanent changes in access to school district play areas. Therefore, no AMMs or mitigation measures would be required.

2.6.1.3.2.10 Permanent Visual Changes That Could Create A Perceived Barrier to Access or Continued Use of School District Play Areas

Construction of Alternative 1 would not result in any permanent visual changes that would create a perceived barrier to access or use of school district play areas. Therefore, no AMMs or mitigation measures would be required.

2.6.1.3.3 Cultural Resources

2.6.1.3.3.1 Permanent Disturbance of Unknown Archaeological Sites

Construction of the project could potentially affect unknown archaeological resources with ground-disturbing construction associated with the project. Unknown archaeological sites might encompass the full range of pre-contact or historic activities conducted over time, including pre-contact lithic scatters and village sites, historic-era homestead remains, and human burials.

Unknown or unrecorded archaeological resources that are not observable when conducting standard surface archaeological inspections, including subsurface buried archaeological deposits, may exist in areas surveyed within urbanized or rural areas. Unknown or unrecorded archaeological resources may also exist in areas where permission to enter has not been granted. Alternative 1 has 622 acres of surface that are generally sensitive for archaeological resources and 3,251 acres that are sensitive for buried archaeological resources.

The project would limit potential impacts on unknown archaeological sites by developing an MOA for each undertaking where the Authority determines there would be an adverse effect on historic properties or when phased identification is necessary and adverse impacts would occur. The Authority and SHPO would use the MOA and the ATP to enforce implementing the required actions arising from the Section 106 consultation. The Authority would implement AMMs to reduce impacts, including CUL-MM#1, CUL-MM#2, and CUL-MM#3.

2.6.1.3.3.2 Permanent Disturbance of a Known Archaeological Site

Construction of the project may result in permanent disturbance of known archaeological sites. Thirty-five archaeological resources are known to exist in the APE. Alternative 1 crosses all or part of 23 known resources. These cultural resources would be subject to phased evaluation and are assumed eligible at the present time only until they can be evaluated and their eligibility determined. Grading, trenching, and excavating in the project footprint during construction, as well as compaction resulting from the use of heavy machinery and other vehicular traffic on the construction site or in TCEs, may affect the integrity of artifact-bearing archaeological deposits. The Authority would implement AMMs to reduce impacts, including CUL-MM#1, CUL-MM#2, and CUL-MM#3.

2.6.1.3.3.3 Temporary Public Access and Disturbance of Archaeological Resources

Construction activities associated with the project would not result in higher potential for public access to archaeological resources by people who previously would not have been able to enter the property where the resource is located because the work areas would be inaccessible to the public. All work areas would be fenced and access controlled, allowing access only to authorized construction personnel; therefore, they would not provide access for persons to loot sites and would not expose sites to compaction through pedestrian or vehicular traffic. Additionally, the project may include increased site protection measures in the MOA and ATP, such as nighttime security patrols.

These design characteristics and features would be the same for all project alternatives. There would be no impacts on unknown archaeological resources because of temporary public access from any of the project alternatives. Additionally, there would be no impact during operations under Alternative 1.

2.6.1.3.3.4 Permanent Demolition, Destruction, Relocation, or Alteration of Built Resources or Setting

Construction activities associated with the project could result in demolition, relocation, and alteration of built resources, the setting of the resources, or both. Alternative 1 has the potential to affect historic built resources in several ways. Where the permanent HSR right-of-way would cross an historic property, character-defining features or entire resources would likely be demolished to make way for the construction of track structures or other facilities. The permanent HSR right-of-way that would be introduced directly adjacent to build resources would alter their setting, which has the potential to impair the resources' integrity of feeling, setting, and association. In other words, introducing a very large, modern transportation structure would make it difficult to understand the historic visual context of the resource, and thus how it functioned and related to its local context during its period of significance. Areas that would be used as a TCE may be used in a variety of ways, including but not limited to materials staging, operation of construction equipment, and installation of protective fencing. Once cleared as a TCE, any activities in support of construction of the project would be allowed. These activities have the potential to result in permanent physical damage to resources or their character-defining features. Under Alternative 1, seven built resources could be affected: five would be demolished, one would experience compromised integrity due to loss of character-defining features, and one's visual setting would be altered due to a change in historic context. The Authority would implement AMMs to reduce impacts, including CUL-MM#4, CUL-MM#6, CUL-MM#7, CUL-MM#10, and CUL-MM#11.

2.6.1.3.3.5 Noise and Vibration Impacts on Built Resources Caused by Construction Activities

Under Alternative 1, no built resources would be adversely affected by construction-related noise or vibration impacts. The Authority would implement several AMMs and IAMFs to avoid impacts, including CUL-IAMF#6, CUL-IAMF#7, and CUL-IAMF#8.

2.6.1.3.3.6 Intermittent Noise and Vibration Impacts on Built Resources Caused by Operations

Under Alternative 1, intermittent noise and vibration caused by operations would have no impact on any built resources. Therefore, no AMMs or mitigation measures would be required.

2.6.1.4 Practicability

2.6.1.4.1 Consistency with the Overall Project Purpose

Alternative 1 would be consistent with the overall project purpose for the San Jose to Merced Project Section.

2.6.1.4.2 Other Practicability Factors

- **Availability:** Alternative 1 would be available.
- **Cost:** Alternative 1 would be practicable from a cost standpoint. .
- **Existing Technology:** Alternative 1 would be capable of being constructed with respect to existing technology. The design of Alternative 1 includes at-grade, below-grade, and above-grade (elevated) segments. Most of the anticipated construction methods that would be used to construct Alternative 1 are the same conventional means and methods employed by contractors that build roads, bridges, railway tracks, and other transportation infrastructure using common industry equipment, readily available labor and tools, and industry-standard operations. Consequently, Alternative 1 would be practicable in light of existing technology.
- **Logistics:** 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. Alternative 1 would be practicable from a logistical standpoint.

2.6.2 Alternative 2

2.6.2.1 Impacts on Aquatic Resources

2.6.2.1.1 Direct Effects

Construction of Alternative 2 would result in the permanent discharge of fill of 108.0 acres and temporary fill of 89.4 acres, as shown in Table 2-9 (see Section 2.7). This is the second highest acreage of permanent impacts after Alternative 3 (highest). The temporary impacts are the highest for all alternatives. Alternative 2 would result in the discharge of permanent fill of 58.1 acres of wetlands and temporary fill of 19.6 acres of wetlands. Alternative 2 would result in permanent placement of fill in non-wetland waters of 49.9 acres of fill in and temporary fill of 69.9 acres of non-wetland waters.

Based on the CRAM assessment, waterbodies potentially affected by Alternative 2 were ranked within the “fair” category with the exception of constructed watercourses, which were ranked poor.

The Authority would implement BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#8, BIO-IAMF#9, BIO-IAMF#10, BIO-MM#1, BIO-MM#3, BIO-MM#4, BIO-MM#5, BIO-MM#6, BIO-MM#71, and BIO-MM#73 to reduce impacts.

2.6.2.1.2 Indirect Effects

Indirect effects were evaluated across the entire project extent but were identified only on subsections where the alternatives are in a common alignment. For this reason, indirect effects would be identical to those described for Alternative 1.

2.6.2.1.3 Cumulative Effects

Construction of the planned projects in the region would result in temporary and permanent impacts on aquatic resources. The same projects described for Alternative 1 as part of the cumulative condition would occur under all alternatives. Alternative 2 would contribute to cumulative effects on waters with the second highest acreage of total permanent impacts (108.0 acres) and the highest temporary impacts (89.4 acres) of all alternatives.

Construction of Alternative 2 would result in the same impacts on vernal pools (both a special-status plant community and an aquatic resource) as the other alternatives because that community is present only in the Pacheco Pass and San Joaquin Valley Subsections, where the alternatives are identical. Each alternative would make the same contribution to the cumulative condition for this resource type.

Operations of planned projects, including the HSR project, would include inspection and maintenance activities. As described for Alternative 1, operation of this project would not contribute to cumulative impacts on aquatic resources.

Both the project and other foreseeable projects in the region would require the discharge of fill to waters. The cumulative effect of these activities, however, would be moderated as a result of “no net loss” policies adopted at the state and federal level.[10]

2.6.2.2 Impacts on Biological Resources

This section provides an overview of effects on special-status plant communities, special-status plant species, special-status wildlife species, and wildlife movement corridors.

2.6.2.2.1 Special-Status Plant Communities

2.6.2.2.1.1 Direct Construction Effects

Construction of Alternative 2 would take place in habitat that supports special-status plant communities. Construction would result in the conversion and degradation of such communities.

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[10] 40 Code of Federal Regulations Section 230.93(f)(1), Executive Order W-59-93 (California)

These impacts would include removal or disruption (e.g., trampling and crushing) of special-status plant communities by construction vehicles and personnel. With respect to vegetation removal, vegetation within the HSR right-of-way would largely be permanently removed. As shown in Table 2-10 (see Section 2.7), Alternative 2 would permanently affect a total of 872.9 acres of special-status plant communities. Alternative 2 would also temporarily affect 426.1 acres of special-status plant communities.

To address these potential impacts on special-status plant communities, AMMs would be implemented. Applicable AMMs include BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#8, BIO-IAMF#9, BIO-IAMF#10, BIO-IAMF#11, BIO-MM#1, BIO-MM#3, BIO-MM#4, BIO-MM#5, BIO-MM#6, BIO-MM#7, and BIO-MM#71. Compensatory mitigation would be implemented per BIO-MM#72.

2.6.2.2.1.2 Indirect Construction Effects

Construction of Alternative 2 would alter topography (e.g., by constructing embankments), which would also affect local drainage patterns and infiltration of precipitation. This change in the physical environment could degrade special-status plant communities at some locations by making those locations less suitable for the establishment or persistence of dominant or characteristic species of a special-status plant community. Extensive movement of equipment and materials into and out of the project footprint would also facilitate the spread of invasive species by facilitating the dispersal of their propagules to the disturbed areas in the project footprint. Construction of Tunnels 1 and 2 could have temporary indirect impacts on the hydrology of groundwater-dependent surface water features, including land cover types that qualify as special-status plant communities (e.g., California sycamore woodland) or that could contain unmapped occurrences of a special-status plant community (i.e., freshwater marsh, palustrine forested wetland, and seasonal wetland). In addition, groundwater depletion could affect deep-rooted oak trees outside of riparian zones, such as valley oaks in areas with relatively shallow groundwater tables. Any reductions in groundwater supply to such features could result in the desiccation of vegetation and eventual degradation of the affected community. To address these potential impacts on special-status plant communities, AMMs would be implemented. Applicable AMMs include HYD-IAMF#5, BIO-MM#2, and BIO-MM#9.

2.6.2.2.1.3 Direct and Indirect Operations Effects

Project operations would include inspection and maintenance activities along the HSR right-of-way. Right-of-way maintenance activities would include minor grading, clearing, and excavation needed to maintain adequate drainage or repair infrastructure; vegetation management, including potential trimming of trees within special-status communities (e.g., riparian) growing adjacent to the right-of-way and application of herbicide to invasive weeds within the right-of-way; and vehicle traffic along maintenance roads. Permanently affected stands of special-status plant communities in the project footprint would have been eliminated during construction, and therefore would not be affected further. However, special-status plant communities inside the right-of-way that were avoided during construction and outside but within 100 feet of the right-of-way (i.e., special-status plant study area) could potentially be affected by these activities. To address potential operations impacts on special-status plant communities, AMMs would be implemented. Applicable AMMs include BIO-IAMF#4 and BIO-MM#70.

2.6.2.2.2 Special-Status Plant Species

2.6.2.2.2.1 Direct Construction Effects

Construction of Alternative 2 would cause direct impacts on special-status plant species through 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). As shown in Table 2-11 (see Section 2.7), Alternative 2 would permanently affect 1,185.9 acres of non-overlapping special-status plant species habitat. Alternative 2 would also temporarily affect 487.1 acres of non-overlapping special-status plant species habitat.

To address these potential impacts on special-status plant species, AMMs would be implemented. Applicable AMMs include BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#8, BIO-IAMF#9, BIO-IAMF#11, BIO-MM#1, BIO-MM#3, BIO-MM#4, BIO-MM#5, BIO-MM#6, BIO-MM#7, BIO-MM#8, BIO-MM#10, and BIO-MM#11. Compensatory mitigation would be implemented per BIO-MM#12.

2.6.2.2.2.2 Indirect Construction Effects

Construction of Alternative 2 would alter topography (e.g., by constructing embankments), which would also modify local drainage patterns and infiltration of precipitation. This change in the physical environment could degrade special-status plant communities at some locations by making those locations less suitable for the establishment or persistence of special-status plants. Extensive movement of equipment and materials into and out of the project footprint would also facilitate the spread of invasive species by facilitating the dispersal of their propagules to the disturbed areas in the project footprint. Construction of Tunnels 1 and 2 could have temporary indirect impacts on the hydrology of groundwater-dependent surface water features, including land cover types that include special-status plant species. Any reductions in groundwater supply to such features could result in the desiccation of vegetation and eventual degradation of the affected community. To address these potential impacts on special-status plant species, AMMs would be implemented. Applicable AMMs include BIO-IAMF#10, HYD-IAMF#5, BIO-MM#2, and BIO-MM#9.

2.6.2.2.2.3 Direct and Indirect Operations Effects

Right-of-way maintenance activities would include minor grading, clearing, and excavation needed to maintain adequate drainage or repair infrastructure; vegetation management, including application of herbicide to invasive weeds growing within the right-of-way; and vehicle traffic along maintenance roads. These activities may cause reduced survival of special-status plants inside the right-of-way that were avoided during construction, as well as any occurring outside of but within 100 feet of the right-of-way (i.e., special-status plant study area). Minor ground disturbance within the right-of-way may result in minor direct (filling, sedimentation, inadvertent release of oils and chemicals from parked vehicles or equipment) or indirect (hydrological interruption, introduction of invasive species) effects on special-status plant habitat in and adjacent to the right-of-way. If applied during high winds, herbicides could drift onto and cause mortality of special-status plants. Dust generated from maintenance vehicles could settle on the leaves of special-status plants, increasing the rate of water loss (i.e., transpiration). Such direct and indirect effects would degrade special-status plant habitat within the special-status plant study area and could lead to the eventual extirpation of special-status plant occurrences.

To address these potential impacts on special-status plant species, AMMs would be implemented. Applicable AMMs include BIO-IAMF#4 and BIO-MM#70.

2.6.2.2.3 Special-Status Fish and Wildlife Species

2.6.2.2.3.1 Direct Construction Effects

2.6.2.2.3.1.1 Invertebrates

Construction of Alternative 2 would cause direct (permanent and temporary) impacts on suitable habitat for Bay checkerspot butterfly (including critical habitat), which could result in impacts on individuals (i.e., injury, mortality, or disturbance), if any are present in affected habitat. As shown in Table 2-12 (see Section 2.7), Alternative 2 would permanently affect 14.7 acres of suitable habitat, of which 9.4 acres are within critical habitat. Alternative 2 would also temporarily affect 27.8 acres of suitable habitat, of which 25.4 acres are within critical habitat.

Construction of Alternative 2 would cause direct impacts on suitable habitat for Crotch’s bumble bee. Construction activities would convert and disturb habitat and could result in the mortality of individual bees if underground nest colonies or overwintering queens are present in the project footprint at the time of construction. As shown in Table 2-12 (see Section 2.7), Alternative 2 would permanently affect 1,154.5 acres of suitable habitat. Alternative 2 would also temporarily affect 461.8 acres of suitable habitat.

To address potential effects on Bay checkerspot butterfly and Crotch's bumble bee, AMMs would be implemented. Applicable AMMs for Bay checkerspot butterfly include BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#8, BIO-IAMF#9, BIO-IAMF#10, BIO-IAMF#11, BIO-MM#1, BIO-MM#2, BIO-MM#3, BIO-MM#4, BIO-MM#5, BIO-MM#6, BIO-MM#10, BIO-MM#13, BIO-MM#14, and BIO-MM#15. Compensatory mitigation would be implemented per BIO-MM#16. Applicable AMMs for Crotch's bumble bee include IAMF-BIO#1, IAMF-BIO#3, IAMF-BIO#5, IAMF-BIO#8, IAMF-BIO#9, IAMF-BIO#10, IAMF-BIO#11, BIO-MM#1, BIO-MM#2, BIO-MM#3, BIO-MM#4, BIO-MM#5, BIO-MM#6, BIO-MM#12, and BIO-MM#23. Compensatory mitigation would be implemented per BIO-MM#24.

2.6.2.2.3.1.2 Fish

The primary project activities affecting special-status fish would be bridge and viaduct construction and channel realignment, temporary construction activities, utility activities, construction of bike lane/pedestrian bridges, and construction of new culverts. Construction of HSR track and systems in all subsections except the San Joaquin Valley Subsection would take place in habitat for steelhead (CCC/SCCC DPS), Pacific lamprey, and Chinook salmon (Central Valley Fall-run) (collectively referred to as special-status fish). Construction activities would result in permanent conversion of some habitat to transportation uses and could cause injury or mortality to individual fish that are present in work areas. The project would also intersect designated critical habitat for CCC and SCCC steelhead.

As shown in Table 2-12 (see Section 2.7), Alternative 2 would permanently affect 159.4 acres of special-status fish species habitat. This acreage consists of 1.5 acres of habitat for Chinook salmon, 21.6 acres for steelhead (of which 5.8 acres are designated critical habitat for CCC and SCCC steelhead), and 141.6 acres for Pacific lamprey. Alternative 2 would also temporarily affect 88.2 acres of special-status fish species habitat. This acreage consists of 8.7 acres for Chinook salmon, 14.5 acres for steelhead (of which 3.6 acres are within critical habitat for steelhead), and 71.5 acres for Pacific lamprey.

To address these potential effects on special-status fish, AMMs would be implemented. Applicable AMMs include BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#8, BIO-IAMF#9, BIO-IAMF#10, BIO-IAMF#11, HMW-IAMF#3, HMW-IAMF#6, BIO-MM#1, BIO-MM#3, BIO-MM#4, BIO-MM#6, BIO-MM#10, BIO-MM#13, BIO-MM#25, BIO-MM#26, and BIO-MM#27. Compensatory mitigation would be implemented for steelhead per BIO-MM#28.

2.6.2.2.3.1.3 Amphibians

Direct impacts on CTS could include injury and mortality of individual salamanders as a result of activities such as vehicle strikes, entrapment in construction areas or materials, and crushing or entombment of salamanders in burrows. As shown in Table 2-12 (see Section 2.7), Alternative 2 would permanently affect 2,305.1 acres of suitable habitat for CTS, of which 213.1 acres are located within critical habitat. Alternative 2 would also temporarily affect 1,087.6 acres of suitable habitat, of which 65.4 acres are within critical habitat.

Construction of the HSR track and systems in all subsections except the San Joaquin Valley Subsection would take place in suitable habitat for the California red-legged frog, resulting in the loss or degradation of such habitat and potential injury or mortality of individual red-legged frogs, if any are present in the affected area. As shown in Table 2-12 (see Section 2.7), Alternative 2 would permanently affect 2,160.0 acres of California red-legged frog habitat, of which 739.5 acres are located within critical habitat. Alternative 2 would also temporarily affect 1,173.5 acres of California red-legged frog habitat, of which 184.1 acres are within critical habitat.

Construction of the HSR track and systems in all subsections except the San Joaquin Valley Subsection would take place in suitable habitat for foothill yellow-legged frog, resulting in loss and degradation of such habitat and potential injury or mortality of individual foothill yellow-legged frog. As shown in Table 2-12 (see Section 2.7), Alternative 2 would permanently affect 89.2 acres of foothill yellow-legged frog habitat. Alternative 2 would also temporarily affect 42.0 acres of foothill yellow-legged frog habitat.

Construction of the HSR track and systems in the Morgan Hill and Gilroy, Pacheco Pass, and San Joaquin Valley Subsections would take place in suitable habitat for western spadefoot, resulting in the loss of and degradation of such habitat and the potential injury or mortality of spadefoot individuals. As shown in Table 2-12 (see Section 2.7), Alternative 2 would permanently affect 528.7 acres of western spadefoot habitat. Alternative 2 would also temporarily affect 212.1 acres of western spadefoot habitat.

To address these potential impacts on amphibians, AMMs would be implemented. Applicable AMMs include BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#6, BIO-IAMF#7, BIO-IAMF#8, BIO-IAMF#9, BIO-IAMF#10, BIO-IAMF#11, BIO-MM#1, BIO-MM#2, BIO-MM#3, BIO-MM#4, BIO-MM#5, BIO-MM#6, BIO-MM#13, BIO-MM#29 (CTS), BIO-MM#30 (CTS), BIO-MM#32 (California red-legged frog), BIO-MM#34 (foothill yellow-legged frog), BIO-MM#36 (western spadefoot), and BIO-MM#37 (western spadefoot). Compensatory mitigation would be implemented per BIO-MM#31 (CTS), BIO-MM#33 (California red-legged frog), BIO-MM#35 (foothill yellow-legged frog), and BIO-MM#74 (western spadefoot).

2.6.2.2.3.1.4 Reptiles

Construction of the HSR track and systems would take place in suitable habitat for western pond turtle. Construction activities would convert suitable habitat and reduce the quality of the remaining suitable habitat and could result in the injury or mortality of individual pond turtles. As shown in Table 2-12 (see Section 2.7), Alternative 2 would permanently affect 2,806.3 acres of western pond turtle habitat. Alternative 2 would also temporarily affect 1,581.9 acres of western pond turtle habitat.

To address these potential effects on western pond turtle, AMMs would be implemented. Applicable AMMs include BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#6, BIO-IAMF#7, BIO-IAMF#8, BIO-IAMF#9, BIO-IAMF#10, BIO-IAMF#11, BIO-MM#1, BIO-MM#2, BIO-MM#3, BIO-MM#4, BIO-MM#5, BIO-MM#6, BIO-MM#13, BIO-MM#36, and BIO-MM#37. Compensatory mitigation would be implemented for CTS per BIO-MM#31 and for California red-legged frog per BIO-MM#33; these measures are also expected to benefit western pond turtles.

2.6.2.2.3.1.5 Birds

Construction of the HSR track and systems in all five subsections would take place in suitable habitat for burrowing owl. Construction activities would result in the conversion and temporary disturbance of habitat and could result in injury and mortality of individual owls and eggs, as well as nest abandonment. Ground disturbance and vehicle traffic could injure or kill burrowing owls by crushing occupied burrows or collapsing burrow entrances, trapping any owls inside. As shown in Table 2-12 (see Section 2.7), Alternative 2 would permanently affect 1,649.8 acres of burrowing owl habitat. Alternative 2 would also temporarily affect 791.3 acres of burrowing owl habitat.

Construction of the HSR track and systems in all five subsections would take place in suitable habitat for bald and golden eagles, although there are no known eagle nests in the RSA. Construction activities would convert and temporarily disturb suitable habitat and could result in disturbance, injury, or mortality of nesting eagles if any are present in the vicinity. As shown in Table 2-12 (see Section 2.7), Alternative 2 would permanently affect 1,193.2 acres of eagle habitat. Alternative 2 would also temporarily affect 525.4 acres of eagle habitat.

Construction of the HSR track and systems in all five subsections would take place in suitable habitat for three special-status raptor species: American peregrine falcon, northern harrier, and white-tailed kite. Construction activities would convert and temporarily disturb suitable habitat and could result in disturbance, injury, or mortality of nesting raptors if any are present in the vicinity. As shown in Table 2-12 (see Section 2.7), Alternative 2 would permanently affect 6,426.4 acres of special-status raptor habitat. Alternative 2 would also temporarily affect 3,526.1 acres of special-status raptor habitat.

Construction of the HSR track and systems in all subsections except the San Jose Diridon Station Approach Subsection would take place in suitable habitat for Swainson's hawk. Construction activities would convert and temporarily disturb habitat and could result in disturbance, injury, or mortality of nesting Swainson's hawks if any are present in the vicinity. As shown in Table 2-12 (see Section 2.7), Alternative 2 would permanently affect 1,045.1 acres of Swainson's hawk habitat. Alternative 2 would also temporarily affect 698.4 acres of Swainson's hawk habitat.

Construction of the HSR track and systems in all five subsections would take place in suitable habitat for three special-status tree-nesting species: purple martin, olive-sided flycatcher, and loggerhead shrike. Construction activities would convert and temporarily disturb suitable habitat and could result in disturbance, injury, or mortality of nesting birds and the destruction of eggs and nests. As shown in Table 2-12 (see Section 2.7), Alternative 2 would permanently affect 2,391.7 acres of special-status tree-nesting species habitat. Alternative 2 would also temporarily affect 1,144.1 acres of special-status tree-nesting species habitat.

Construction of the HSR track and systems would take place in suitable habitat for three special-status riparian species: least Bell's vireo, yellow warbler, and yellow-breasted chat. Construction activities would convert and temporarily disturb suitable habitat and could result in disturbance, injury, or mortality of nesting birds and the destruction of eggs and nests. As shown in Table 2-12 (see Section 2.7), Alternative 2 would permanently affect 128.5 acres of special-status riparian species habitat. Alternative 2 would also temporarily affect 98.1 acres of special-status riparian species habitat.

Construction of the HSR track and systems in all five subsections would take place in suitable habitat for tricolored blackbird and yellow-headed blackbird. Construction activities would convert and temporarily disturb habitat and could result in disturbance, injury, or mortality of nesting birds and the destruction of eggs and nests. As shown in Table 2-12 (see Section 2.7), Alternative 2 would permanently affect 1,877.0 acres of tricolored blackbird and yellow-headed blackbird habitat. Alternative 2 would also temporarily affect 1,040.6 acres of tricolored blackbird and yellow-headed blackbird habitat.

To address these potential effects on avian species, AMMs would be implemented. Applicable AMMs include BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#8, BIO-IAMF#10, BIO-IAMF#11, BIO-MM#1, BIO-MM#2, BIO-MM#3, BIO-MM#4, BIO-MM#5, BIO-MM#6, BIO-MM#12, BIO-MM#13 (eagles, Swainson's hawk, least Bell's vireo, yellow warbler, yellow-breasted chat, tricolored blackbird), BIO-MM#45 (burrowing owl), BIO-MM#46 (burrowing owl), BIO-MM#48 (eagles), BIO-MM#49 (eagles), BIO-MM#52 (raptors), BIO-MM#53 (Swainson's hawk), BIO-MM#54 (Swainson's hawk), BIO-MM#43 (purple martin, olive-sided flycatcher, loggerhead shrike, least Bell's vireo, yellow warbler, yellow-breasted chat), and BIO-MM#56 (tricolored blackbird). Compensatory mitigation would be implemented per BIO-MM#47 (burrowing owl), BIO-MM#50 (eagles), BIO-MM#55 (Swainson's hawk), BIO-MM#72 (least Bell's vireo, yellow warbler, yellow-breasted chat), and BIO-MM#57 (tricolored blackbird).

2.6.2.2.3.1.6 Mammals

Construction of the HSR track and systems in the eastern portion of the Morgan Hill and Gilroy Subsection and throughout the Pacheco Pass and San Joaquin Valley Subsections would take place in suitable habitat for San Joaquin kit fox. Construction activities would convert and temporarily disturb habitat and could result in the disturbance, injury, and mortality of individual foxes. As shown in Table 2-12 (see Section 2.7), Alternative 2 would permanently affect 2,021.5 acres of San Joaquin kit fox habitat. Alternative 2 would also temporarily affect 860.1 acres of San Joaquin kit fox habitat.

Construction of the HSR track and systems would take place in suitable habitat for American badger. Construction activities would convert and temporarily disturb habitat and could result in the disturbance, injury, and mortality of individual badgers. As shown in Table 2-12 (see Section 2.7), Alternative 2 would permanently affect 805.4 acres of American badger habitat. Alternative 2 would also temporarily affect 399.3 acres of American badger habitat.

Construction of the HSR track and systems in all subsections except the San Joaquin Valley Subsection would take place in suitable habitat for San Francisco dusky-footed woodrat and ringtail. Construction activities would convert and temporarily disturb habitat and could result in the disturbance, injury, and mortality of individual woodrats and ringtails. As shown in Table 2-12 (see Section 2.7), Alternative 2 would permanently affect 399.6 acres of San Francisco dusky-footed woodrat and ringtail habitat. Alternative 2 would also temporarily affect 113.2 acres of San Francisco dusky-footed woodrat and ringtail habitat.

Construction of the HSR track and systems in all subsections would take place in suitable habitat for pallid bat, Townsend's big-eared bat, western mastiff bat, and western red bat. Construction activities would convert and temporarily disturb habitat and could result in the disturbance, modification, or loss of both night and maternity roost sites, as well as associated injury and mortality of roosting individuals. Ground-disturbing activities (including tunnel boring), vegetation removal, and structure demolition (e.g., removal or modification of culverts, bridges, and old buildings) in suitable habitat for these species could destroy occupied roost sites, resulting in injury or mortality of adults and young. Construction-generated noise and vibration near potential roost sites, including caves or mines in or near the project footprint for Tunnels 1 and 2, could disturb maternity roosts and cause bats to abandon their young. As shown in Table 2-12 (see Section 2.7), Alternative 2 would permanently affect 3,599.7 acres of special-status bat habitat. Alternative 2 would also temporarily affect 2,116.9 acres of special-status bat habitat.

To address these potential effects on mammals, AMMs would be implemented. Applicable AMMs include BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#7, BIO-IAMF#8, BIO-IAMF#9, BIO-IAMF#10, BIO-IAMF#11, BIO-MM#1, BIO-MM#2, BIO-MM#3, BIO-MM#4, BIO-MM#5, BIO-MM#6, BIO-MM#13, BIO-MM#59 (San Joaquin kit fox), BIO-MM#60 (San Joaquin kit fox), BIO-MM#64 (American badger), BIO-MM#65 (ringtail), BIO-MM#66 (dusky-footed woodrat), BIO-MM#67 (bats), BIO-MM#68 (bats), and BIO-MM#69 (bats). Compensatory mitigation would be implemented per BIO-MM#61 (San Joaquin kit fox) and BIO-MM#72 (riparian habitat, which would benefit San Francisco dusky-footed woodrat and ringtail).

2.6.2.2.3.2 Indirect Construction Effects

2.6.2.2.3.2.1 Invertebrates

No indirect impacts from Alternative 2 on Bay checkerspot butterfly have been identified. Noise and vibration caused by both construction and operations may cause indirect effects on Crotch's bumble bee by temporarily disrupting normal foraging or behavioral patterns; however, the extent of occupied habitat is expected to be small, and effects would be distributed on the landscape.

2.6.2.2.3.2.2 Fish

Indirect impacts from Alternative 2 (changes in channel morphology, long-term discharge of sediment and hazardous pollutants) are assumed to take place in areas comparable to those subject to direct impacts; however, because of the nature of aquatic systems, the impacts could extend downstream.

Construction of Tunnels 1 and 2 could have temporary indirect impacts on the hydrology of groundwater-dependent surface waters, including habitat and designated critical habitat for SCCC steelhead in Pacheco Creek near Casa de Fruta (i.e., northeast of Tunnel 1 and northwest of Tunnel 2). A drop in groundwater inflow to Pacheco Creek (directly or via upstream tributaries) could alter instream habitat conditions and fish movement potential. The duration of this impact would depend on hydrologic conditions, subsurface conditions, and the amount of lowering of groundwater tables or tunnel dewatering discharge, none of which can be estimated at this time.

In addition, if tunnel dewatering discharges at the Tunnel 2 west portal were routed to Pacheco Creek, such discharges could affect fish movement through the scour of creeks or banks, which could alter channel conditions, as well as through the introduction of abnormally warm water that could be a thermal barrier to safe fish passage. To meet water quality standards for beneficial reuse, settling ponds, storage tanks, and a series of treatment systems may be necessary. Only treated groundwater that meets appropriate water quality standards would be beneficially reused or discharged into receiving waterbodies. The application of regulatory discharge controls would avoid water quality effects related to fish habitat conditions and fish movement.

While pre-construction and construction actions to protect habitat for special-status fish species are part of the project, these actions would not prevent the conversion and disturbance of aquatic habitat where work must be conducted. In addition to habitat loss and temporary disturbance, construction activities could temporarily remove riparian vegetation, resulting in decreased stream shading; ground-disturbing activities could result in increased sediment discharge; and dewatering could result in stranding and death of individual fish.

To address these potential effects on relevant fish, AMMs would be implemented. Applicable AMMs include those discussed for direct impacts, as well as BIO-MM#9 and HYD-IAMF#5.

2.6.2.2.3.2.3 Amphibians

If construction in the project footprint for Alternative 2 alters a hydrologic regime that supplies water to vernal pools or aquatic features within 250 feet of the footprint, such hydrological modifications could indirectly affect habitat by altering the pools' ponding duration and rendering aquatic habitat unsuitable to support breeding behavior and the development of eggs and larvae. The introduction of nonnative plant species to upland habitat could reduce dispersal to nonbreeding sites (i.e., burrows) because dense herbaceous vegetation could impede movement.

Construction of Tunnels 1 and 2 could have temporary indirect impacts on the hydrology of groundwater-dependent surface waters, including ponds, wetlands, and streams that provide habitat for California red-legged frog, CTS, and foothill yellow-legged frog. Any reduction in groundwater hydrology that supplies water to features that function as habitat could cause adverse effects, including reduced reproductive success, degradation of habitat, and potential mortality. AMMs would be implemented. Applicable AMMs include those discussed for direct impacts, as well as BIO-MM#9 and HYD-IAMF#5.

2.6.2.2.3.2.4 Reptiles

The use of chemicals and hazardous substances during construction (e.g., oils, gasoline) may cause mortality if individuals enter aquatic habitat that has been contaminated by spills or other vehicle and equipment leaks. Construction of Tunnels 1 and 2 could have temporary indirect impacts on the hydrology of groundwater-dependent surface waters, including those that provide aquatic habitat for western pond turtle. Because western pond turtles are associated with ponds or streams that hold water year-round, any reductions in groundwater supply to occupied ponds and streams could reduce the availability of foraging and basking habitat for the affected population. Sudden decreases in water levels could strand basking individuals, forcing them to move to other aquatic habitat, if any is available nearby. To address these impacts, AMMs would be implemented. Applicable AMMs include those discussed for direct impacts, as well as BIO-MM#9 and HYD-IAMF#5.

2.6.2.2.3.2.5 Birds

Increased cover of invasive weeds could reduce habitat suitability for burrowing owls because they prefer areas with short, sparse vegetation.

The project could cause indirect impacts on special-status riparian birds. Ground disturbance and vegetation removal in riparian habitat would create areas of bare soil susceptible to colonization by nonnative invasive plant species, such as giant reed, tamarisk, and perennial pepperweed. Dense stands of these species would degrade riparian habitat for least Bell's vireos and other riparian birds by outcompeting willows and other native plants that provide nest sites. Construction of Tunnels 1 and 2 could have temporary indirect impacts on the hydrology of groundwater-dependent surface water features, including riparian vegetation along Pacheco Creek that provides habitat for least Bell's vireo and other riparian birds. Reductions in groundwater supply to riparian vegetation could result in the desiccation of vegetation and degradation of habitat for these species. To address these potential impacts on these avian species, AMMs would be implemented. Applicable AMMs include those discussed for direct impacts, as well as BIO-MM#9 and HYD-IAMF#5.

2.6.2.2.3.2.6 Mammals

Introduction of invasive nonnative vegetation could alter the structure of the vegetation community, making it less suitable to support kit foxes, woodrats, and ringtails, and could adversely affect the productivity of the prey base. To address these potential impacts on mammals, AMMs would be implemented. Applicable AMMs include those discussed for direct impacts.

2.6.2.2.3.3 Direct and Indirect Operations Effects

HSR operations would include inspection and maintenance activities along the HSR right-of-way. Right-of-way maintenance activities would include minor grading, clearing, and excavation needed to maintain adequate drainage or repair infrastructure; vegetation management, including application of herbicide to invasive weeds growing within the right-of-way; and vehicle traffic along maintenance roads. Because much of the right-of-way would already have been subjected to extensive ground disturbance and construction activities and converted to HSR track and systems, the areas within the right-of-way would provide limited habitat for most special-status wildlife. Nevertheless, these activities may further degrade habitat areas inside the right-of-way that were avoided during construction, as well as habitat outside of but within 250 feet of the right-of-way (i.e., core habitat study area). Minor ground disturbance within the right-of-way may result in minor direct (filling, sedimentation, inadvertent release of oils and chemicals from parked vehicles or equipment) or indirect (hydrological interruption, introduction of invasive species) impacts on special-status wildlife habitat in and adjacent to the right-of-way. If applied during high winds, herbicides could drift into and contaminate aquatic habitat features (e.g., ponds and wetlands). Such direct and indirect impacts would degrade special-status wildlife habitat in the habitat study area. Some habitat areas may be degraded to the extent that they no longer support the resources necessary for species survival and reproduction, and therefore cease to function as habitat for those species.

To address these potential effects on special-status animal species, AMMs would be implemented. Applicable AMMs include BIO-IAMF#4 and BIO-MM#70.

2.6.2.2.4 Wildlife Corridors

2.6.2.2.4.1 Construction Impacts

Construction of Alternative 2 would temporarily and permanently affect regional and local wildlife movement patterns. Construction of the HSR track and systems in all subsections would temporarily affect wildlife movement in several ways. Construction fencing and dewatering would create temporary barriers to movement, precluding the normal movement of animals. Noise, vibration, and visual disturbance from construction vehicles and pile driving may alter or delay movement of individuals as they attempt to avoid the construction area. Nighttime construction or security lighting could cause animals to delay or alter movement patterns because they may avoid lit areas.

Construction of the project would permanently affect regional and local wildlife movement patterns by creating new barriers to local and regional wildlife movement and fragmenting habitat. While project design would provide for wildlife movement across the alignment in Coyote Valley, the Soap Lake floodplain, most of Pacheco Pass, and the Central Valley, barriers to movement would remain on the west slope of Pacheco Pass where the rail alignment parallel to Pacheco Creek would be placed on a series of continuous cut-and-fill slopes. Barriers to movement and habitat fragmentation reduce resource availability and isolate breeding groups; both conditions can ultimately lead to reduced reproductive success and inbreeding depression. Terrestrial species are most vulnerable to permanent movement impacts. Birds and bats are able to move over patches of unsuitable habitat.

To address these potential effects on wildlife movement patterns, AMMs would be implemented. Applicable AMMs include BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#8, NV-IAMF#1, BIO-MM#3, BIO-MM#25, BIO-MM#76, BIO-MM#77, BIO-MM#78, and BIO-MM#79.

2.6.2.2.4.2 Operation Impacts

Alternative 2 would result in noise from operations that can affect wildlife movement. The analysis detailed in the WCA (Authority 2020c) determined that only wildlife within a particular screening distance would be vulnerable to these impacts. The analysis detailed in the WCA determined that only terrestrial wildlife within the screening distance from the HSR centerline (e.g., within 70 feet of an at-grade section with a train traveling at 220 mph) would experience noise effects. The WCA determined that for birds and bats, three aerial species focal groups—waterfowl, shorebirds, and wading birds (collectively waterbirds)—were vulnerable to noise and were present in populations and concentrations substantial enough to be adversely affected. In the regional RSA, these focal groups are known to congregate in two primary locations: the UPR and GEA IBAs. Within the UPR IBA, Alternative 2 would affect 1,075 acres through impacts such as temporary hearing damage, masking, and arousal. Within the GEA IBA, Alternative 2 would affect 1,205 acres through the same kinds of impacts.

Vibration from train operations may also affect wildlife movement. Vibration effects are most likely to be perceived by species such as reptiles and amphibians, some of which—specifically snakes—are the most vibration-sensitive wildlife species known. However, because the affected species are reasonably common and the impacts would be brief and primarily diurnal (snakes are chiefly nocturnal predators), these vibration impacts are unlikely to cause substantial or long-lasting impacts. Amphibians are also highly sensitive to vibration, using ground vibration for communication, especially in the process of mate selection; thus, vibration generated by project operations at the time of amphibian breeding has the potential to affect the success of amphibian breeding activities and thereby to affect their population status. Burrowing rodents, notably kangaroo rats, are potentially sensitive to vibration influences on behavior and on the risk of vibration-caused burrow collapse. Studies involving intensive seismic exploration (Cypher et al. 2016), which generates extensive ground vibrations, did not find evidence of burrow collapse; however, minimization measures, including avoiding kangaroo rat burrows by a buffer distance of at least 10 meters (33 feet), may have avoided such effects. In the context of proposed operations, these findings suggest that exclusion fencing would limit impacts on kangaroo rats by excluding species' use of habitat within a distance of up to 13 meters (42 feet) from the tracks.

Train operations can also cause intermittent visual disturbance of wildlife. The literature identifies two distances at which response to visual stimuli occurs for waterfowl: flight initiation distance (average 269 feet) and minimum approach distance (average 404 feet). The flight initiation distance is assumed to have potential for the greatest impact and was applied as a threshold to determine acres of affected habitat. Alternative 2 would affect 173 acres of habitat (i.e., habitat within the 269-foot flight initiation distance) in the Soap Lake 10-year floodplain and 524 acres in the GEA IBA. For raptors, the flight initiation distance from motor vehicles is 262 feet on average. If a raptor nest is within this distance of the rail alignment, there is potential for train operations to cause nest abandonment.

Project lighting can also affect wildlife using corridors during train operations. Conversely, nighttime lighting impacts are expected to be greatest in natural settings, where baseline light levels are low, and in locations where wildlife is known to move. In addition, light impacts from trains are expected to be greatest where the rail is at grade. However, the impacts on movement from train light are likely to be less than those from noise and vibration because noise and vibration travel farther from the centerline than light (which is directed in front of the train). For aerial species, few quantitative studies are available to determine the distance at which this impact may occur; however, published analyses confirm some potential for impact. For example, hunting owls may perch on OCS structures and become disoriented by the headlight of the approaching train, resulting in train strike. Also, birds may become "trapped" by a cone of light, unwilling to exit into darkness. This behavior may elevate train strike risk for birds lit by the headlight of an approaching train.

Operations also have the potential to cause mortality by train strike, although at-grade sections would have fencing to reduce wildlife access. Because terrestrial species are not expected to gain access to elevated sections, it is only at-grade sections that present risk of train strike to terrestrial species. Train operations also pose the risk of injury and mortality to aerial species by striking birds or bats flying in the path of passing trains. Nevertheless, quantifying the severity of the impact is difficult. For special-status species with low reproductive rates, such as California condor, Swainson's hawk, sandhill crane, and golden eagle, the loss of one individual would be a substantial impact. For more common species, the injury or mortality of a small portion of the local or regional population is not likely to be a substantial impact.

Within the GEA IBA specifically, waterfowl, shorebirds, and wading birds are known to congregate in relatively large numbers, and intermittent strike of these special-status species could affect the abundance and local or regional populations of these species over time. While condor numbers are very low in the region, and there is no evidence of nesting, train strike has potential to affect the distribution and abundance of local or regional populations of the species. CDFW tracking data confirm condor flights over the proposed rail alignment in western Pacheco Pass near Casa de Fruta; consequently, there is potential for individuals to be struck by the train while attempting to forage on carrion on or near the alignment.

Collisions with power lines or OCS facilities pose the risk of injury and mortality to bird and bat species. Prior to construction, the Authority would design the OCS and other structures (e.g., fencing) to be bird- and raptor-safe in accordance with applicable APLIC recommendations (Authority 2020c).

To address these potential effects on wildlife corridors and movement, AMMs would be implemented. Applicable AMMs include BIO-IAMF#12, BIO-MM#77, BIO-MM#78, BIO-MM#80, BIO-MM#81, BIO-MM#82, and BIO-MM#83. Compensatory mitigation would be implemented per BIO-MM#58.

2.6.2.3 Other Environmental Consequences

2.6.2.3.1 Agricultural Farmlands

2.6.2.3.1.1 Temporary Use of Important Farmland During Construction

Construction of Alternative 2 would require the temporary use of 658.6 acres of Important Farmland. This land would be leased from the landowner and temporarily removed from agricultural use for the duration of construction. In addition, reconductoring activities as part of the network upgrades would require temporary use of Important Farmland.

Although the project would temporarily use Important Farmland, the land would be restored following the cessation of construction activities and would not be permanently converted to nonagricultural use. The Authority would implement the same IAMFs as discussed for Alternative 1 to reduce impacts.

2.6.2.3.1.2 Permanent Conversion of Important Farmland to Nonagricultural Use

Direct permanent conversion of Important Farmland to nonagricultural use would occur where the project footprint of an alternative overlaps Important Farmland. Alternative 2 would result in permanent conversion of 1,181.3 acres of Important Farmland. The Authority would purchase and use the land in the project footprint for the HSR right-of-way, access easement, stations, and maintenance facilities. The Authority would implement the same AMM as for Alternative 1.

2.6.2.3.1.3 Permanent Creation of Remnant Parcels of Important Farmland

Alternative 2 would result in the indirect creation of remnant parcels of Important Farmland in and adjacent to the TCE because of severance by the project. Some parcels could be severed from a larger parcel because the guideway alignment would bisect the parcel, and some parcels could be severed because roadway access would be restricted or eliminated. Some remnant parcels would remain in agricultural use because of adjacency to other farmland with access, sufficient size, or farmable shape. However, remnant parcels of 20 acres or less have the potential to become unfarmable because of lack of access, size, shape, location, or other constraint. These are referred to as nonviable remnant parcels and would result in conversion to nonagricultural use. Alternative 2 would convert 244.3 acres of Important Farmland to nonagricultural use through creation of nonviable remnant parcels, with acreage spread across 250 remnant parcels. The Authority would implement the same AMM as for Alternative 1.

2.6.2.3.2 Parks, Recreation, and Open Space

2.6.2.3.2.1 Temporary Changes from Noise, Vibration, and Construction Emissions on Use and User Experience of Parks, Recreational Facilities, and Open Space Resources

Construction of the San Jose to Merced Section has the potential to disrupt use and user experience at parks, recreational facilities, and open spaces due to temporary and localized noise, vibration, and construction emissions. Alternative 2 would affect the user experience at 36 park, recreation, and open space resources. Additionally, under Alternative 2, construction noise and vibration would preclude use of the amphitheater at the Morgan Hill Community and Cultural Center during two construction phases (concrete pour/aerial structure and track installation) and could result in damage to the playhouse and other buildings at the facility, despite project actions that address construction noise, vibration, and fugitive dust impacts. The project would comply with the Federal Transit Administration and FRA guidelines for minimizing construction noise and vibration impacts when work is conducted within 1,000 feet of sensitive receptors, which includes the parks, recreation facilities, and open space resources (FRA 2012) where uses are noise and vibration sensitive. The Authority would implement the same AMMs as for Alternative 1, as well as AMMs N&V-MM#1 and N&V-MM#2.

2.6.2.3.2.2 Temporary Changes to Access or Use of Parks

Construction of the project would require TCEs to facilitate placement of construction equipment and construction activities that could reduce access to roadways or otherwise temporarily affect access to and use of parks. Project construction would likely occur over a period of 4 years, with 1.5 years of continuous construction activity at any one location. Alternative 2 would limit access to 14 park, recreation, and open space resources. The Authority would implement the same AMMs as for Alternative 1.

Additionally, under Alternative 2 construction of the project would result in temporary visual changes, but they would not create a perceived barrier to use. The Authority would implement SOCIO-IAMF#1 to minimize impacts on residents and businesses.

2.6.2.3.2.3 Permanent Acquisition of Parks, Recreation, and Open Space Resources

Construction of Alternative 2 would result in the permanent acquisition of portions of 10 park, recreation, and open space resources. The Authority would implement the same AMMs as for Alternative 1.

2.6.2.3.2.4 Additional Permanent Changes to Parks, Recreation, and Open Space Resources

Construction of Alternative 2 would result in permanent changes to access or circulation at three resources. The Authority would implement PK-IAMF#1 and PR-MM#3 to reduce impacts.

Construction of Alternative 2 would not result in permanent visual changes that could create an actual or perceived barrier to use, even though the user experience at certain resources would be altered. The Authority would implement AVR-IAMF#1 and AVR-IAMF#2 to reduce impacts.

Construction of Alternative 2 would result in permanent effects from operational noise on two resources and no permanent effects from vibration on any resource. The Authority would implement NV-MM#3, NV-MM#4, and NV-MM#8 to reduce impacts.

Construction of Alternative 2 would not result in the permanent closure or relocation of any parks, recreational facilities, or open space areas. Therefore, no new parks or other recreational facilities would need to be constructed to accommodate demand, and no mitigation measures would be required.

2.6.2.3.2.5 Temporary Changes to Access or Use of School District Play Areas

Construction of the project would require TCEs for placement of construction equipment and construction activities; such TCEs could reduce access to roadways or otherwise temporarily affect access to and use of school district play areas. Project construction would likely occur over a period of 4 years, with 1.5 years of continuous construction activity at any one location. It is assumed that TCEs could be in place for up to 4 years. The location of TCEs adjacent to the project alignment would temporarily affect access to five school district play areas. The Authority would implement the same AMMs as for Alternative 1.

2.6.2.3.2.6 Additional Temporary Changes to School District Play Areas

Construction of Alternative 2 would generate temporary and localized noise, vibration, and construction emissions affecting school district play areas within 1,000 feet of the project footprint, but they would not preclude the use of these play areas. The Authority would implement NV-IAMF#1 and AQ-IAMF#1 to minimize these impacts.

Construction of Alternative 2 would result in temporary visual changes, but they would not create a perceived barrier to access or continued use of school district play areas. The Authority would implement SOCIO-IAMF#1 to reduce impacts.

2.6.2.3.2.7 Permanent Acquisition of School District Play Areas

Under Alternative 2, the project would result in the permanent acquisition of 12 percent of the play area at South Valley Middle School in Gilroy. Additionally, 0.1 percent of the play area at San Martin/Gwinn Elementary School would be necessary. The Authority would implement the same AMM as for Alternative 1.

2.6.2.3.2.8 Permanent Changes from Noise and Vibration on School District Play Area Character and Use

No moderate or severe operational noise impacts for school district play areas would occur under Alternative 2.

2.6.2.3.2.9 Permanent Changes Affecting Access to School District Play Areas

Construction of Alternative 2 would not result in permanent changes in access to school district play areas. Therefore, no AMMs or mitigation measures would be required.

2.6.2.3.2.10 Permanent Visual Changes That Could Create A Perceived Barrier to Access or Continued Use of School District Play Areas

Construction of Alternative 2 would not result in any permanent visual changes that would create a perceived barrier to access or use of school district play areas. Therefore, no AMMs or mitigation measures would be required.

2.6.2.3.3 Cultural Resources

2.6.2.3.3.1 Permanent Disturbance of Unknown Archaeological Sites

Construction of the project could potentially affect unknown archaeological resources with ground-disturbing construction associated with the project. Unknown archaeological sites might encompass the full range of pre-contact or historic activities conducted over time, including pre-contact lithic scatters and village sites, historic-era homestead remains, and human burials.

Unknown or unrecorded archaeological resources that are not observable when conducting standard surface archaeological inspections, including subsurface buried archaeological deposits, may exist in areas surveyed within urbanized or rural areas. Unknown or unrecorded archaeological resources may also exist in areas where permission to enter has not been granted. Alternative 2 has 683 acres of surface that are generally sensitive for archaeological resources and 3,828 acres that are sensitive for buried archaeological resources.

The project would limit potential impacts on unknown archaeological sites by developing an MOA for each undertaking where the Authority determines there would be an adverse effect on historic properties or when phased identification is necessary and adverse impacts would occur. The Authority and SHPO would use the MOA and ATP to enforce implementing the required actions arising from the Section 106 consultation. The Authority would implement the same AMMs as discussed for Alternative 1.

2.6.2.3.3.2 Permanent Disturbance of a Known Archaeological Site

Construction of the project may result in permanent disturbance of known archaeological sites. Thirty-five archaeological resources are known to exist in the APE. Alternative 2 crosses all or part of 30 known resources. These cultural resources would be subject to phased evaluation; and are assumed eligible at the present time only until they can be evaluated and their eligibility determined. Grading, trenching, and excavating in the project footprint during construction, as well as compaction resulting from the use of heavy machinery and other vehicular traffic on the construction site or in TCEs, may affect the integrity of artifact-bearing archaeological deposits. The Authority would implement the same AMMs as discussed for Alternative 1.

2.6.2.3.3.3 Temporary Public Access and Disturbance of Archaeological Resources

Construction activities associated with the project would not result in higher potential for public access to archaeological resources by people who previously would not have been able to enter the property where the resource is located because the work areas would be inaccessible to the public. All work areas would be fenced and access controlled, allowing access only to authorized construction personnel; therefore, they would not provide access for persons to loot sites and would not expose sites to compaction through pedestrian or vehicular traffic. Additionally, the project may include increased site protection measures in the MOA and ATP, such as nighttime security patrols.

These design characteristics and features would be the same for all project alternatives. There would be no impacts on unknown archaeological resources because of temporary public access from any of the project alternatives. Additionally, there would be no impact during operations under Alternative 2.

2.6.2.3.3.4 Permanent Demolition, Destruction, Relocation, or Alteration of Built Resources or Setting

Construction activities associated with the project could result in demolition, relocation, and alteration of built resources, the setting of the resources, or both. Alternative 2 has the potential to affect historic built resources in several ways. Where the permanent HSR right-of-way would cross an historic property, character-defining features or entire resources would likely be demolished to make way for the construction of track structures or other facilities. The permanent HSR right-of-way that would be introduced directly adjacent to built resources would alter their setting, which has the potential to impair the resources' integrity of feeling, setting, and association. In other words, introducing a very large, modern transportation structure would make it difficult to understand the historic visual context of the resource, and thus how it functioned and related to its local context during its period of significance. Areas that would be used as a TCE may be used in a variety of ways, including but not limited to materials staging, operation of construction equipment, and installation of protective fencing. Once cleared as a TCE, any activities in support of construction of the project would be allowed. These activities have the potential to result in permanent physical damage to resources or their character-defining features. Under Alternative 2, 11 built resources could be affected: seven would be demolished, two would experience compromised integrity due to the loss of character-defining features, and two would have their setting altered in a way that changes the historic context. The Authority would implement the same AMMs as discussed for Alternative 1.

2.6.2.3.3.5 Noise and Vibration Impacts on Built Resources Caused by Construction Activities

Under Alternative 2, no built resources would be adversely affected by construction-related noise or vibration impacts. The Authority would implement the following project features to protect built resources and to avoid impacts: CUL-IAMF#6, CUL-IAMF#7, and CUL-IAMF#8.

2.6.2.3.3.6 Intermittent Noise and Vibration Impacts on Built Resources Caused by Operations

Under Alternative 2, intermittent noise and vibration caused by operations would have no impact on any built resources. Therefore, no AMMs or mitigation measures would be required.

2.6.2.4 Practicability

2.6.2.4.1 Consistency with the Overall Project Purpose

Alternative 2 would be consistent with the overall project purpose for the San Jose to Merced Project Section.

2.6.2.4.2 Other Practicability Factors

- **Availability:** Alternative 2 would be available.
- **Cost:** Alternative 2 would be practicable from a cost standpoint.
- **Existing Technology:** Alternative 2 would be capable of being constructed with respect to existing technology. The design of Alternative 2 includes at-grade, below-grade, and above-grade (elevated) segments. Most of the anticipated construction methods that would be used to construct Alternative 2 are the same conventional means and methods employed by contractors that build roads, bridges, railway tracks, and other transportation infrastructure using common industry equipment, readily available labor and tools, and industry-standard operations. Consequently, Alternative 2 would be practicable in light of existing technology.
- **Logistics:** 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. Alternative 2 would be practicable from a logistical standpoint.

2.6.3 Alternative 3

2.6.3.1 Impacts on Aquatic Resources

2.6.3.1.1 Direct Effects

Construction of Alternative 3 would result in the permanent discharge of fill of 110.8 acres and temporary fill of 80.7 acres, as shown in Table 2-9 (see Section 2.7). This is the highest acreage of permanent impacts. The temporary impacts are the third highest for all alternatives. Alternative 3 would result in the discharge of permanent fill of 67.8 acres of wetlands and temporary fill of 11.9 acres of wetlands. Alternative 3 would result in permanent placement of fill in non-wetland waters of 43.0 acres and temporary fill in 68.8 acres of non-wetland waters.

Based on the CRAM assessment, waterbodies potentially affected by Alternative 3 were ranked within the “fair” category with the exception of constructed watercourses, which were ranked poor.

The Authority would implement BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#8, BIO-IAMF#9, BIO-IAMF#10, BIO-MM#1, BIO-MM#3, BIO-MM#4, BIO-MM#5, BIO-MM#6, BIO-MM#71, and BIO-MM#73 to reduce impacts.

2.6.3.1.2 Indirect Effects

Indirect effects were evaluated across the entire project extent but were identified only on subsections where the alternatives are in a common alignment. For this reason, indirect effects would be identical to those described for Alternative 1.

2.6.3.1.3 Cumulative Effects

Construction of the planned projects in the region would result in temporary and permanent impacts on aquatic resources. The same projects described for Alternative 1 as part of the cumulative condition would occur under all alternatives. Alternative 3 would contribute to cumulative effects on waters with the highest acreage of total permanent impacts (110.8 acres) and the third highest temporary impacts (80.7 acres) of all alternatives.

Construction of all four alternatives would have identical impacts on vernal pools (both a special-status plant community and an aquatic resource) because that community is present only in the Pacheco Pass and San Joaquin Valley Subsections, where the alternatives are identical. Each alternative would make the same contribution to the cumulative condition for this resource type.

Operations of planned projects, including the HSR project, would include inspection and maintenance activities. As described for Alternative 1, operation of this project would not contribute to cumulative impacts on aquatic resources.

Both the project and other foreseeable projects in the region would require the discharge of fill to waters. The cumulative effect of these activities, however, would be moderated as a result of “no net loss” policies adopted at the state and federal level.[11].

2.6.3.2 Impacts on Biological Resources

This section provides an overview of effects on special-status plant communities, special-status plant species, special-status wildlife species, and wildlife movement corridors.

2.6.3.2.1 Special-Status Plant Communities

2.6.3.2.1.1 Direct Construction Effects

Construction of Alternative 3 would take place in habitat that supports special-status plant communities. Construction would result in the conversion and degradation of such communities. These impacts would include removal or disruption (e.g., trampling and crushing) of special-status plant communities by construction vehicles and personnel. With respect to vegetation removal, vegetation within the HSR right-of-way would largely be permanently removed. As shown in Table 2-10 (see Section 2.7), Alternative 3 would permanently affect a total of 880.5 acres of special-status plant communities. Alternative 3 would also temporarily affect 400.9 acres of special-status plant communities.

To address these potential impacts on special-status plant communities, AMMs would be implemented. Applicable AMMs include BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#8, BIO-IAMF#9, BIO-IAMF#10, BIO-IAMF#11, BIO-MM#1, BIO-MM#3, BIO-MM#4, BIO-MM#5, BIO-MM#6, BIO-MM#7, and BIO-MM#71. Compensatory mitigation would be implemented per BIO-MM#72.

2.6.3.2.1.2 Indirect Construction Effects

Construction of Alternative 3 would alter topography (e.g., by constructing embankments), which would also affect local drainage patterns and infiltration of precipitation. This change in the physical environment could degrade special-status plant communities at some locations by making those locations less suitable for the establishment or persistence of dominant or characteristic species of a special-status plant community. Extensive movement of equipment and materials into and out of the project footprint would also facilitate the spread of invasive species by facilitating the dispersal of their propagules to the disturbed areas in the project footprint. Construction of Tunnels 1 and 2 could have temporary indirect impacts on the hydrology of groundwater-dependent surface water features, including land cover types that qualify as special-status plant communities (e.g., California sycamore woodland) or that could contain unmapped occurrences of a special-status plant community (i.e., freshwater marsh, palustrine forested wetland, and seasonal wetland). In addition, groundwater depletion could affect deep-rooted oak trees outside of riparian zones, such as valley oaks in areas with relatively shallow groundwater tables. Any reductions in groundwater supply to such features could result in the desiccation of vegetation and eventual degradation of the affected community. To address these potential impacts on special-status plant communities, AMMs would be implemented. Applicable AMMs include HYD-IAMF#5, BIO-MM#2, and BIO-MM#9.

2.6.3.2.1.3 Direct and Indirect Operations Effects

Project operations would include inspection and maintenance activities along the HSR right-of-way. Right-of-way maintenance activities would include minor grading, clearing, and excavation needed to maintain adequate drainage or repair infrastructure; vegetation management, including potential trimming of trees within special-status communities (e.g., riparian) growing adjacent to

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[11] 40 Code of Federal Regulations Section 230.93(f)(1), Executive Order W-59-93 (California)

the right-of-way and application of herbicide to invasive weeds within the right-of-way; and vehicle traffic along maintenance roads. Permanently affected stands of special-status plant communities in the project footprint would have been eliminated during construction, and therefore would not be affected further. However, special-status plant communities inside the right-of-way that were avoided during construction and outside but within 100 feet of the right-of-way (i.e., special-status plant study area) could potentially be affected by these activities. To address potential operations impacts on special-status plant communities, AMMs would be implemented. Applicable AMMs include BIO-IAMF#4 and BIO-MM#70.

2.6.3.2.2 Special-Status Plant Species

2.6.3.2.2.1 Direct Construction Effects

Construction of Alternative 3 would cause direct impacts on special-status plant species through 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). As shown in Table 2-11 (see Section 2.7), Alternative 3 would permanently affect 1,190.8 acres of non-overlapping special-status plant species habitat. Alternative 3 would also temporarily affect 467.5 acres of non-overlapping special-status plant species habitat.

To address these potential impacts on special-status plant species, AMMs would be implemented. Applicable AMMs include BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#8, BIO-IAMF#9, BIO-IAMF#11, BIO-MM#1, BIO-MM#3, BIO-MM#4, BIO-MM#5, BIO-MM#6, BIO-MM#7, BIO-MM#8, BIO-MM#10, and BIO-MM#11. Compensatory mitigation would be implemented per BIO-MM#12.

2.6.3.2.2.2 Indirect Construction Effects

Construction of Alternative 3 would alter topography (e.g., by constructing embankments), which would also modify local drainage patterns and infiltration of precipitation. This change in the physical environment could degrade special-status plant communities at some locations by making those locations less suitable for the establishment or persistence of special-status plants. Extensive movement of equipment and materials into and out of the project footprint would also facilitate the spread of invasive species by facilitating the dispersal of their propagules to the disturbed areas in the project footprint. Construction of Tunnels 1 and 2 could have temporary indirect impacts on the hydrology of groundwater-dependent surface water features, including land cover types that include special-status plant species. Any reductions in groundwater supply to such features could result in the desiccation of vegetation and eventual degradation of the affected community. To address these potential impacts on special-status plant species, AMMs would be implemented. Applicable AMMs include BIO-IAMF#10, HYD-IAMF#5, BIO-MM#2, and BIO-MM#9.

2.6.3.2.2.3 Direct and Indirect Operations Effects

Right-of-way maintenance activities would include minor grading, clearing, and excavation needed to maintain adequate drainage or repair infrastructure; vegetation management, including application of herbicide to invasive weeds growing within the right-of-way; and vehicle traffic along maintenance roads. These activities may cause reduced survival of special-status plants inside the right-of-way that were avoided during construction, as well as any occurring outside of but within 100 feet of the right-of-way (i.e., special-status plant study area). Minor ground disturbance within the right-of-way may result in minor direct (filling, sedimentation, inadvertent release of oils and chemicals from parked vehicles or equipment) or indirect (hydrological interruption, introduction of invasive species) effects on special-status plant habitat in and adjacent to the right-of-way. If applied during high winds, herbicides could drift onto and cause mortality of special-status plants. Dust generated from maintenance vehicles could settle on the leaves of special-status plants, increasing the rate of water loss (i.e., transpiration). Such direct and indirect effects would degrade special-status plant habitat within the special-status plant study area and could lead to the eventual extirpation of special-status plant occurrences.

To address these potential impacts on special-status plant species, AMMs would be implemented. Applicable AMMs include BIO-IAMF#4 and BIO-MM#70.

2.6.3.2.3 Special-Status Fish and Wildlife Species

2.6.3.2.3.1 Direct Construction Effects

2.6.3.2.3.1.1 Invertebrates

Construction of Alternative 3 would cause direct (permanent and temporary) impacts on suitable habitat for Bay checkerspot butterfly (including critical habitat), which could result in impacts on individuals (i.e., injury, mortality, or disturbance), if any are present in affected habitat. As shown in Table 2-12, Alternative 3 would permanently affect 9.8 acres of suitable habitat, of which 4.3 acres are within critical habitat. Alternative 3 would also temporarily affect 22.6 acres of suitable habitat, of which 21.7 acres are within critical habitat.

Construction of Alternative 3 would cause direct impacts on suitable habitat for Crotch's bumble bee. Construction activities would convert and disturb habitat and could result in the mortality of individual bees if underground nest colonies or overwintering queens are present in the project footprint at the time of construction. As shown in Table 2-12, Alternative 3 would permanently affect 1,148.8 acres of suitable habitat. Alternative 3 would also temporarily affect 444.0 acres of suitable habitat.

To address potential effects on Bay checkerspot butterfly and Crotch's bumble bee, AMMs would be implemented. Applicable AMMs for Bay checkerspot butterfly include BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#8, BIO-IAMF#9, BIO-IAMF#10, BIO-IAMF#11, BIO-MM#1, BIO-MM#2, BIO-MM#3, BIO-MM#4, BIO-MM#5, BIO-MM#6, BIO-MM#10, BIO-MM#13, BIO-MM#14, and BIO-MM#15. Compensatory mitigation would be implemented per BIO-MM#16. Applicable AMMs for Crotch's bumble bee include BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#8, BIO-IAMF#9, BIO-IAMF#10, BIO-IAMF#11, BIO-MM#1, BIO-MM#2, BIO-MM#3, BIO-MM#4, BIO-MM#5, BIO-MM#6, BIO-MM#12, and BIO-MM#23. Compensatory mitigation would be implemented per BIO-MM#24.

2.6.3.2.3.1.2 Fish

The primary project activities affecting special-status fish would be bridge and viaduct construction and channel realignment, temporary construction activities, utility activities, construction of bike lane/pedestrian bridges, and construction of new culverts. Construction of HSR track and systems in all subsections except the San Joaquin Valley Subsection would take place in habitat for steelhead (CCC/SCCC DPS), Pacific lamprey, and Chinook salmon (Central Valley Fall-run) (collectively referred to as special-status fish). Construction activities would result in permanent conversion of some habitat to transportation uses and could cause injury or mortality to individual fish that are present in work areas. The project would also intersect designated critical habitat for CCC and SCCC steelhead.

As shown in Table 2-12 (see Section 2.7), Alternative 3 would permanently affect 177.4 acres of special-status fish species. Of this acreage, 3.3 acres are for Chinook salmon, 31.5 acres are for steelhead (of which 5.9 acres are designated critical habitat for CCC and SCCC steelhead), and 147.4 acres are for Pacific lamprey. Alternative 3 would also temporarily affect 80.6 acres of special-status fish habitat. Of this acreage, 6.5 are for chinook salmon, 15.3 are for steelhead (of which 3.5 acres are within critical habitat for the steelhead), and 65.2 acres are for Pacific lamprey.

To address these potential effects on special-status fish, AMMs would be implemented. Applicable AMMs include BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#8, BIO-IAMF#9, BIO-IAMF#10, BIO-IAMF#11, HMW-IAMF#3, HMW-IAMF#6, BIO-MM#1, BIO-MM#3, BIO-MM#4, BIO-MM#6, BIO-MM#10, BIO-MM#13, BIO-MM#25, BIO-MM#26, and BIO-MM#27. Compensatory mitigation would be implemented for steelhead per BIO-MM#28.

2.6.3.2.3.1.3 Amphibians

Direct impacts on CTS could include injury and mortality of individual salamanders as a result of activities such as vehicle strikes, entrapment in construction areas or materials, and crushing or entombment of salamanders in burrows. As shown in Table 2-12, Alternative 3 would permanently affect 2,447.8 acres of suitable habitat for CTS, of which 213.1 acres are located within critical habitat. Alternative 3 would also temporarily affect 956.5 acres of suitable habitat, of which 65.3 acres are within critical habitat.

Construction of the HSR track and systems in all subsections except the San Joaquin Valley Subsection would take place in suitable habitat for the California red-legged frog, resulting in the loss or degradation of such habitat and potential injury or mortality of individual red-legged frogs, if any are present in the affected area. As shown in Table 2-12 (see Section 2.7), Alternative 3 would permanently affect 2,119.3 acres of California red-legged frog habitat, of which 738.7 are located within critical habitat. Alternative 3 would also temporarily affect 882.3 acres of California red-legged frog habitat, of which 184.3 acres are within critical habitat.

Construction of the HSR track and systems in all subsections except the San Joaquin Valley Subsection would take place in suitable habitat for foothill yellow-legged frog, resulting in loss and degradation of such habitat and potential injury or mortality of individual foothill yellow-legged frog. As shown in Table 2-12 (see Section 2.7), Alternative 3 would permanently affect 91.9 acres of foothill yellow-legged frog habitat. Alternative 3 would also temporarily affect 41.0 acres of foothill yellow-legged frog habitat.

Construction of the HSR track and systems in the Morgan Hill and Gilroy, Pacheco Pass, and San Joaquin Valley Subsections would take place in suitable habitat for western spadefoot, resulting in the loss of and degradation of such habitat and the potential injury or mortality of spadefoot individuals. As shown in Table 2-12 (see Section 2.7), Alternative 3 would permanently affect 546.2 acres of western spadefoot habitat. Alternative 3 would also temporarily affect 214.7 acres of western spadefoot habitat.

To address these potential impacts on amphibians, AMMs would be implemented. Applicable AMMs include BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#6, BIO-IAMF#7, BIO-IAMF#8, BIO-IAMF#9, BIO-IAMF#10, BIO-IAMF#11, BIO-MM#1, BIO-MM#2, BIO-MM#3, BIO-MM#4, BIO-MM#5, BIO-MM#6, BIO-MM#13, BIO-MM#29 (CTS), BIO-MM#30 (CTS), BIO-MM#32 (California red-legged frog), BIO-MM#34 (foothill yellow-legged frog), BIO-MM#36 (western spadefoot), and BIO-MM#37 (western spadefoot). Compensatory mitigation would be implemented per BIO-MM#31 (CTS), BIO-MM#33 (California red-legged frog), BIO-MM#35 (foothill yellow-legged frog), and BIO-MM#74 (western spadefoot).

2.6.3.2.3.1.4 Reptiles

Construction of the HSR track and systems would take place in suitable habitat for western pond turtle. Construction activities would convert suitable habitat and reduce the quality of the remaining suitable habitat and could result in the injury or mortality of individual pond turtles. As shown in Table 2-12 (see Section 2.7), Alternative 3 would permanently affect 2,545.4 acres of western pond turtle habitat. Alternative 3 would also temporarily affect 1,266.1 acres of western pond turtle habitat.

To address these potential effects on western pond turtle, AMMs would be implemented. AMMs include BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#6, BIO-IAMF#7, BIO-IAMF#8, BIO-IAMF#9, BIO-IAMF#10, BIO-IAMF#11, BIO-MM#1, BIO-MM#2, BIO-MM#3, BIO-MM#4, BIO-MM#5, BIO-MM#6, BIO-MM#13, BIO-MM#36, and BIO-MM#37. Compensatory mitigation would be implemented for CTS per BIO-MM#31 and for California red-legged frog per BIO-MM#33; these measures are also expected to benefit western pond turtles.

2.6.3.2.3.1.5 Birds

Construction of the HSR track and systems in all five subsections would take place in suitable habitat for burrowing owl. Construction activities would result in the conversion and temporary disturbance of habitat and could result in injury and mortality of individual owls and eggs, as well as nest abandonment. Ground disturbance and vehicle traffic could injure or kill burrowing owls by crushing occupied burrows or collapsing burrow entrances, trapping any owls inside. As shown in Table 2-12 (see Section 2.7), Alternative 3 would permanently affect 1,694.3 acres of burrowing owl habitat. Alternative 3 would also temporarily affect 672.0 acres of burrowing owl habitat.

Construction of the HSR track and systems in all five subsections would take place in suitable habitat for bald and golden eagles, although there are no known eagle nests in the RSA. Construction activities would convert and temporarily disturb suitable habitat and could result in disturbance, injury, or mortality of nesting eagles if any are present in the vicinity. As shown in Table 2-12 (see Section 2.7), Alternative 3 would permanently affect 1,169.4 acres of eagle habitat. Alternative 3 would also temporarily affect 504.7 acres of eagle habitat.

Construction of the HSR track and systems in all five subsections would take place in suitable habitat for three special-status raptor species: American peregrine falcon, northern harrier, and white-tailed kite. Construction activities would convert and temporarily disturb suitable habitat and could result in disturbance, injury, or mortality of nesting raptors if any are present in the vicinity. As shown in Table 2-12 (see Section 2.7), Alternative 3 would permanently affect 6,359.4 acres of special-status raptor habitat. Alternative 3 would also temporarily affect 2,897.6 acres of special-status raptor habitat.

Construction of the HSR track and systems in all subsections except the San Jose Diridon Station Approach Subsection would take place in suitable habitat for Swainson's hawk. Construction activities would convert and temporarily disturb habitat and could result in disturbance, injury, or mortality of nesting Swainson's hawks if any are present in the vicinity. As shown in Table 2-12 (see Section 2.7), Alternative 3 would permanently affect 955.5 acres of Swainson's hawk habitat. Alternative 3 would also temporarily affect 578.9 acres of Swainson's hawk habitat.

Construction of the HSR track and systems in all five subsections would take place in suitable habitat for three special-status tree-nesting species: purple martin, olive-sided flycatcher, and loggerhead shrike. Construction activities would convert and temporarily disturb suitable habitat and could result in disturbance, injury, or mortality of nesting birds and the destruction of eggs and nests. As shown in Table 2-12 (see Section 2.7), Alternative 3 would permanently affect 2,478.7 acres of special-status tree-nesting species habitat. Alternative 3 would also temporarily affect 993.0 acres of special-status tree-nesting species habitat.

Construction of the HSR track and systems would take place in suitable habitat for three special-status riparian species: least Bell's vireo, yellow warbler, and yellow-breasted chat. Construction activities would convert and temporarily disturb suitable habitat and could result in disturbance, injury, or mortality of nesting birds and the destruction of eggs and nests. As shown in Table 2-12 (see Section 2.7), Alternative 3 would permanently affect 131.6 acres of special-status riparian species habitat. Alternative 3 would also temporarily affect 88.9 acres of special-status riparian species habitat.

Construction of the HSR track and systems in all five subsections would take place in suitable habitat for tricolored blackbird and yellow-headed blackbird. Construction activities would convert and temporarily disturb habitat and could result in disturbance, injury, or mortality of nesting birds and the destruction of eggs and nests. As shown in Table 2-12 (see Section 2.7), Alternative 3 would permanently affect 1,925.5 acres of tricolored blackbird and yellow-headed blackbird habitat. Alternative 3 would also temporarily affect 921.7 acres of tricolored blackbird and yellow-headed blackbird habitat.

To address these potential effects on avian species, AMMs would be implemented. Applicable AMMs include BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#8, BIO-IAMF#10, BIO-IAMF#11, BIO-MM#1, BIO-MM#2, BIO-MM#3, BIO-MM#4, BIO-MM#5, BIO-MM#6, BIO-MM#12, BIO-MM#13 (eagles, Swainson's hawk, least Bell's vireo, yellow warbler, yellow-breasted chat, tricolored blackbird), BIO-MM#45 (burrowing owl), BIO-MM#46 (burrowing owl), BIO-MM#48 (eagles), BIO-MM#49 (eagles), BIO-MM#52 (raptors), BIO-MM#53 (Swainson's hawk), BIO-MM#54 (Swainson's hawk), BIO-MM#43 (purple martin, olive-sided flycatcher, loggerhead shrike, least Bell's vireo, yellow warbler, yellow-breasted chat), and BIO-MM#56 (tricolored blackbird). Compensatory mitigation would be implemented per BIO-MM#47 (burrowing owl), BIO-MM#50 (eagles), BIO-MM#55 (Swainson's hawk), BIO-MM#72 (least Bell's vireo, yellow warbler, yellow-breasted chat), and BIO-MM#57 (tricolored blackbird).

2.6.3.2.3.1.6 Mammals

Construction of the HSR track and systems in the eastern portion of the Morgan Hill and Gilroy Subsection and throughout the Pacheco Pass and San Joaquin Valley Subsections would take place in suitable habitat for San Joaquin kit fox. Construction activities would convert and temporarily disturb habitat and could result in the disturbance, injury, and mortality of individual foxes. As shown in Table 2-12 (see Section 2.7), Alternative 3 would permanently affect 2,066.2 acres of San Joaquin kit fox habitat. Alternative 3 would also temporarily affect 848.2 acres of San Joaquin kit fox habitat.

Construction of the HSR track and systems would take place in suitable habitat for American badger. Construction activities would convert and temporarily disturb habitat and could result in the disturbance, injury, and mortality of individual badgers. As shown in Table 2-12 (see Section 2.7), Alternative 3 would permanently affect 799.6 acres of American badger habitat. Alternative 3 would also temporarily affect 378.9 acres of American badger habitat.

Construction of the HSR track and systems in all subsections except the San Joaquin Valley Subsection would take place in suitable habitat for San Francisco dusky-footed woodrat and ringtail. Construction activities would convert and temporarily disturb habitat and could result in the disturbance, injury, and mortality of individual woodrats and ringtails. As shown in Table 2-12 (see Section 2.7), Alternative 3 would permanently affect 402.6 acres of San Francisco dusky-footed woodrat and ringtail habitat. Alternative 3 would also temporarily affect 110.7 acres of San Francisco dusky-footed woodrat and ringtail habitat.

Construction of the HSR track and systems in all subsections would take place in suitable habitat for pallid bat, Townsend's big-eared bat, western mastiff bat, and western red bat. Construction activities would convert and temporarily disturb habitat and could result in the disturbance, modification, or loss of both night and maternity roost sites, as well as associated injury and mortality of roosting individuals. Ground-disturbing activities (including tunnel boring), vegetation removal, and structure demolition (e.g., removal or modification of culverts, bridges, and old buildings) in suitable habitat for these species could destroy occupied roost sites, resulting in injury or mortality of adults and young. Construction-generated noise and vibration near potential roost sites, including caves or mines in or near the project footprint for Tunnels 1 and 2, could disturb maternity roosts and cause bats to abandon their young. As shown in Table 2-12 (see Section 2.7), Alternative 3 would permanently affect 3,446.2 acres of special-status bat habitat. Alternative 3 would also temporarily affect 1,650.5 acres of special-status bat habitat.

To address these potential effects on mammals, AMMs would be implemented. Applicable AMMs include BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#7, BIO-IAMF#8, BIO-IAMF#9, BIO-IAMF#10, BIO-IAMF#11, BIO-MM#1, BIO-MM#2, BIO-MM#3, BIO-MM#4, BIO-MM#5, BIO-MM#6, BIO-MM#13, BIO-MM#59 (San Joaquin kit fox), BIO-MM#60 (San Joaquin kit fox), BIO-MM#64 (American badger), BIO-MM#65 (ringtail), BIO-MM#66 (dusky-footed woodrat), BIO-MM#67 (bats), BIO-MM#68 (bats), and BIO-MM#69 (bats). Compensatory mitigation would be implemented per BIO-MM#61 (San Joaquin kit fox), and BIO-MM#72 (riparian habitat, which would benefit San Francisco dusky-footed woodrat and ringtail).

2.6.3.2.3.2 Indirect Construction Effects

2.6.3.2.3.2.1 Invertebrates

No indirect impacts from Alternative 3 on Bay checkerspot butterfly have been identified. Noise and vibration caused by both construction and operations may cause indirect effects on Crotch's bumble bee by temporarily disrupting normal foraging or behavioral patterns; however, the extent of occupied habitat is expected to be small, and effects would be distributed on the landscape.

2.6.3.2.3.2.2 Fish

Indirect impacts from Alternative 3 (changes in channel morphology, long-term discharge of sediment and hazardous pollutants) are assumed to take place in areas comparable to those subject to direct impacts; however, because of the nature of aquatic systems, the impacts could extend downstream.

Construction of Tunnels 1 and 2 could have temporary indirect impacts on the hydrology of groundwater-dependent surface waters, including habitat and designated critical habitat for SCCC steelhead in Pacheco Creek near Casa de Fruta (i.e., northeast of Tunnel 1 and northwest of Tunnel 2). A drop in groundwater inflow to Pacheco Creek (directly or via upstream tributaries) could alter instream habitat conditions and fish movement potential. The duration of this impact would depend on hydrologic conditions, subsurface conditions, and the amount of lowering of groundwater tables or tunnel dewatering discharge, none of which can be estimated at this time.

In addition, if tunnel dewatering discharges at the Tunnel 2 west portal were routed to Pacheco Creek, such discharges could affect fish movement through the scour of creeks or banks, which could alter channel conditions, as well as through the introduction of abnormally warm water that could be a thermal barrier to safe fish passage. To meet water quality standards for beneficial reuse, settling ponds, storage tanks, and a series of treatment systems may be necessary. Only treated groundwater that meets appropriate water quality standards would be beneficially reused or discharged into receiving waterbodies. The application of regulatory discharge controls would avoid water quality effects related to fish habitat conditions and fish movement.

While pre-construction and construction actions to protect habitat for special-status fish species are part of the project, these actions would not prevent the conversion and disturbance of aquatic habitat where work must be conducted. In addition to habitat loss and temporary disturbance, construction activities could temporarily remove riparian vegetation, resulting in decreased stream shading; ground-disturbing activities could result in increased sediment discharge; and dewatering could result in stranding and death of individual fish.

To address these potential effects on relevant fish, AMMs would be implemented. Applicable AMMs include those discussed for direct impacts, as well as BIO-MM#9 and HYD-IAMF#5.

2.6.3.2.3.2.3 Amphibians

If construction in the project footprint for Alternative 3 alters a hydrologic regime that supplies water to vernal pools or aquatic features within 250 feet of the footprint, such hydrological modifications could indirectly affect habitat by altering the pools’ ponding duration and rendering aquatic habitat unsuitable to support breeding behavior and the development of eggs and larvae. The introduction of nonnative plant species to upland habitat could reduce dispersal to nonbreeding sites (i.e., burrows) because dense herbaceous vegetation could impede movement.

Construction of Tunnels 1 and 2 could have temporary indirect impacts on the hydrology of groundwater-dependent surface waters, including ponds, wetlands, and streams that provide habitat for California red-legged frog, CTS, and foothill yellow-legged frog. Any reduction in groundwater hydrology that supplies water to features that function as habitat could cause adverse effects, including reduced reproductive success, degradation of habitat, and potential mortality. AMMs would be implemented. Applicable AMMs include those discussed for direct impacts, as well as BIO-MM#9 and HYD-IAMF#5.

2.6.3.2.3.2.4 Reptiles

The use of chemicals and hazardous substances during construction (e.g., oils, gasoline) may cause mortality if individuals enter aquatic habitat that has been contaminated by spills or other vehicle and equipment leaks. Construction of Tunnels 1 and 2 could have temporary indirect impacts on the hydrology of groundwater-dependent surface waters, including those that provide aquatic habitat for western pond turtle. Because western pond turtles are associated with ponds or streams that hold water year-round, any reductions in groundwater supply to occupied ponds and streams could reduce the availability of foraging and basking habitat for the affected population. Sudden decreases in water levels could strand basking individuals, forcing them to move to other aquatic habitat, if any is available nearby. To address these impacts, AMMs would be implemented. Applicable AMMs include those discussed for direct impacts, as well as BIO-MM#9 and HYD-IAMF#5.

2.6.3.2.3.2.5 Birds

Increased cover of invasive weeds could reduce habitat suitability for burrowing owls because they prefer areas with short, sparse vegetation.

The project could cause indirect impacts on special-status riparian birds. Ground disturbance and vegetation removal in riparian habitat would create areas of bare soil susceptible to colonization by nonnative invasive plant species, such as giant reed, tamarisk, and perennial pepperweed. Dense stands of these species would degrade riparian habitat for least Bell's vireos and other riparian birds by outcompeting willows and other native plants that provide nest sites. Construction of Tunnels 1 and 2 could have temporary indirect impacts on the hydrology of groundwater-dependent surface water features, including riparian vegetation along Pacheco Creek that provides habitat for least Bell's vireo and other riparian birds. Reductions in groundwater supply to riparian vegetation could result in the desiccation of vegetation and degradation of habitat for these species. To address these potential impacts on these avian species, AMMs would be implemented. Applicable AMMs include those discussed for direct impacts, as well as BIO-MM#9 and HYD-IAMF#5.

2.6.3.2.3.2.6 Mammals

Introduction of invasive nonnative vegetation could alter the structure of the vegetation community, making it less suitable to support kit foxes, woodrats, and ringtails, and could adversely affect the productivity of the prey base. To address these potential impacts on mammals, AMMs would be implemented. Applicable AMMs include those discussed for direct impacts.

2.6.3.2.3.3 Direct and Indirect Operations Effects

HSR operations would include inspection and maintenance activities along the HSR right-of-way. Right-of-way maintenance activities would include minor grading, clearing, and excavation needed to maintain adequate drainage or repair infrastructure; vegetation management, including application of herbicide to invasive weeds growing within the right-of-way; and vehicle traffic along maintenance roads. Because much of the right-of-way would already have been subjected to extensive ground disturbance and construction activities and converted to HSR track and systems, the areas within the right-of-way would provide limited habitat for most special-status wildlife. Nevertheless, these activities may further degrade habitat areas inside the right-of-way that were avoided during construction, as well as habitat outside of but within 250 feet of the right-of-way (i.e., core habitat study area). Minor ground disturbance within the right-of-way may result in minor direct (filling, sedimentation, inadvertent release of oils and chemicals from parked vehicles or equipment) or indirect (hydrological interruption, introduction of invasive species) impacts on special-status wildlife habitat in and adjacent to the right-of-way. If applied during high winds, herbicides could drift into and contaminate aquatic habitat features (e.g., ponds and wetlands). Such direct and indirect impacts would degrade special-status wildlife habitat in the habitat study area. Some habitat areas may be degraded to the extent that they no longer support the resources necessary for species survival and reproduction, and therefore cease to function as habitat for those species.

To address these potential effects on special-status animal species, AMMs would be implemented. Applicable AMMs include BIO-IAMF#4 and BIO-MM#70.

2.6.3.2.4 Wildlife Corridors

2.6.3.2.4.1 Construction Impacts

Construction of Alternative 3 would temporarily and permanently affect regional and local wildlife movement patterns. Construction of the HSR track and systems in all subsections would temporarily affect wildlife movement in several ways. Construction fencing and dewatering would create temporary barriers to movement, precluding the normal movement of animals. Noise, vibration, and visual disturbance from construction vehicles and pile driving may alter or delay movement of individuals as they attempt to avoid the construction area. Nighttime construction or security lighting could cause animals to delay or alter movement patterns because they may avoid lit areas.

Construction of the project would permanently affect regional and local wildlife movement patterns by creating new barriers to local and regional wildlife movement and fragmenting habitat. While project design would provide for wildlife movement across the alignment in Coyote Valley, the Soap Lake floodplain, most of Pacheco Pass, and the Central Valley, barriers to movement would remain on the west slope of Pacheco Pass where the rail alignment parallel to Pacheco Creek would be placed on a series of continuous cut-and-fill slopes. Barriers to movement and habitat fragmentation reduce resource availability and isolate breeding groups; both conditions can ultimately lead to reduced reproductive success and inbreeding depression. Terrestrial species are most vulnerable to permanent movement impacts. Birds and bats are able to move over patches of unsuitable habitat.

To address these potential effects on wildlife movement patterns, AMMs would be implemented. Applicable AMMs include BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#8, NV-IAMF#1, BIO-MM#3, BIO-MM#25, BIO-MM#76, BIO-MM#77, BIO-MM#78, and BIO-MM#79.

2.6.3.2.4.2 Operation Impacts

Alternative 3 would result in noise from operations that can affect wildlife movement. The analysis detailed in the WCA (Authority 2020c) determined that only wildlife within a particular screening distance would be vulnerable to these impacts. The analysis detailed in the WCA determined that only terrestrial wildlife within the screening distance from the HSR centerline (e.g., within 70 feet of an at-grade section with a train traveling at 220 mph) would experience noise effects. The WCA determined that for birds and bats, three aerial species focal groups—waterfowl, shorebirds, and wading birds (collectively waterbirds)—were vulnerable to noise and were present in populations and concentrations substantial enough to be adversely affected. In the regional RSA, these focal groups are known to congregate in two primary locations: the UPR and GEA IBAs. Within the UPR IBA, Alternative 3 would affect 1,568 acres through impacts such as temporary hearing damage, masking, and arousal. Within the GEA IBA, Alternative 3 would affect 1,205 acres through the same kinds of impacts.

Vibration from train operations may also affect wildlife movement. Vibration effects are most likely to be perceived by species such as reptiles and amphibians, some of which—specifically snakes—are the most vibration-sensitive wildlife species known. However, because the affected species are reasonably common and the impacts would be brief and primarily diurnal (snakes are chiefly nocturnal predators), these vibration impacts are unlikely to cause substantial or long-lasting impacts. Amphibians are also highly sensitive to vibration, using ground vibration for communication, especially in the process of mate selection; thus, vibration generated by project operations at the time of amphibian breeding has the potential to affect the success of amphibian breeding activities and thereby to affect their population status. Burrowing rodents, notably kangaroo rats, are potentially sensitive to vibration influences on behavior and on the risk of vibration-caused burrow collapse. Studies involving intensive seismic exploration (Cypher et al. 2016), which generates extensive ground vibrations, did not find evidence of burrow collapse; however, minimization measures, including avoiding kangaroo rat burrows by a buffer distance of at least 10 meters (33 feet), may have avoided such effects. In the context of proposed operations, these findings suggest that exclusion fencing would limit impacts on kangaroo rats by excluding species' use of habitat within a distance of up to 13 meters (42 feet) from the tracks.

Train operations can also cause intermittent visual disturbance of wildlife. The literature identifies two distances at which response to visual stimuli occurs for waterfowl: flight initiation distance (average 269 feet) and minimum approach distance (average 404 feet). The flight initiation distance is assumed to have potential for the greatest impact and was applied as a threshold to determine acres of affected habitat. Alternative 3 would affect 244 acres of habitat (i.e., habitat within the 269-foot flight initiation distance) in the Soap Lake 10-year floodplain and 524 acres in the GEA IBA. For raptors, the flight initiation distance from motor vehicles is 262 feet on average. If a raptor nest is within this distance of the rail alignment, there is potential for train operations to cause nest abandonment.

Project lighting can also affect wildlife using corridors during train operations. Conversely, nighttime lighting impacts are expected to be greatest in natural settings, where baseline light levels are low, and in locations where wildlife is known to move. In addition, light impacts from trains are expected to be greatest where the rail is at grade. However, the impacts on movement from train light are likely to be less than those from noise and vibration because noise and vibration travel farther from the centerline than light (which is directed in front of the train). For aerial species, few quantitative studies are available to determine the distance at which this impact may occur; however, published analyses confirm some potential for impact. For example, hunting owls may perch on OCS structures and become disoriented by the headlight of the approaching train, resulting in train strike. Also, birds may become “trapped” by a cone of light, unwilling to exit into darkness. This behavior may elevate train strike risk for birds lit by the headlight of an approaching train.

Operations also have the potential to cause mortality by train strike, although at-grade sections would have fencing to reduce wildlife access. Because terrestrial species are not expected to gain access to elevated sections, it is only at-grade sections that present risk of train strike to terrestrial species. Train operations also pose the risk of injury and mortality to aerial species by striking birds or bats flying in the path of passing trains. Nevertheless, quantifying the severity of the impact is difficult. For special-status species with low reproductive rates, such as California condor, Swainson’s hawk, sandhill crane, and golden eagle, the loss of one individual would be a substantial impact. For more common species, the injury or mortality of a small portion of the local or regional population is not likely to be a substantial impact.

Within the GEA IBA specifically, waterfowl, shorebirds, and wading birds are known to congregate in relatively large numbers, and intermittent strike of these special-status species could affect the abundance and local or regional populations of these species over time. While condor numbers are very low in the region, and there is no evidence of nesting, train strike has potential to affect the distribution and abundance of local or regional populations of the species. CDFW tracking data confirm condor flights over the proposed rail alignment in western Pacheco Pass near Casa de Fruta; consequently, there is potential for individuals to be struck by the train while attempting to forage on carrion on or near the alignment.

Collisions with power lines or OCS facilities pose the risk of injury and mortality to bird and bat species. Prior to construction, the Authority would design the OCS and other structures (e.g., fencing) to be bird- and raptor-safe in accordance with applicable APLIC recommendations (Authority 2020c).

To address these potential effects on wildlife corridors and movement, AMMs would be implemented. Applicable AMMs include BIO-IAMF#12, BIO-MM#77, BIO-MM#78, BIO-MM#80, BIO-MM#81, BIO-MM#82, and BIO-MM#83. Compensatory mitigation would be implemented per BIO-MM#58.

2.6.3.3 Other Environmental Consequences

2.6.3.3.1 Agricultural Farmlands

2.6.3.3.1.1 Temporary Use of Important Farmland During Construction

Construction of Alternative 3 would require the temporary use of 671.9 acres of Important Farmland. This land would be leased from the landowner and temporarily removed from agricultural use for the duration of construction. In addition, reconductoring activities as part of the network upgrades would require temporary use of Important Farmland. Although the project would temporarily use Important Farmland, the land would be restored following the cessation of construction activities and would not be permanently converted to nonagricultural use. The Authority would implement the same IAMFs as discussed for Alternative 1 to reduce impacts.

2.6.3.3.1.2 Permanent Conversion of Important Farmland to Nonagricultural Use

Direct permanent conversion of Important Farmland to nonagricultural use would occur where the project footprint of an alternative overlaps Important Farmland. Alternative 3 would result in permanent conversion of 1,192.5 acres of Important Farmland. The Authority would purchase and use the land in the project footprint for the HSR right-of-way, access easement, stations, and maintenance facilities. The Authority would implement the same AMM as for Alternative 1.

2.6.3.3.1.3 Permanent Creation of Remnant Parcels of Important Farmland

Alternative 3 would result in the indirect creation of remnant parcels of Important Farmland in and adjacent to the TCE because of severance by the project. Some parcels could be severed from a larger parcel because the guideway alignment would bisect the parcel, and some parcels could be severed because roadway access would be restricted or eliminated. Some remnant parcels would remain in agricultural use because of adjacency to other farmland with access, sufficient size, or farmable shape. However, remnant parcels of 20 acres or less have the potential to become unfarmable because of lack of access, size, shape, location, or other constraint. These are referred to as nonviable remnant parcels and would result in conversion to nonagricultural use. Alternative 3 would convert 252.8 acres of Important Farmland to nonagricultural use through creation of nonviable remnant parcels, with acreage spread across 195 remnant parcels. The Authority would implement the same AMM as for Alternative 1.

2.6.3.3.2 Parks, Recreation, and Open Space

2.6.3.3.2.1 Temporary Changes from Noise, Vibration, and Construction Emissions on Use and User Experience of Parks, Recreational Facilities, and Open Space Resources

Construction of the San Jose to Merced Section has the potential to disrupt use and user experience at parks, recreational facilities, and open spaces due to temporary and localized noise, vibration, and construction emissions. Alternative 3 would affect the user experience at 34 park, recreation, and open space resources. The Authority would implement the same AMMs as for Alternative 1.

2.6.3.3.2.2 Temporary Changes to Access or Use of Parks

Construction of the project would require TCEs to facilitate placement of construction equipment and construction activities that could reduce access to roadways or otherwise temporarily affect access to and use of parks. Project construction would likely occur over a period of 4 years, with 1.5 years of continuous construction activity at any one location. Alternative 3 would limit access to 12 park, recreation, and open space resources. The Authority would implement the same AMMs as for Alternative 1.

Additionally, under Alternative 3 construction of the project would result in temporary visual changes, but they would not create a perceived barrier to use. The Authority would implement SOCIO-IAMF#1 to minimize impacts on residents and businesses.

2.6.3.3.2.3 Permanent Acquisition of Parks, Recreation, and Open Space Resources

Construction of Alternative 3 would result in the permanent acquisition of portions of nine park, recreation, and open space resources.

2.6.3.3.2.4 Additional Permanent Changes to Parks, Recreation, and Open Space Resources

Construction of Alternative 3 would result in permanent changes to access or circulation at three resources. The Authority would implement PK-IAMF#1 and PR-MM#3 to reduce impacts.

Construction of Alternative 3 would not result in permanent visual changes that could create an actual or perceived barrier to use, even though the user experience at certain resources would be altered. The Authority would implement AVR-IAMF#1 and AVR-IAMF#2 to reduce impacts.

Construction of Alternative 3 would result in permanent effects from operational noise on one resource and no permanent effects from vibration on any resource. The Authority would implement NV-MM#3, NV-MM#4, and NV-MM#8 to reduce impacts.

Construction of Alternative 3 would not result in the permanent closure or relocation of any parks, recreational facilities, or open space areas. Therefore, no new parks or other recreational facilities would need to be constructed to accommodate demand, and no mitigation measures would be required.

2.6.3.3.2.5 Temporary Changes to Access or Use of School District Play Areas

Construction of the project would require TCEs for placement of construction equipment and construction activities; such TCEs could reduce access to roadways or otherwise temporarily affect access to and use of school district play areas. Project construction would likely occur over a period of 4 years, with 1.5 years of continuous construction activity at any one location. It is assumed that TCEs could be in place for up to 4 years. The location of TCEs adjacent to the project alignment would temporarily affect access to two school district play areas. The Authority would implement the same AMMs as for Alternative 1.

2.6.3.3.2.6 Additional Temporary Changes to School District Play Areas

Construction of Alternative 3 would generate temporary and localized noise, vibration, and construction emissions affecting school district play areas within 1,000 feet of the project footprint, but they would not preclude the use of these play areas. The Authority would implement NV-IAMF#1 and AQ-IAMF#1 to minimize these impacts.

Construction of Alternative 3 would result in temporary visual changes, but they would not create a perceived barrier to access or continued use of school district play areas. The Authority would implement SOCIO-IAMF#1 to reduce impacts

2.6.3.3.2.7 Permanent Acquisition of School District Play Areas

Under Alternative 3, the project would not result in permanent acquisition of school district play areas.

2.6.3.3.2.8 Permanent Changes from Noise and Vibration on School District Play Area Character and Use

No moderate or severe operational noise impacts on school district play areas would occur under Alternative 3.

2.6.3.3.2.9 Permanent Changes Affecting Access to School District Play Areas

Construction of Alternative 3 would not result in permanent changes in access to school district play areas. Therefore, no AMMs or mitigation measures would be required.

2.6.3.3.2.10 Permanent Visual Changes That Could Create A Perceived Barrier to Access or Continued Use of School District Play Areas

Construction of Alternative 3 would not result in any permanent visual changes that would create a perceived barrier to access or use of school district play areas. Therefore, no AMMs or mitigation measures would be required.

2.6.3.3.3 Cultural Resources

2.6.3.3.3.1 Permanent Disturbance of Unknown Archaeological Sites

Construction of the project could potentially affect unknown archaeological resources with ground-disturbing construction associated with the project. Unknown archaeological sites might encompass the full range of pre-contact or historic activities conducted over time, including pre-contact lithic scatters and village sites, historic-era homestead remains, and human burials.

Unknown or unrecorded archaeological resources that are not observable when conducting standard surface archaeological inspections, including subsurface buried archaeological deposits, may exist in areas surveyed within urbanized or rural areas. Unknown or unrecorded archaeological resources may also exist in areas where permission to enter has not been granted. Alternative 3 has 625 acres of surface that are generally sensitive for archaeological resources and 3,386 acres that are sensitive for buried archaeological resources. The project would limit potential impacts on unknown archaeological sites by developing an MOA for each undertaking where the Authority determines there would be an adverse effect on historic properties or when phased identification is necessary and adverse impacts would occur. The Authority and SHPO would use the MOA and the ATP to enforce implementing the required actions arising from the Section 106 consultation. The Authority would implement the same AMMs as discussed for Alternative 1.

2.6.3.3.3.2 Permanent Disturbance of a Known Archaeological Site

Construction of the project may result in permanent disturbance of known archaeological sites. Thirty-five archaeological resources are known to exist in the APE. Alternative 3 crosses all or part of 24 known resources. These cultural resources would be subject to phased evaluation, and are assumed eligible at the present time only until they can be evaluated and their eligibility determined. Grading, trenching, and excavating in the project footprint during construction, as well as compaction resulting from the use of heavy machinery and other vehicular traffic on the construction site or in TCEs, may affect the integrity of artifact-bearing archaeological deposits. The Authority would implement the same AMMs as discussed for Alternative 1.

2.6.3.3.3.3 Temporary Public Access and Disturbance of Archaeological Resources

Construction activities associated with the project would not result in higher potential for public access to archaeological resources by people who previously would not have been able to enter the property where the resource is located because the work areas would be inaccessible to the public. All work areas would be fenced and access controlled, allowing access only to authorized construction personnel; therefore, they would not provide access for persons to loot sites and would not expose sites to compaction through pedestrian or vehicular traffic. Additionally, the project may include increased site protection measures in the MOA and ATP, such as nighttime security patrols.

These design characteristics and features would be the same for all project alternatives. There would be no impacts on unknown archaeological resources because of temporary public access from any of the project alternatives. Additionally, there would be no impact during operations under Alternative 3.

2.6.3.3.3.4 Permanent Demolition, Destruction, Relocation, or Alteration of Built Resources or Setting

Construction activities associated with the project could result in demolition, relocation, and alteration of built resources, the setting of the resources, or both. Alternative 3 has the potential to affect historic built resources in several ways. Where the permanent HSR right-of-way would cross an historic property, character-defining features or entire resources would likely be demolished to make way for the construction of track structures or other facilities. The permanent HSR right-of-way that would be introduced directly adjacent to built resources would alter their setting, which has the potential to impair the resources’ integrity of feeling, setting, and association. In other words, introducing a very large, modern transportation structure would make it difficult to understand the historic visual context of the resource, and thus how it functioned and related to its local context during its period of significance. Areas that would be used as a TCE may be used in a variety of ways, including but not limited to materials staging, operation of construction equipment, and installation of protective fencing. Once cleared as a TCE, any activities in support of construction of the project would be allowed. These activities have the potential to result in permanent physical damage to resources or their character-defining features. Under Alternative 3, seven built resources could be affected: four would be demolished, one would experience compromised integrity due to the loss of character-defining features, and two would have their setting altered in a way that changes the historic context. The Authority would implement the same AMMs as discussed for Alternative 1.

2.6.3.3.3.5 Noise and Vibration Impacts on Built Resources Caused by Construction Activities

Under Alternative 3, no built resources would be adversely affected by construction-related noise or vibration impacts. The Authority would implement the following project features to protect built resources and to avoid impacts: CUL-IAMF#6, CUL-IAMF#7, and CUL-IAMF#8.

2.6.3.3.3.6 Intermittent Noise and Vibration Impacts on Built Resources Caused by Operations

Under Alternative 3, intermittent noise and vibration caused by operations would have no impact on any built resources. Therefore, no AMMs or mitigation measures would be required.

2.6.3.4 Practicability

2.6.3.4.1 Consistency with the Overall Project Purpose

Alternative 3 would be consistent with the overall project purpose for the San Jose to Merced Project Section.

2.6.3.4.2 Other Practicability Factors

- **Availability:** Alternative 3 would be available for construction.
- **Cost:** Alternative 3 would be practicable from a cost standpoint.
- **Existing Technology:** Alternative 3 would be capable of being constructed with respect to existing technology. The design of Alternative 3 includes at-grade, below-grade, and above-grade (elevated) segments. Most of the anticipated construction methods that would be used to construct Alternative 3 are the same conventional means and methods employed by contractors that build roads, bridges, railway tracks, and other transportation infrastructure using common industry equipment, readily available labor and tools, and industry-standard operations. Consequently, Alternative 3 would be practicable in light of existing technology.
- **Logistics:** 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. Alternative 3 would be practicable from a logistical standpoint.

2.6.4 Alternative 4

2.6.4.1 Impacts on Aquatic Resources

2.6.4.1.1 Direct Effects

Construction of Alternative 4 would result in the permanent discharge of fill of 96.5 acres and temporary fill of 78.3 acres, as shown in Table 2-3 (see Section 2.7). This is the least permanent and temporary fill of any alternative. Alternative 4 would result in the discharge of permanent fill of 56.2 acres of wetlands and temporary fill of 13.6 acres of wetlands. Alternative 4 would result in permanent placement of fill in non-wetland waters 40.4 acres and temporary fill of 64.7 acres of non-wetland waters.

Based on the CRAM assessment, waterbodies potentially affected by Alternative 4 were ranked within the “fair category” with the exception of constructed watercourses, which were ranked poor across all alternatives.

The Authority would implement BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#8, BIO-IAMF#9, BIO-IAMF#10, BIO-MM#1, BIO-MM#3, BIO-MM#4, BIO-MM#5, BIO-MM#6, BIO-MM#71, and BIO-MM#73 to reduce impacts.

2.6.4.1.2 Indirect Effects

Indirect effects were evaluated across the entire project extent but were identified only on subsections where the alternatives are in a common alignment. For this reason, indirect effects would be identical to those described for Alternative 1.

2.6.4.1.3 Cumulative Effects

Construction of the planned projects in the region would result in temporary and permanent impacts on aquatic resources. The same projects described for Alternative 1 as part of the cumulative condition would occur under all alternatives. Alternative 4 would contribute to cumulative effects on waters with the least total permanent and temporary acreage of fill of any alternative (96.5 acres and 78.3 acres, respectively).

Construction of all four alternatives would have identical impacts on vernal pools (both a special-status plant community and an aquatic resource) because that community is present only in the Pacheco Pass and San Joaquin Valley Subsections, where the alternatives are identical. Each alternative would make the same contribution to the cumulative condition for this resource type.

Operations of planned projects, including the HSR project, would include inspection and maintenance activities. As described for Alternative 1, operation of this project would not contribute to cumulative impacts on aquatic resources.

Both the project and other foreseeable projects in the region would require the discharge of fill to waters. The cumulative effect of these activities, however, would be moderated as a result of the "no net loss" policies adopted at the state and federal level.[12.]

2.6.4.2 Impacts on Biological Resources

This section provides an overview of effects on special-status plant communities, special-status plant species, special-status wildlife species, and wildlife movement corridors, and habitats of concern.

2.6.4.2.1 Special-Status Plant Communities

2.6.4.2.1.1 Direct Construction Effects

Construction of Alternative 4 would take place in habitat that supports special-status plant communities. Construction would result in the conversion and degradation of such communities. These impacts would include removal or disruption (e.g., trampling and crushing) of special-status plant communities by construction vehicles and personnel. With respect to vegetation removal, vegetation within the HSR right-of-way would largely be permanently removed. As shown in Table 2-10 (see Section 2.7), Alternative 4 would permanently affect a total of 839.1 acres of special-status plant communities. Alternative 4 would also temporarily affect 371.0 acres of special-status plant communities.

To address these potential impacts on special-status plant communities, AMMs would be implemented. Applicable AMMs include BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#8, BIO-IAMF#9, BIO-IAMF#10, BIO-IAMF#11, BIO-MM#1, BIO-MM#3, BIO-MM#4, BIO-MM#5, BIO-MM#6, BIO-MM#7, and BIO-MM#71. Compensatory mitigation would be implemented per BIO-MM#72.

2.6.4.2.1.2 Indirect Construction Effects

Construction of Alternative 4 would alter topography (e.g., by constructing embankments), which would also affect local drainage patterns and infiltration of precipitation. This change in the physical environment could degrade special-status plant communities at some locations by making those locations less suitable for the establishment or persistence of dominant or characteristic species of a special-status plant community. Extensive movement of equipment and materials into and out of the project footprint would also facilitate the spread of invasive species by facilitating the dispersal of their propagules to the disturbed areas in the project footprint. Construction of Tunnels 1 and 2 could have temporary indirect impacts on the hydrology of groundwater-dependent surface water features, including land cover types that qualify as special-status plant communities (e.g., California sycamore woodland) or that could contain unmapped occurrences of a special-status plant community (i.e., freshwater marsh, palustrine forested wetland, and seasonal wetland). In addition, groundwater depletion could affect deep-rooted oak trees outside of riparian zones, such as valley oaks in areas with relatively shallow groundwater tables. Any reductions in groundwater supply to such features could result in the desiccation of vegetation and eventual degradation of the affected community. Applicable AMMs include HYD-IAMF#5, BIO-MM#2, and BIO-MM#9.

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[12] 40 Code of Federal Regulations Section 230.93(f)(1), Executive Order W-59-93 (California)

2.6.4.2.1.3 Direct and Indirect Operations Effects

Project operations would include inspection and maintenance activities along the HSR right-of-way. Right-of-way maintenance activities would include minor grading, clearing, and excavation needed to maintain adequate drainage or repair infrastructure; vegetation management, including potential trimming of trees within special-status communities (e.g., riparian) growing adjacent to the right-of-way and application of herbicide to invasive weeds within the right-of-way; and vehicle traffic along maintenance roads. Permanently affected stands of special-status plant communities in the project footprint would have been eliminated during construction, and therefore would not be affected further. However, special-status plant communities inside the right-of-way that were avoided during construction and outside but within 100 feet of the right-of-way (i.e., special-status plant study area) could potentially be affected by these activities. To address potential operations impacts on special-status plant communities, AMMs would be implemented. Applicable AMMs include BIO-IAMF#4 and BIO-MM#70.

2.6.4.2.2 Special-Status Plant Species

2.6.4.2.2.1 Direct Construction Effects

Construction of Alternative 4 would cause direct impacts on special-status plant species through 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). As shown in Table 2-11, Alternative 4 would permanently affect 1,154.2 acres of non-overlapping special-status plant species habitat. Alternative 4 would also temporarily affect 429.1 acres of non-overlapping special-status plant species habitat.

To address these potential impacts on special-status plant species, AMMs would be implemented. Applicable AMMs include BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#8, BIO-IAMF#9, BIO-IAMF#11, BIO-MM#1, BIO-MM#3, BIO-MM#4, BIO-MM#5, BIO-MM#6, BIO-MM#7, BIO-MM#8, BIO-MM#10, and BIO-MM#11. Compensatory mitigation would be implemented per BIO-MM#12.

2.6.4.2.2.2 Indirect Construction Effects

Construction of Alternative 4 would alter topography (e.g., by constructing embankments), which would also modify local drainage patterns and infiltration of precipitation. This change in the physical environment could degrade special-status plant communities at some locations by making those locations less suitable for the establishment or persistence of special-status plants. Extensive movement of equipment and materials into and out of the project footprint would also facilitate the spread of invasive species by facilitating the dispersal of their propagules to the disturbed areas in the project footprint. Construction of Tunnels 1 and 2 could have temporary indirect impacts on the hydrology of groundwater-dependent surface water features, including land cover types that include special-status plant species. Any reductions in groundwater supply to such features could result in the desiccation of vegetation and eventual degradation of the affected community. To address these potential impacts on special-status plant species, AMMs would be implemented. Applicable AMMs include BIO-IAMF#10, HYD-IAMF#5, BIO-MM#2, and BIO-MM#9.

2.6.4.2.2.3 Direct and Indirect Operations Effects

Right-of-way maintenance activities would include minor grading, clearing, and excavation needed to maintain adequate drainage or repair infrastructure; vegetation management, including application of herbicide to invasive weeds growing within the right-of-way; and vehicle traffic along maintenance roads. These activities may cause reduced survival of special-status plants inside the right-of-way that were avoided during construction, as well as any occurring outside of but within 100 feet of the right-of-way (i.e., special-status plant study area). Minor ground disturbance within the right-of-way may result in minor direct (filling, sedimentation, inadvertent release of oils and chemicals from parked vehicles or equipment) or indirect (hydrological interruption, introduction of invasive species) effects on special-status plant habitat in and adjacent to the right-of-way. If applied during high winds, herbicides could drift onto and cause mortality of special-status plants. Dust generated from maintenance vehicles could settle on the leaves of special-status plants, increasing the rate of water loss (i.e., transpiration). Such direct and indirect effects would degrade special-status plant habitat within the special-status plant study area and could lead to the eventual extirpation of special-status plant occurrences.

To address these potential impacts on special-status plant species, AMMs would be implemented. Applicable AMMs include BIO-IAMF#4 and BIO-MM#70.

2.6.4.2.3 Special-Status Fish and Wildlife Species

2.6.4.2.3.1 Direct Construction Effects

2.6.4.2.3.1.1 Invertebrates

Construction of Alternative 4 would cause direct (permanent and temporary) impacts on suitable habitat for Bay checkerspot butterfly (including critical habitat), which could result in impacts on individuals (i.e., injury, mortality, or disturbance), if any are present in affected habitat. As shown in Table 2-12 (see Section 2.7), Alternative 4 would permanently affect 10.9 acres of suitable habitat, of which 1.9 acres are within critical habitat. Alternative 4 would also temporarily affect 14.5 acres of suitable habitat, of which 19.1 acres are within critical habitat.

Construction of Alternative 4 would cause direct impacts on suitable habitat for Crotch's bumble bee. Construction activities would convert and disturb habitat and could result in the mortality of individual bees if underground nest colonies or overwintering queens are present in the project footprint at the time of construction. As shown in Table 2-12 (see Section 2.7), Alternative 4 would permanently affect 1,127.0 acres of suitable habitat. Alternative 4 would also temporarily affect 412.7 acres of suitable habitat.

To address potential effects on Bay checkerspot butterfly and Crotch's bumble bee, AMMs would be implemented. Applicable AMMs for Bay checkerspot butterfly include BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#8, BIO-IAMF#9, BIO-IAMF#10, BIO-IAMF#11, BIO-MM#1, BIO-MM#2, BIO-MM#3, BIO-MM#4, BIO-MM#5, BIO-MM#6, BIO-MM#10, BIO-MM#13, BIO-MM#14, and BIO-MM#15. Compensatory mitigation would be implemented per BIO-MM#16. Applicable AMMs for Crotch's bumble bee include BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#8, BIO-IAMF#9, BIO-IAMF#10, BIO-IAMF#11, BIO-MM#1, BIO-MM#2, BIO-MM#3, BIO-MM#4, BIO-MM#5, BIO-MM#6, BIO-MM#12, and BIO-MM#23. Compensatory mitigation would be implemented per BIO-MM#24.

2.6.4.2.3.1.2 Fish

The primary project activities affecting special-status fish would be bridge and viaduct construction and channel realignment, temporary construction activities, utility activities, construction of bike lane/pedestrian bridges, and construction of new culverts. Construction of HSR track and systems in all subsections except the San Joaquin Valley Subsection would take place in habitat for steelhead (CCC/SCCC DPS), Pacific lamprey, and Chinook salmon (Central Valley Fall-run) (collectively referred to as special-status fish). Construction activities would result in permanent conversion of some habitat to transportation uses and could cause injury or mortality to individual fish that are present in work areas. The project would also intersect designated critical habitat for CCC and SCCC steelhead.

As shown in Table 2-12 (see Section 2.7), Alternative 4 would permanently affect 154.9 acres of special-status fish species. Of this acreage, 2.3 acres are for Chinook salmon, 19.3 acres are for steelhead (of which 5.0 acres are designated critical habitat for steelhead), and 138.3 acres are for Pacific lamprey. Alternative 4 would also temporarily affect 73.4 acres of special-status fish species. Of this acreage, 4.3 acres are for Chinook salmon, 11.8 acres are for steelhead (of which 2.5 acres are critical habitat for SCCC steelhead), and 62.2 acres are for Pacific lamprey.

To address these potential effects on special-status fish, AMMs would be implemented. Applicable AMMs include BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#8, BIO-IAMF#9, BIO-IAMF#10, BIO-IAMF#11, HMW-IAMF#3, HMW-IAMF#6, BIO-MM#1, BIO-MM#3, BIO-MM#4,

BIO-MM#6, BIO-MM#10, BIO-MM#13, BIO-MM#25, BIO-MM#26, and BIO-MM#27. Compensatory mitigation would be implemented for steelhead per BIO-MM#28.

2.6.4.2.3.1.3 Amphibians

Direct impacts on CTS could include injury and mortality of individual salamanders as a result of activities such as vehicle strikes, entrapment in construction areas or materials, and crushing or entombment of salamanders in burrows. As shown in Table 2-12 (see Section 2.7), Alternative 4 would permanently affect 2,126.4 acres of suitable habitat for CTS, of which 213.1 acres are located within critical habitat. Alternative 4 would also temporarily affect 842.2 acres of suitable habitat, of which 65.4 acres are within critical habitat.

Construction of the HSR track and systems in all subsections except the San Joaquin Valley Subsection would take place in suitable habitat for the California red-legged frog, resulting in the loss or degradation of such habitat and potential injury or mortality of individual red-legged frogs, if any are present in the affected area. As shown in Table 2-12 (see Section 2.7), Alternative 4 would permanently affect 1,812.5 acres of California red-legged frog habitat, of which 739.5 acres are located within critical habitat. Alternative 4 would also temporarily affect 657.2 acres of California red-legged frog habitat, of which 184.1 acres are within critical habitat.

Construction of the HSR track and systems in all subsections except the San Joaquin Valley Subsection would take place in suitable habitat for foothill yellow-legged frog, resulting in loss and degradation of such habitat and potential injury or mortality of individual foothill yellow-legged frog. As shown in Table 2-12 (see Section 2.7), Alternative 4 would permanently affect 88.3 acres of foothill yellow-legged frog habitat. Alternative 4 would also temporarily affect 39.4 acres of foothill yellow-legged frog habitat.

Construction of the HSR track and systems in the Morgan Hill and Gilroy, Pacheco Pass, and San Joaquin Valley Subsections would take place in suitable habitat for western spadefoot, resulting in the loss of and degradation of such habitat and the potential injury or mortality of spadefoot individuals. As shown in Table 2-12, Alternative 4 would permanently affect 528.7 acres of western spadefoot habitat. Alternative 4 would also temporarily affect 212.1 acres of western spadefoot habitat.

To address these potential impacts on amphibians, AMMs would be implemented. Applicable AMMs include BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#6, BIO-IAMF#7, BIO-IAMF#8, BIO-IAMF#9, BIO-IAMF#10, BIO-IAMF#11, BIO-MM#1, BIO-MM#2, BIO-MM#3, BIO-MM#4, BIO-MM#5, BIO-MM#6, BIO-MM#13, BIO-MM#29 (CTS), BIO-MM#30 (CTS), BIO-MM#32 (California red-legged frog), BIO-MM#34 (foothill yellow-legged frog), BIO-MM#36 (western spadefoot), and BIO-MM#37 (western spadefoot). Compensatory mitigation would be implemented per BIO-MM#31 (CTS), BIO-MM#33 (California red-legged frog), BIO-MM#35 (foothill yellow-legged frog), and BIO-MM#74 (western spadefoot).

2.6.4.2.3.1.4 Reptiles

Construction of the HSR track and systems would take place in suitable habitat for western pond turtle. Construction activities would convert suitable habitat and reduce the quality of the remaining suitable habitat and could result in the injury or mortality of individual pond turtles. As shown in Table 2-12 (see Section 2.7), Alternative 4 would permanently affect 2,461.6 acres of western pond turtle habitat. Alternative 4 would also temporarily affect 1,055.6 acres of western pond turtle habitat.

To address these potential effects on western pond turtle, AMMs would be implemented. Applicable AMMs include BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#6, BIO-IAMF#7, BIO-IAMF#8, BIO-IAMF#9, BIO-IAMF#10, BIO-IAMF#11, BIO-MM#1, BIO-MM#2, BIO-MM#3, BIO-MM#4, BIO-MM#5, BIO-MM#6, BIO-MM#13, BIO-MM#36, and BIO-MM#37. Compensatory mitigation would be implemented for CTS per BIO-MM#31 and for California red-legged frog per BIO-MM#33; these measures are also expected to benefit western pond turtles.

2.6.4.2.3.1.5 Birds

Construction of the HSR track and systems in all five subsections would take place in suitable habitat for burrowing owl. Construction activities would result in the conversion and temporary disturbance of habitat and could result in injury and mortality of individual owls and eggs, as well as nest abandonment. Ground disturbance and vehicle traffic could injure or kill burrowing owls by crushing occupied burrows or collapsing burrow entrances, trapping any owls inside. As shown in Table 2-12 (see Section 2.7), Alternative 4 would permanently affect 1,464.7 acres of burrowing owl habitat. Alternative 4 would also temporarily affect 549.9 acres of burrowing owl habitat.

Construction of the HSR track and systems in all five subsections would take place in suitable habitat for bald and golden eagles, although there are no known eagle nests in the RSA. Construction activities would convert and temporarily disturb suitable habitat and could result in disturbance, injury, or mortality of nesting eagles if any are present in the vicinity. As shown in Table 2-12 (see Section 2.7), Alternative 4 would permanently affect 1,141.5 acres of eagle habitat. Alternative 4 would also temporarily affect 469.6 acres of eagle habitat.

Construction of the HSR track and systems in all five subsections would take place in suitable habitat for three special-status raptor species: American peregrine falcon, northern harrier, and white-tailed kite. Construction activities would convert and temporarily disturb suitable habitat and could result in disturbance, injury, or mortality of nesting raptors if any are present in the vicinity. As shown in Table 2-12 (see Section 2.7), Alternative 4 would permanently affect 5,723.2 acres of special-status raptor habitat. Alternative 4 would also temporarily affect 2,368.3 acres of special-status raptor habitat.

Construction of the HSR track and systems in all subsections except the San Jose Diridon Station Approach Subsection would take place in suitable habitat for Swainson's hawk. Construction activities would convert and temporarily disturb habitat and could result in disturbance, injury, or mortality of nesting Swainson's hawks if any are present in the vicinity. As shown in Table 2-12 (see Section 2.7), Alternative 4 would permanently affect 939.1 acres of Swainson's hawk habitat. Alternative 4 would also temporarily affect 541.7 acres of Swainson's hawk habitat.

Construction of the HSR track and systems in all five subsections would take place in suitable habitat for three special-status tree-nesting species: purple martin, olive-sided flycatcher, and loggerhead shrike. Construction activities would convert and temporarily disturb suitable habitat and could result in disturbance, injury, or mortality of nesting birds and the destruction of eggs and nests. As shown in Table 2-12 (see Section 2.7), Alternative 4 would permanently affect 2,171.5 acres of special-status tree-nesting species habitat. Alternative 4 would also temporarily affect 857.7 acres of special-status tree-nesting species habitat.

Construction of the HSR track and systems would take place in suitable habitat for three special-status riparian species: least Bell's vireo, yellow warbler, and yellow-breasted chat. Construction activities would convert and temporarily disturb suitable habitat and could result in disturbance, injury, or mortality of nesting birds and the destruction of eggs and nests. As shown in Table 2-12 (see Section 2.7), Alternative 4 would permanently affect 117.5 acres of special-status riparian species habitat. Alternative 4 would also temporarily affect 77.2 acres of special-status riparian species habitat.

Construction of the HSR track and systems in all five subsections would take place in suitable habitat for tricolored blackbird and yellow-headed blackbird. Construction activities would convert and temporarily disturb habitat and could result in disturbance, injury, or mortality of nesting birds and the destruction of eggs and nests. As shown in Table 2-12 (see Section 2.7), Alternative 4 would permanently affect 1,682.8 acres of tricolored blackbird and yellow-headed blackbird habitat. Alternative 4 would also temporarily affect 826.0 acres of tricolored blackbird and yellow-headed blackbird habitat.

To address these potential effects on avian species, AMMs would be implemented. Applicable AMMs include BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#8, BIO-IAMF#10, BIO-IAMF#11, BIO-MM#1, BIO-MM#2, BIO-MM#3, BIO-MM#4, BIO-MM#5, BIO-MM#6, BIO-MM#12, BIO-MM#13 (eagles, Swainson's hawk, least Bell's vireo, yellow warbler, yellow-breasted chat, tricolored blackbird), BIO-MM#45 (burrowing owl), BIO-MM#46 (burrowing owl), BIO-MM#48 (eagles), BIO-MM#49 (eagles), BIO-MM#52 (raptors), BIO-MM#53 (Swainson's hawk), BIO-

MM#54 (Swainson's hawk), BIO-MM#43 (purple martin, olive-sided flycatcher, loggerhead shrike, least Bell's vireo, yellow warbler, yellow-breasted chat), and BIO-MM#56 (tricolored blackbird). Compensatory mitigation would be implemented per BIO-MM#47 (burrowing owl), BIO-MM#50 (eagles), BIO-MM#55 (Swainson's hawk), BIO-MM#72 (least Bell's vireo, yellow warbler, yellow-breasted chat), and BIO-MM#57 (tricolored blackbird).

2.6.4.2.3.1.6 Mammals

Construction of the HSR track and systems in the eastern portion of the Morgan Hill and Gilroy Subsection and throughout the Pacheco Pass and San Joaquin Valley Subsections would take place in suitable habitat for San Joaquin kit fox. Construction activities would convert and temporarily disturb habitat and could result in the disturbance, injury, and mortality of individual foxes. As shown in Table 2-12 (see Section 2.7), Alternative 4 would permanently affect 2,023.1 acres of San Joaquin kit fox habitat. Alternative 4 would also temporarily affect 857.9 acres of San Joaquin kit fox habitat.

Construction of the HSR track and systems would take place in suitable habitat for American badger. Construction activities would convert and temporarily disturb habitat and could result in the disturbance, injury, and mortality of individual badgers. As shown in Table 2-12 (see Section 2.7), Alternative 4 would permanently affect 778.4 acres of American badger habitat. Alternative 4 would also temporarily affect 350.7 acres of American badger habitat.

Construction of the HSR track and systems in all subsections except the San Joaquin Valley Subsection would take place in suitable habitat for San Francisco dusky-footed woodrat and ringtail. Construction activities would convert and temporarily disturb habitat and could result in the disturbance, injury, and mortality of individual woodrats and ringtails. As shown in Table 2-12 (see Section 2.7), Alternative 4 would permanently affect 395.9 acres of San Francisco dusky-footed woodrat and ringtail habitat. Alternative 4 would also temporarily affect 84.0 acres of San Francisco dusky-footed woodrat and ringtail habitat.

Construction of the HSR track and systems in all subsections would take place in suitable habitat for pallid bat, Townsend's big-eared bat, western mastiff bat, and western red bat. Construction activities would convert and temporarily disturb habitat and could result in the disturbance, modification, or loss of both night and maternity roost sites, as well as associated injury and mortality of roosting individuals. Ground-disturbing activities (including tunnel boring), vegetation removal, and structure demolition (e.g., removal or modification of culverts, bridges, and old buildings) in suitable habitat for these species could destroy occupied roost sites, resulting in injury or mortality of adults and young. Construction-generated noise and vibration near potential roost sites, including caves or mines in or near the project footprint for Tunnels 1 and 2, could disturb maternity roosts and cause bats to abandon their young. As shown in Table 2-12 (see Section 2.7), Alternative 4 would permanently affect 3,133.7 acres of special-status bat habitat. Alternative 4 would also temporarily affect 1,252.7 acres of special-status bat habitat.

To address these potential effects on mammals, AMMs would be implemented. Applicable AMMs include BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#7, BIO-IAMF#8, BIO-IAMF#9, BIO-IAMF#10, BIO-IAMF#11, BIO-MM#1, BIO-MM#2, BIO-MM#3, BIO-MM#4, BIO-MM#5, BIO-MM#6, BIO-MM#13, BIO-MM#59 (San Joaquin kit fox), BIO-MM#60 (San Joaquin kit fox), BIO-MM#64 (American badger), BIO-MM#65 (ringtail), BIO-MM#66 (dusky-footed woodrat), BIO-MM#67 (bats), BIO-MM#68 (bats), and BIO-MM#69 (bats). Compensatory mitigation would be implemented per BIO-MM#61 (San Joaquin kit fox) and BIO-MM#72 (riparian habitat, which would benefit San Francisco dusky-footed woodrat and ringtail).

2.6.4.2.3.2 Indirect Construction Effects

2.6.4.2.3.2.1 Invertebrates

No indirect impacts from Alternative 4 on Bay checkerspot butterfly have been identified. Noise and vibration caused by both construction and operations may cause indirect effects on Crotch's bumble bee by temporarily disrupting normal foraging or behavioral patterns; however, the extent of occupied habitat is expected to be small, and effects would be distributed on the landscape.

2.6.4.2.3.2.2 Fish

Indirect impacts from Alternative 4 (changes in channel morphology, long-term discharge of sediment and hazardous pollutants) are assumed to take place in areas comparable to those subject to direct impacts; however, because of the nature of aquatic systems, the impacts could extend downstream. Construction of Tunnels 1 and 2 could have temporary indirect impacts on the hydrology of groundwater-dependent surface waters, including habitat and designated critical habitat for SCCC steelhead in Pacheco Creek near Casa de Fruta (i.e., northeast of Tunnel 1 and northwest of Tunnel 2). A drop in groundwater inflow to Pacheco Creek (directly or via upstream tributaries) could alter instream habitat conditions and fish movement potential. The duration of this impact would depend on hydrologic conditions, subsurface conditions, and the amount of lowering of groundwater tables or tunnel dewatering discharge, none of which can be estimated at this time.

In addition, if tunnel dewatering discharges at the Tunnel 2 west portal were routed to Pacheco Creek, such discharges could affect fish movement through the scour of creeks or banks, which could alter channel conditions, as well as through the introduction of abnormally warm water that could be a thermal barrier to safe fish passage. To meet water quality standards for beneficial reuse, settling ponds, storage tanks, and a series of treatment systems may be necessary. Only treated groundwater that meets appropriate water quality standards would be beneficially reused or discharged into receiving waterbodies. The application of regulatory discharge controls would avoid water quality effects related to fish habitat conditions and fish movement.

While pre-construction and construction actions to protect habitat for special-status fish species are part of the project, these actions would not prevent the conversion and disturbance of aquatic habitat where work must be conducted. In addition to habitat loss and temporary disturbance, construction activities could temporarily remove riparian vegetation, resulting in decreased stream shading; ground-disturbing activities could result in increased sediment discharge; and dewatering could result in stranding and death of individual fish.

To address these potential effects on relevant fish, AMMs would be implemented. Applicable AMMs include those discussed for direct impacts, as well as BIO-MM#9 and HYD-IAMF#5.

2.6.4.2.3.2.3 Amphibians

If construction in the project footprint for Alternative 4 alters a hydrologic regime that supplies water to vernal pools or aquatic features within 250 feet of the footprint, such hydrological modifications could indirectly affect habitat by altering the pools' ponding duration and rendering aquatic habitat unsuitable to support breeding behavior and the development of eggs and larvae. The introduction of nonnative plant species to upland habitat could reduce dispersal to nonbreeding sites (i.e., burrows) because dense herbaceous vegetation could impede movement.

Construction of Tunnels 1 and 2 could have temporary indirect impacts on the hydrology of groundwater-dependent surface waters, including ponds, wetlands, and streams that provide habitat for California red-legged frog, CTS, and foothill yellow-legged frog. Any reduction in groundwater hydrology that supplies water to features that function as habitat could cause adverse effects, including reduced reproductive success, degradation of habitat, and potential mortality. AMMs would be implemented. Applicable AMMs include those discussed for direct impacts, as well as BIO-MM#9 and HYD-IAMF#5.

2.6.4.2.3.2.4 Reptiles

The use of chemicals and hazardous substances during construction (e.g., oils, gasoline) may cause mortality if individuals enter aquatic habitat that has been contaminated by spills or other vehicle and equipment leaks. Construction of Tunnels 1 and 2 could have temporary indirect impacts on the hydrology of groundwater-dependent surface waters, including those that provide aquatic habitat for western pond turtle. Because western pond turtles are associated with ponds or streams that hold water year-round, any reductions in groundwater supply to occupied ponds and streams could reduce the availability of foraging and basking habitat for the affected population. Sudden decreases in water levels could strand basking individuals, forcing them to move to other aquatic habitat, if any is available nearby. To address these impacts, AMMs would be implemented. Applicable AMMs include those discussed for direct impacts, as well as BIO-MM#9 and HYD-IAMF#5.

2.6.4.2.3.2.5 Birds

Increased cover of invasive weeds could reduce habitat suitability for burrowing owls because they prefer areas with short, sparse vegetation.

The project could cause indirect impacts on special-status riparian birds. Ground disturbance and vegetation removal in riparian habitat would create areas of bare soil susceptible to colonization by nonnative invasive plant species, such as giant reed, tamarisk, and perennial pepperweed. Dense stands of these species would degrade riparian habitat for least Bell's vireos and other riparian birds by outcompeting willows and other native plants that provide nest sites. Construction of Tunnels 1 and 2 could have temporary indirect impacts on the hydrology of groundwater-dependent surface water features, including riparian vegetation along Pacheco Creek that provides habitat for least Bell's vireo and other riparian birds. Reductions in groundwater supply to riparian vegetation could result in the desiccation of vegetation and degradation of habitat for these species. To address these potential impacts on these avian species, AMMs would be implemented. Applicable AMMs include those discussed for direct impacts, as well as BIO-MM#9 and HYD-IAMF#5.

2.6.4.2.3.2.6 Mammals

Introduction of invasive nonnative vegetation could alter the structure of the vegetation community, making it less suitable to support kit foxes, woodrats, and ringtails, and could adversely affect the productivity of the prey base. To address these potential impacts on mammals, AMMs would be implemented. Applicable AMMs include those discussed for direct impacts.

2.6.4.2.3.3 Direct and Indirect Operations Effects

HSR operations would include inspection and maintenance activities along the HSR right-of-way. Right-of-way maintenance activities would include minor grading, clearing, and excavation needed to maintain adequate drainage or repair infrastructure; vegetation management, including application of herbicide to invasive weeds growing within the right-of-way; and vehicle traffic along maintenance roads. Because much of the right-of-way would already have been subjected to extensive ground disturbance and construction activities and converted to HSR track and systems, the areas within the right-of-way would provide limited habitat for most special-status wildlife. Nevertheless, these activities may further degrade habitat areas inside the right-of-way that were avoided during construction, as well as habitat outside of but within 250 feet of the right-of-way (i.e., core habitat study area). Minor ground disturbance within the right-of-way may result in minor direct (filling, sedimentation, inadvertent release of oils and chemicals from parked vehicles or equipment) or indirect (hydrological interruption, introduction of invasive species) impacts on special-status wildlife habitat in and adjacent to the right-of-way. If applied during high winds, herbicides could drift into and contaminate aquatic habitat features (e.g., ponds and wetlands). Such direct and indirect impacts would degrade special-status wildlife habitat in the habitat study area. Some habitat areas may be degraded to the extent that they no longer support the resources necessary for species survival and reproduction, and therefore cease to function as habitat for those species.

To address these potential effects on special-status animal species, AMMs would be implemented. Applicable AMMs include BIO-IAMF#4 and BIO-MM#70.

2.6.4.2.4 Wildlife Corridors

2.6.4.2.4.1 Construction Impacts

Construction of Alternative 4 would temporarily and permanently affect regional and local wildlife movement patterns. Construction of the HSR track and systems in all subsections would temporarily affect wildlife movement in several ways. Construction fencing and dewatering would create temporary barriers to movement, precluding the normal movement of animals. Noise, vibration, and visual disturbance from construction vehicles and pile driving may alter or delay movement of individuals as they attempt to avoid the construction area. Nighttime construction or security lighting could cause animals to delay or alter movement patterns because they may avoid lit areas.

Construction of the project would permanently affect regional and local wildlife movement patterns by creating new barriers to local and regional wildlife movement and fragmenting habitat. While project design would provide for wildlife movement across the alignment in Coyote Valley, the Soap Lake floodplain, most of Pacheco Pass, and the Central Valley, barriers to movement would remain on the west slope of Pacheco Pass where the rail alignment parallel to Pacheco Creek would be placed on a series of continuous cut-and-fill slopes. Barriers to movement and habitat fragmentation reduce resource availability and isolate breeding groups; both conditions can ultimately lead to reduced reproductive success and inbreeding depression. Terrestrial species are most vulnerable to permanent movement impacts. Birds and bats are able to move over patches of unsuitable habitat.

To address these potential effects on wildlife movement patterns, AMMs would be implemented. Applicable AMMs include BIO-IAMF#1, BIO-IAMF#3, BIO-IAMF#5, BIO-IAMF#8, NV-IAMF#1, BIO-MM#3, BIO-MM#25, BIO-MM#76, BIO-MM#77, BIO-MM#78, and BIO-MM#79.

2.6.4.2.4.2 Operation Impacts

Alternative 4 would result in noise from operations that can affect wildlife movement. The analysis detailed in the WCA (Authority 2020c) determined that only wildlife within a particular screening distance would be vulnerable to these impacts. The analysis detailed in the WCA determined that only terrestrial wildlife within the screening distance from the HSR centerline (e.g., within 70 feet of an at-grade section with a train traveling at 220 mph) would experience noise effects. The WCA determined that for birds and bats, three aerial species focal groups—waterfowl, shorebirds, and wading birds (collectively waterbirds)—were vulnerable to noise and were present in populations and concentrations substantial enough to be adversely affected. In the regional RSA, these focal groups are known to congregate in two primary locations: the UPR and GEA IBAs. Within the UPR IBA, Alternative 4 would affect 1,087 acres through impacts such as temporary hearing damage, masking, and arousal. Within the GEA IBA, Alternative 4 would affect 1,205 acres through the same kinds of impacts.

Vibration from train operations may also affect wildlife movement. Vibration effects are most likely to be perceived by species such as reptiles and amphibians, some of which—specifically snakes—are the most vibration-sensitive wildlife species known. However, because the affected species are reasonably common and the impacts would be brief and primarily diurnal (snakes are chiefly nocturnal predators), these vibration impacts are unlikely to cause substantial or long-lasting impacts. Amphibians are also highly sensitive to vibration, using ground vibration for communication, especially in the process of mate selection; thus, vibration generated by project operations at the time of amphibian breeding has the potential to affect the success of amphibian breeding activities and thereby to affect their population status. Burrowing rodents, notably kangaroo rats, are potentially sensitive to vibration influences on behavior and on the risk of vibration-caused burrow collapse. Studies involving intensive seismic exploration (Cypher et al. 2016), which generates extensive ground vibrations, did not find evidence of burrow collapse; however, minimization measures, including avoiding kangaroo rat burrows by a buffer distance of at least 10 meters (33 feet), may have avoided such effects. In the context of proposed operations, these findings suggest that exclusion fencing would limit impacts on kangaroo rats by excluding species' use of habitat within a distance of up to 13 meters (42 feet) from the tracks.

Train operations can also cause intermittent visual disturbance of wildlife. The literature identifies two distances at which response to visual stimuli occurs for waterfowl: flight initiation distance (average 269 feet) and minimum approach distance (average 404 feet). The flight initiation distance is assumed to have potential for the greatest impact and was applied as a threshold to determine acres of affected habitat. Alternative 4 would affect 173 acres of habitat (i.e., habitat within the 269-foot flight initiation distance) in the Soap Lake 10-year floodplain and 524 acres in the GEA IBA. For raptors, the flight initiation distance from motor vehicles is 262 feet on average.

If a raptor nest is within this distance of the rail alignment, there is potential for train operations to cause nest abandonment.

Project lighting can also affect wildlife using corridors during train operations. Conversely, nighttime lighting impacts are expected to be greatest in natural settings, where baseline light levels are low, and in locations where wildlife is known to move. In addition, light impacts from trains are expected to be greatest where the rail is at grade. However, the impacts on movement from train light are likely to be less than those from noise and vibration because noise and vibration travel farther from the centerline than light (which is directed in front of the train). For aerial species, few quantitative studies are available to determine the distance at which this impact may occur; however, published analyses confirm some potential for impact. For example, hunting owls may perch on OCS structures and become disoriented by the headlight of the approaching train, resulting in train strike. Also, birds may become “trapped” by a cone of light, unwilling to exit into darkness. This behavior may elevate train strike risk for birds lit by the headlight of an approaching train.

Operations also have the potential to cause mortality by train strike, although at-grade sections would have fencing to reduce wildlife access. Because terrestrial species are not expected to gain access to elevated sections, it is only at-grade sections that present risk of train strike to terrestrial species. Train operations also pose the risk of injury and mortality to aerial species by striking birds or bats flying in the path of passing trains. Nevertheless, quantifying the severity of the impact is difficult. For special-status species with low reproductive rates such as California condor, Swainson’s hawk, sandhill crane, and golden eagle, the loss of one individual would be a substantial impact. For more common species, the injury or mortality of a small portion of the local or regional population is not likely to be a substantial impact.

Within the GEA IBA specifically, waterfowl, shorebirds, and wading birds are known to congregate in relatively large numbers, and intermittent strike of these special-status species could affect the abundance and local or regional populations of these species over time. While condor numbers are very low in the region, and there is no evidence of nesting, train strike has potential to affect the distribution and abundance of local or regional populations of the species. CDFW tracking data confirm condor flights over the proposed rail alignment in western Pacheco Pass near Casa de Fruta; consequently, there is potential for individuals to be struck by the train while attempting to forage on carrion on or near the alignment.

Collisions with power lines or OCS facilities pose the risk of injury and mortality to bird and bat species. Prior to construction, the Authority would design the OCS and other structures (e.g., fencing) to be bird- and raptor-safe in accordance with applicable APLIC recommendations (Authority 2020c).

To address these potential effects on wildlife corridors and movement, AMMs would be implemented. Applicable AMMs include BIO-IAMF#12, BIO-MM#77, BIO-MM#78, BIO-MM#80, BIO-MM#81, BIO-MM#82, and BIO-MM#83. Compensatory mitigation would be implemented per BIO-MM#58.

2.6.4.3 Other Environmental Consequences

2.6.4.3.1 Agricultural Farmlands

2.6.4.3.1.1 Temporary Use of Important Farmland During Construction

Construction of Alternative 4 would require the temporary use of 460.9 acres of Important Farmland. This land would be leased from the landowner and temporarily removed from agricultural use for the duration of construction. In addition, reconductoring activities as part of the network upgrades would require temporary use of Important Farmland.

Although the project would temporarily use Important Farmland, the land would be restored following the cessation of construction activities and would not be permanently converted to nonagricultural use. The Authority would implement the same AMMs as discussed for Alternative 1 to reduce impacts.

2.6.4.3.1.2 Permanent Conversion of Important Farmland to Nonagricultural Use

Direct permanent conversion of Important Farmland to nonagricultural use would occur where the project footprint of an alternative overlaps Important Farmland. Alternative 4 would result in permanent conversion of 1,032.6 acres of Important Farmland. The Authority would purchase and use the land in the project footprint for the HSR right-of-way, access easement, stations, and maintenance facilities. The Authority would implement the same AMM as for Alternative 1.

2.6.4.3.1.3 Permanent Creation of Remnant Parcels of Important Farmland

Alternative 4 would result in the indirect creation of remnant parcels of Important Farmland in and adjacent to the TCE because of severance by the project. Some parcels could be severed from a larger parcel because the guideway alignment would bisect the parcel, and some parcels could be severed because roadway access would be restricted or eliminated. Some remnant parcels would remain in agricultural use because of adjacency to other farmland with access, sufficient size, or farmable shape. However, remnant parcels of 20 acres or less have the potential to become unfarmable because of lack of access, size, shape, location, or other constraint. These are referred to as nonviable remnant parcels and would result in conversion to nonagricultural use. Alternative 4 would convert 147.0 acres of Important Farmland to nonagricultural use through creation of nonviable remnant parcels, with acreage spread across 144 remnant parcels. The Authority would implement the same AMM as for Alternative 1.

2.6.4.3.2 Parks, Recreation, and Open Space

2.6.4.3.2.1 Temporary Changes from Noise, Vibration, and Construction Emissions on Use and User Experience of Parks, Recreational Facilities, and Open Space Resources

Construction of the San Jose to Merced Section has the potential to disrupt use and user experience at parks, recreational facilities, and open spaces due to temporary and localized noise, vibration, and construction emissions. Alternative 4 would affect the user experience at 38 park, recreation, and open space resources. Additionally, under Alternative 4, construction noise and vibration would preclude use of the amphitheater at the Morgan Hill Community and Cultural Center during one construction phase (track installation) under Alternative 4 and could result in damage to the playhouse and other buildings at the facility, despite project actions that address construction noise, vibration, and fugitive dust impacts. The project would comply with the Federal Transit Administration and FRA guidelines for minimizing construction noise and vibration impacts when work is conducted within 1,000 feet of sensitive receptors, which includes the parks, recreation facilities, and open space resources (FRA 2012) where uses are noise and vibration sensitive. The Authority would implement the same AMMs as for Alternative 1, as well as AMMs N&V-MM#1 and N&V-MM#2.

2.6.4.3.2.2 Temporary Changes to Access or Use of Parks

Construction of the project would require TCEs to facilitate placement of construction equipment and construction activities that could reduce access to roadways or otherwise temporarily affect access to and use of parks. Project construction would likely occur over a period of 4 years, with 1.5 years of continuous construction activity at any one location. Alternative 4 would limit access to five park, recreation, and open space resources. The Authority would implement the same AMMs as for Alternative 1.

Additionally, under Alternative 4, construction of the project would result in temporary visual changes, but they would not create a perceived barrier to use. The Authority would implement SOCIO-IAMF#1 to minimize impacts on residents and businesses.

2.6.4.3.2.3 Permanent Acquisition of Parks, Recreation, and Open Space Resources

Construction of Alternative 4 would result in the permanent acquisition of portions of eight park, recreation, and open space resources. The Authority would implement the same AMMs as discussed for Alternative 1.

2.6.4.3.2.4 Additional Permanent Changes to Parks, Recreation, and Open Space Resources

Construction of Alternative 4 would result in permanent changes to access or circulation at two resources. The Authority would implement PK-IAMF#1 and PR-MM#3 to reduce impacts.

Construction of Alternative 4 would not result in permanent visual changes that could create an actual or perceived barrier to use, even though the user experience at certain resources would be altered. The Authority would implement AVR-IAMF#1 and AVR-IAMF#2 to reduce impacts.

Construction of Alternative 4 would result in permanent effects from operational noise on three resources and permanent effects from vibration on one resource. The Authority would implement NV-MM#3, NV-MM#4, and NV-MM#8 to reduce impacts.

Construction of Alternative 4 would not result in the permanent closure or relocation of any parks, recreational facilities, or open space areas. Therefore, no new parks or other recreational facilities would need to be constructed to accommodate demand, and no mitigation measures would be required.

2.6.4.3.2.5 Temporary Changes to Access or Use of School District Play Areas

Under Alternative 4, no changes in access or use of school district play areas would occur.

2.6.4.3.2.6 Additional Temporary Changes to School District Play Areas

Construction of Alternative 4 would generate temporary and localized noise, vibration, and construction emissions affecting school district play areas within 1,000 feet of the project footprint, but they would not preclude the use of these play areas. The Authority would implement NV-IAMF#1 and AQ-IAMF#1 to minimize these impacts.

Construction of Alternative 4 would result in temporary visual changes, but they would not create a perceived barrier to access or continued use of school district play areas. The Authority would implement SOCIO-IAMF#1 to reduce impacts.

2.6.4.3.2.7 Permanent Acquisition of School District Play Areas

Under Alternative 4,the project would not result in permanent acquisition of school district play areas.

2.6.4.3.2.8 Permanent Changes from Noise and Vibration on School District Play Area Character and Use

HSR operations along the project alignment would generate noise and vibration from trains, station activities, and maintenance activities at the MOWF that would add to existing sources of noise. While new noise and vibration from project operations could affect resources in the three northernmost subsections, the majority of school district play areas are located close to developed areas along existing rail corridors that already experience railway noise. The school district play areas at the schools considered in this analysis are located in developed areas and would be used intermittently, unlike other sensitive receptors, such as school buildings, which are used all day for 9 months of the year, or residences, where residents would be exposed continuously to increased noise and vibration. Under Alternative 4, operations would result in permanent effects from noise and vibration on Gardner Elementary School, Central High School, San Martin/Gwinn Elementary School, South Valley Middle School, and Gilroy Prep School. The Authority would implement AMM NV-MM#3 to reduce impacts.

2.6.4.3.2.9 Permanent Changes Affecting Access to School District Play Areas

Construction of Alternative 4 would not result in permanent changes in access to school district play areas. Therefore, no AMMs or mitigation measures would be required.

2.6.4.3.2.10 Permanent Visual Changes That Could Create A Perceived Barrier to Access or Continued Use of School District Play Areas

Construction of Alternative 4 would not result in any permanent visual changes that would create a perceived barrier to access or use of school district play areas. Therefore, no AMMs or mitigation measures would be required.

2.6.4.3.3 Cultural Resources

2.6.4.3.3.1 Permanent Disturbance of Unknown Archaeological Sites

Construction of the project could potentially affect unknown archaeological resources with ground-disturbing construction associated with the project. Unknown archaeological sites might encompass the full range of pre-contact or historic activities conducted over time, including pre-contact lithic scatters and village sites, historic-era homestead remains, and human burials.

Unknown or unrecorded archaeological resources that are not observable when conducting standard surface archaeological inspections, including subsurface buried archaeological deposits, may exist in areas surveyed within urbanized or rural areas. Unknown or unrecorded archaeological resources may also exist in areas where permission to enter has not been granted. Alternative 4 has 568 acres of surface that are generally sensitive for archaeological resources and 2,713 acres that are sensitive for buried archaeological resources.

The project would limit potential impacts on unknown archaeological sites by developing an MOA for each undertaking where the Authority determines there would be an adverse effect on historic properties or when phased identification is necessary and adverse impacts would occur. The Authority and SHPO would use the MOA and the ATP to enforce implementing the required actions arising from the Section 106 consultation. The Authority would implement the same AMMs as discussed for Alternative 1.

2.6.4.3.3.2 Permanent Disturbance of a Known Archaeological Site

Construction of the project may result in permanent disturbance of known archaeological sites. Thirty-five archaeological resources are known to exist in the APE. Alternative 4 crosses all or part of 24 known resources. These cultural resources would be subject to phased evaluation, and are assumed eligible at the present time only until they can be evaluated and their eligibility determined. Grading, trenching, and excavating in the project footprint during construction, as well as compaction resulting from the use of heavy machinery and other vehicular traffic on the construction site or in TCEs, may affect the integrity of artifact-bearing archaeological deposits. The Authority would implement the same AMMs as discussed for Alternative 1.

2.6.4.3.3.3 Temporary Public Access and Disturbance of Archaeological Resources

Construction activities associated with the project would not result in higher potential for public access to archaeological resources by people who previously would not have been able to enter the property where the resource is located because the work areas would be inaccessible to the public. All work areas would be fenced and access controlled, allowing access only to authorized construction personnel; therefore, they would not provide access for persons to loot sites and would not expose sites to compaction through pedestrian or vehicular traffic. Additionally, the project may include increased site protection measures in the MOA and ATP, such as nighttime security patrols.

These design characteristics and features would be the same for all project alternatives. There would be no impacts on unknown archaeological resources because of temporary public access from any of the project alternatives. Additionally, there would be no impact during operations under Alternative 4.

2.6.4.3.3.4 Permanent Demolition, Destruction, Relocation, or Alteration of Built Resources or Setting

Construction activities associated with the project could result in demolition, relocation, and alteration of built resources, the setting of the resources, or both. Alternative 4 has the potential to affect historic built resources in several ways. Where the permanent HSR right-of-way would cross an historic property, character-defining features or entire resources would likely be demolished to make way for the construction of track structures or other facilities. The permanent HSR right-of-way that would be introduced directly adjacent to built resources would alter their setting, which has the potential to impair the resources' integrity of feeling, setting, and association. In other words, introducing a very large, modern transportation structure would make it difficult to understand the historic visual context of the resource, and thus how it functioned and related to its local context during its period of significance. Areas that would be used as a TCE may be used in a variety of ways, including but not limited to materials staging, operation of construction equipment, and installation of protective fencing. Once cleared as a TCE, any activities in support of construction of the project would be allowed. These activities have the potential to result in permanent physical damage to resources or their character-defining features. Under Alternative 4, five built resources could be affected: three would be demolished, one would experience compromised integrity due to loss of character-defining features, and one would have its setting altered in a way that changes its historic context. The Authority would implement the same AMMs as discussed for Alternative 1, except for CUL-MM#11, which pertains to a resource that Alternative 4 would not affect.

2.6.4.3.3.5 Noise and Vibration Impacts on Built Resources Caused by Construction Activities

Under Alternative 4, no built resources would be adversely affected by construction-related noise and vibration impacts. The Authority would implement the following project features to protect built resources and to avoid impacts: CUL-IAMF#6, CUL-IAMF#7, and CUL-IAMF#8.

2.6.4.3.3.6 Intermittent Noise and Vibration Impacts on Built Resources Caused by Operations
Under Alternative 4, intermittent noise and vibration caused by operations would have no impact on any built resources. Therefore, no AMMs or mitigation measures would be required.

2.6.4.4 Practicability

2.6.4.4.1 Consistency with the Overall Project Purpose

Alternative 4 would be consistent with the overall project purpose for the San Jose to Merced Project Section.

2.6.4.4.2 Other Practicability Factors

- **Availability:** Alternative 4 would be available for construction.
- **Cost:** Alternative 4 would be practicable from a cost standpoint.
- **Existing Technology:** Alternative 4 would be capable of being constructed with respect to existing technology. The design of Alternative 4 includes at-grade, below-grade, and above-grade (elevated) segments. Most of the anticipated construction methods that would be used to construct Alternative 4 are the same conventional means and methods employed by contractors that build roads, bridges, railway tracks, and other transportation infrastructure using common industry equipment, readily available labor and tools, and industry-standard operations. Consequently, Alternative 4 would be practicable in light of existing technology.
- **Logistics:** 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. Alternative 4 would be practicable from a logistical standpoint.

2.6.5 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 horizontally and/or vertically.

2.6.5.1 Practicability

2.6.5.1.1 Consistency with Overall Project Purpose

A No-Fill Alternative would be consistent with the overall project purpose.

2.6.5.1.2 Other Practicability Factors

2.6.5.1.2.1 Availability

The No-Fill Alternative would be available.

2.6.5.1.3 Cost

Table 2-8 shows cost estimates for each of the 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 has emphasized the need to maximize the use of at-grade construction, taking into account that the HSR system is currently publicly 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.

Table 2-8 Cost Estimate for Each Alternative

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Cost (2017 Billions of Dollars)	$20.5	$17.7	$20.8	$13.6

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 regional labor and material costs. All material quantities are estimated based on a preliminary level of design for the alternatives. This level of design has generally defined at-grade or elevated profiles, structure types, earth fill, and tunneling. Roadway and utility relocations have been identified, and power substations have been sized and located.

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 potentially avoid impacts on 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 project extent is estimated to be in the range of $13.6 to $20.8 billion. If the project extent was constructed entirely on viaduct (except tunnel sections), the subsection would cost $24.28 billion ($10.68 billion more than the planned costs of Alternative 4, which is the Preliminary LEDPA). The substantial additional cost of avoiding waters of the U.S. would be unreasonable; therefore, the No-Fill Alternative would not be practicable.

2.6.5.1.4 Existing Technology

The No-Fill Alternative would not be practicable in light of existing technology.

Under a No-Fill Alternative, portions of the project 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 because 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 (Authority 2020a). While this approach would be less conventional, these methods could be used in most areas to avoid waters. At the water crossing discussed below, this technology would not be practicable for spanning waters.

East of Gilroy, the project extent crosses Tequisquita Slough, which occurs in the fault rift of the Calaveras fault. Because the slough occurs on a fault rift, the feature could not be spanned by viaduct regardless of the length of viaduct required. Elevated structures are vulnerable to rupture during earthquakes, and the Calaveras fault is a seismically active fault with two plates moving north and south along the axis of the fault (USGS 1999). Authority design criteria require crossing major faults on embankment in order to avoid complete failure of an elevated structure during seismic events. For these reasons, it is not technically feasible to cross this feature on an elevated structure that would span the jurisdictional waters at this location. As further discussed below under "Logistics," horizontal shifts are also not available to avoid waters in this location.

2.6.5.1.5 Logistics

A No-Fill Alternative would not be logistically practicable for the San Jose to Merced Section.

The logistics criterion generally refers to the feasibility of project construction in light of any constraints to development, such as location, access, topography, terrain, and existing infrastructure. The following discussion evaluates the logistical practicability of using a combination of vertical elevation on viaduct and horizontal shifts to avoid all waters given the distribution of waters in and around the corridor.

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 of the two. 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 project extent, thereby almost certainly foreclosing the opportunity to fully avoid impacts on waters of the U.S. Therefore, a No-Fill Alternative would not be logistically practicable.

Specifically, under a horizontal approach, efforts would be made to shift the alignment 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 project extent because of the interrelated features comprising the project extent. Such a horizontal shift would affect a large geographic area. As discussed in detail below, efforts to position the alignment in a manner that would avoid all jurisdictional waters would not be practicable in and near the corridor.

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 alignment on viaducts to avoid jurisdictional waters would not be practicable, as discussed above. 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. The following provides a more specific set of examples areas in which waters could not, from a logistical standpoint, be avoided:

- Tequisquita Slough occurs in the Calaveras fault rift east of Gilroy by approximately 6.7 miles in the Morgan Hill and Gilroy Subsection. This natural waterbody spans the entire corridor from north to south (the corridor crosses this feature at a perpendicular angle). For this reason, a horizontal shift within the corridor would not avoid the feature. As explained above, under technological considerations, it is also impracticable to use viaduct to span this feature. A visual inspection of the landscape in relation to the fault location shows abundant distribution of waterbodies consisting of natural creeks, as well as larger features, such as San Felipe Lake, in the area immediately north and south of the corridor. Given the scale of embankment required for the construction of the guideway, it is not feasible to avoid waters at the fault crossing location even by deviating somewhat from the corridor.

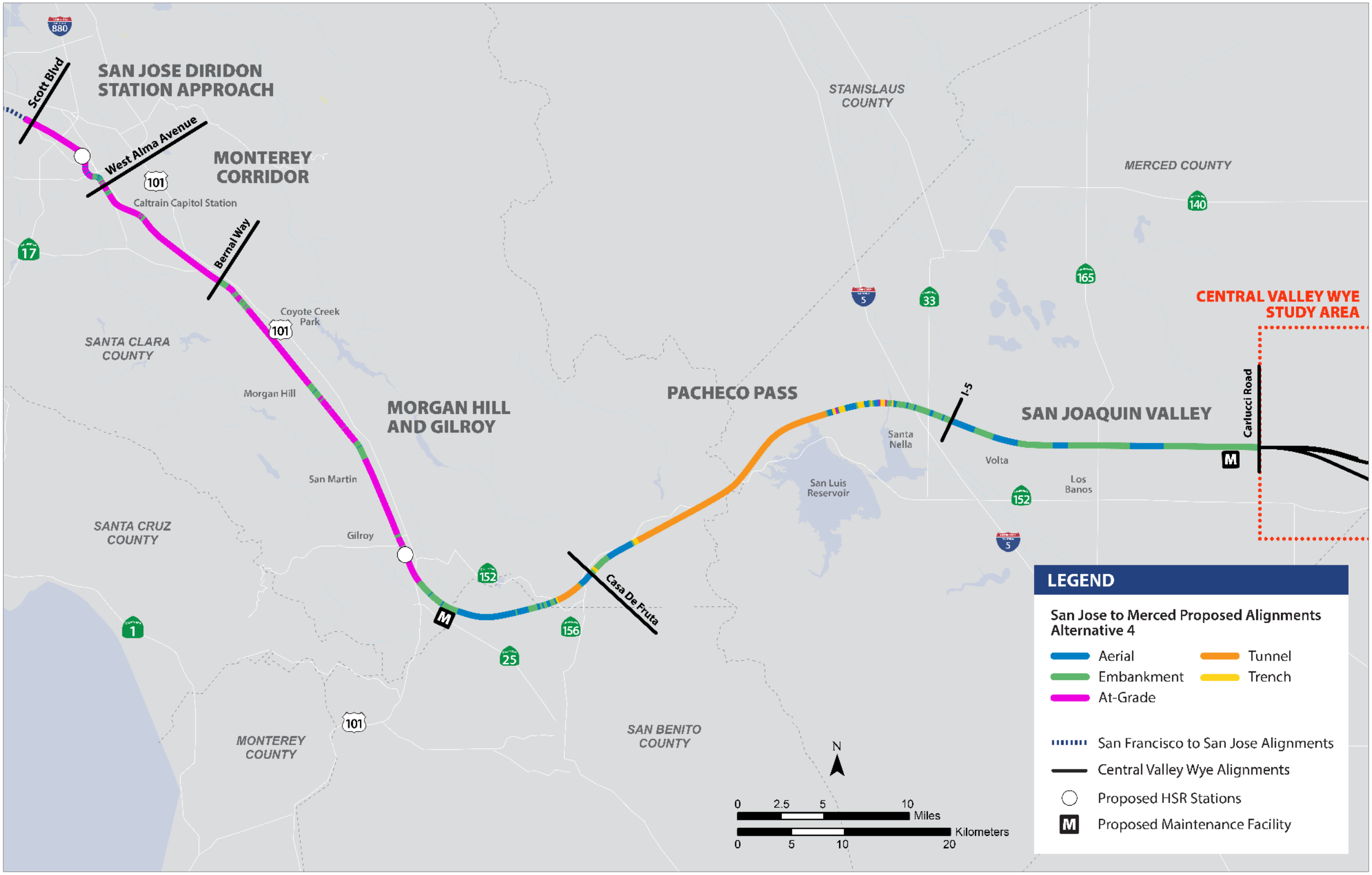
- Just east of the Central California Irrigation District main canal, a very large constructed basin occurs within the San Joaquin Valley Subsection. The feature crosses the entire corridor as currently aligned and would require a viaduct section with a free span of over 1,600 feet to avoid all fill. Because 1,600 feet far exceeds the maximum span length that could be constructed, it would not be possible to avoid fill of this feature. While it would be feasible to make a horizontal shift to avoid this feature, visual inspection of the surrounding landscape shows that the agricultural landscape is interspersed with large wetland complexes around the San Luis Wasteway and the wetland complexes south of Volta. A horizontal shift in the general vicinity of the corridor would intersect with these wetland complexes, where it would also be impracticable to construct a free span across the entire portion of the landscape with wetlands or other features that are most likely jurisdictional because they all are more than 350 feet in width.
- A large wetland complex consisting of alkali marsh wetlands, alkali scrub wetlands, and natural watercourses occurs on both sides of Henry Miller Road approximately 1.5 miles east of the intersection with SR 165/Mercey Springs Road in the San Joaquin Valley Subsection. This complex spans the entire corridor from north to south and extends over 5 miles north and south of the alignment. The portion of the complex that intersects the corridor measures approximately 1.2 miles east to west, well beyond the capacity of the train to span features with viaduct. While the width of the complex varies to the north and south, at no point is it feasible to free span this complex with viaduct given the maximum span lengths available of 350 feet.

Because a combination of horizontal and vertical shifts would not allow for the avoidance waters of the U.S., a No-Fill Alternative would not be practicable based on logistical considerations.

2.7 Summary of the Section 404(b)(1) Alternatives Analysis

2.7.1 Preliminary Least Environmentally Damaging Practicable Alternative

Consistent with the Section 404(b)(1) Guidelines, the Authority has identified Alternative 4, illustrated on Figure 2-25, as the Preliminary LEDPA. The Preliminary LEDPA would have a less adverse impact on the aquatic ecosystem than the other action alternatives and would not result in a substantial adverse environmental consequence, as shown in Section 2.6, Comparative Analysis of Project Alternatives. Alternative 4 is consistent with the overall project purpose and is available and capable of being done, as described in Section 2.6.4.4.2, Other Practicability Considerations. These effects are summarized in Table 2-13 and in Section 2.7.2, Basis for the Selection of the Preliminary LEDPA, and described in greater detail in Section 2.6, Comparative Analysis of Project Alternatives.



Source: Authority 2020a

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Figure 2-25 Preliminary LEDPA

Table 2-9 Direct Impacts on Aquatic Resources by Project Alternative (acres)

	Alt 1		Alt 2		Alt 3		Alt 4	
Impacts	**Perm**	**Temp**	**Perm**	**Temp**	**Perm**	**Temp**	**Perm**	**Temp**
Permanent Conversion or Degradation of Aquatic Resources Considered Jurisdictional under Section 404 of the Federal Clean Water Act								
Wetlands								
Alkali Marsh	6.2	3.5	6.2	3.5	6.2	3.5	6.2	3.5
Alkali Scrub Wetland	0.5	0.4	0.5	0.4	0.5	0.4	0.5	0.4
Alkali Vernal Pool[1]	27.1	0.0	27.1	0.0	27.1	0.0	27.1	0.0
Freshwater Marsh	2.3	<0.1	2.3	0.1	11.1	0.2	2.3	<0.1
Mixed Riparian-Natural Watercourse	3.6	1.3	3.6	1.2	3.6	1.3	3.6	1.2
Palustrine Forested Wetland[2]	1.6	5.5	1.5	5.6	1.1	1.7	1.9	2.4
Palustrine Forested Wetland-Natural Watercourse	5.8	3.4	5.7	3.2	5.7	3.0	5.5	3.2
Seasonal Wetland	10.7	5.2	10.8	5.6	12.1	1.8	8.7	2.9
Vernal Pools	0.4	0.0	0.4	0.0	0.4	0.0	0.4	0.0
Subtotal Wetlands	**58.2**	**19.3**	**58.1**	**19.6**	**67.8**	**11.9**	**56.2**	**13.6**
Non-Wetlands								
Constructed Basin	2.1	38.9	7.2	38.9	2.1	38.9	2.1	38.6
Constructed Watercourse	21.9	13.4	24.4	14.3	22.7	13.1	20.0	13.0
Freshwater Pond	4.5	0.9	4.5	0.9	4.3	0.2	4.5	0.9
Natural Watercourse[2]	13.8	15.1	13.8	15.8	13.9	16.6	13.8	12.2
Reservoir	<0.1	0.1	<0.1	0.1	<0.1	0.1	0.0	0.0
Subtotal Non-Wetlands	**42.3**	**68.3**	**49.9**	**69.9**	**43.0**	**68.8**	**40.4**	**64.7**
Total Section 404 Aquatic Resources	**100.5**	**87.5**	**108.0**	**89.4**	**110.8**	**80.7**	**96.5**	**78.3**

Source: Authority 2020c

[1] The alkali vernal pool (AVP) type includes areas mapped as vernal pool complexes. Acreage provided is an estimate of the wetted vernal pool area within vernal pool complexes. For this resource category alone (AVP), we identify the total acreage affected, which extends not only beyond the footprint, but beyond the edge of the wetland study area because this is the acreage that may be indirectly bisected, consistent with the aquatic impact methodology.

[2] Note that the acres of these aquatic resources are less than the total acres of mapped land cover types used elsewhere in this section due to differences in the methods for mapping features considered jurisdictional under Section 404 of the Clean Water Act.

Perm = permanent

Temp = temporary

2.7.2 Basis for the Selection of the Preliminary LEDPA

The Authority has identified Alternative 4 as the Preliminary LEDPA. The determination is based on the following considerations:

- effect on aquatic resources;
- effect on other environmental resources; and
- practicability as defined in the Section 404(b)(1) Guidelines, including consistency with the overall project purpose.

2.7.2.1 Summary of Effects on Aquatic Resources

Table 2-9 shows a summary of all permanent direct effects on waters of the U.S. The acreages presented in the table reflect the quantities that are reported in tables in Section 2.6, Comparative Analysis of Project Alternatives.

Overall, the total magnitude of direct permanent impacts on jurisdictional aquatic resources by alternative would be 110.8 acres under Alternative 3, 108.0 acres under Alternative 2, 100.5 acres under Alternative 1, and 96.5 acres under Alternative 4. The extent of direct temporary impacts would be 89.4 acres under Alternative 2, 87.5 acres under Alternative 1, 80.7 acres under Alternative 3, and 78.3 acres under Alternative 4. Table 2-9 shows the comparative effects for each alternative. While all the San Jose to Merced Section alternatives would require the discharge of fill into wetlands and non-wetland waters, Alternative 4 would have the fewest permanent and temporary effects on jurisdictional waters.

2.7.2.1.1 Summary of Effects on Wetlands

The San Jose to Merced Section alternatives would affect wetlands, including alkali marsh, alkali scrub wetland, alkali vernal pool, freshwater marsh, mixed riparian-natural watercourse, palustrine forested wetland, palustrine forested wetland-natural watercourse, and seasonal wetland. All four alternatives would affect the same acreage of alkali marsh, alkali scrub wetland, and alkali vernal pool. Alternative 4 would result in less discharge of fill into wetlands than the other action alternatives.

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

The San Jose to Merced Section alternatives would also affect other waters of the U.S., including constructed basins, constructed watercourses, freshwater pond, natural watercourse, and reservoir. Alternative 4 would result in less discharge of fill into other waters of the U.S. than the other action alternatives.

2.7.2.2 Summary of Effects on Biological Resources

2.7.2.2.1 Special-Status Plant Communities

The areal extent of direct permanent and temporary impacts (conversion and disturbance of habitat, habitat fragmentation, hydrologic changes, and introduction of hazardous materials) on special-status plant communities is shown in Table 2-10. Overall, the total magnitude of impacts on special-status plant communities would be substantially similar for all alternatives. The extent of permanent impacts would be, in descending order, 880.5 acres under Alternative 3, 872.9 acres under Alternative 2, 867.8 acres under Alternative 1, and 839.1 acres under Alternative 4. The extent of temporary impacts, in descending order, would be 426.1 acres under Alternative 2, 401.8 acres under Alternative 1, 400.9 acres under Alternative 3, and 371.0 acres under Alternative 4.

Table 2-10 Impacts on Special-Status Plant Communities (Acres)

Impacts	Alt 1			Alt 2			Alt 3			Alt 4		
	Perm	Temp		Perm	Temp		Perm	Temp		Perm	Temp	
		Long	Short		Long	Short		Long	Short		Long	Short
Permanent Conversion or Degradation of Special-Status Plant Communities												
Alkali Marsh	6.2	2.9	0.7	6.2	2.9	0.7	6.2	2.9	0.7	6.2	2.9	0.7
Alkali Scrub Wetland	0.5	0.4	<0.1	0.5	0.4	<0.1	0.5	0.4	<0.1	0.5	0.4	<0.1
Alkali Vernal Pool[1]	27.1	0.0	0.0	27.1	0.0	0.0	27.1	0.0	0.0	27.1	0.0	0.0
California Annual Grassland[2]	772.8	295.5	70.1	778.0	311.5	76.9	773.8	298.4	71.8	749.4	270.5	72.0
California Sycamore Woodland	9.4	3.2	<0.1	9.4	3.2	<0.1	9.4	3.2	<0.1	9.4	3.2	<0.1
Freshwater Marsh	2.3	<0.1	<0.1	2.3	0.1	<0.1	11.1	0.2	<0.1	2.3	<0.1	<0.1
Mixed Chaparral	15.8	3.8	<0.1	15.8	3.8	<0.1	15.8	3.7	<0.1	15.8	3.8	<0.1
Mixed Riparian	15.2	8.5	2.6	15.2	8.8	3.6	17.3	12.2	0.8	11.9	6.7	2.3
Palustrine Forested Wetland	7.4	6.2	2.7	7.2	5.9	2.8	6.8	4.5	0.3	7.4	4.6	0.9
Seasonal Wetland	10.7	3.9	1.3	10.8	4.1	1.4	12.1	1.7	0.1	8.7	1.7	1.3
Vernal Pools[3]	0.4	0.0	0.0	0.4	0.0	0.0	0.4	0.0	0.0	0.4	0.0	0.0
Total	**867.8**	**324.4**	**77.4**	**872.9**	**340.7**	**85.4**	**880.5**	**327.2**	**73.7**	**839.1**	**293.8**	**77.2**

Source: Authority 2020c
[1] The alkali vernal pool type includes areas mapped as vernal pool complexes. Acreage provided is an estimate of the wetted vernal pool area within vernal pool complexes.
[2] Annual grassland is included because it may contain inclusions of serpentine bunchgrass grasslands.
[3] Temporary impacts = 0 because all vernal pool impacts are considered permanent.
Long = long term
Perm = permanent
Short = short term
Temp = temporary

2.7.2.2.2 Special-Status Plant Species

The areal extent of direct permanent and temporary impacts on habitat for both listed and nonlisted special-status plant species is shown in Table 2-11. All four project alternatives would be nearly identical with respect to the extent of habitat for special-status plant species potentially affected. The aggregate magnitude of permanent and temporary impacts by alternative would be 1,190.8 acres and 467.5 acres, respectively, under Alternative 3; 1,185.9 acres and 487.1 acres under Alternative 2; 1,179.3 acres and 460.1 acres under Alternative 1; and 1,154.2 acres and 429.1 acres under Alternative 4.

Table 2-11 Impacts on Habitat for Special-Status Plant Species by Project Alternative (acres)

	Alternative 1		Alternative 2		Alternative 3		Alternative 4	
	Perm	Temp	Perm	Temp	Perm	Temp	Perm	Temp
Total habitat of all special-status plant species	**6,415.4**	**3,095.3**	**6,493.5**	**3,266.4**	**6,447.3**	**3,145.8**	**6,252.0**	**2,909.8**
Total affected habitat of all special-status plant species (non-overlapping)	**1,179.3**	**460.1**	**1,185.9**	**487.1**	**1,190.8**	**467.5**	**1,154.2**	**429.1**

Source: Authority 2020c
Nonoverlapping acreage reflects the *aggregate* areal extent of all species taken together—in other words, the exterior perimeter of the overlapping boundaries of mapped habitat—so that land where habitat has been mapped for more than one species is counted only once.

2.7.2.2.3 Special-Status Wildlife Species

Table 2-12 shows the direct 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 by terrestrial and aquatic species, the habitat quality and location within the landscape may not be conducive to specific species requirements. For this reason, substantial portions of these areas/acres may not be occupied. Where there is differentiation among impacts of alternatives, Alternative 4 has the overall least effect on special-status wildlife species. While the acres of impacts would differ between alternatives, the types of impacts on special-status species habitat would be similar across all San Jose to Merced Section alternatives because construction activities would be similar and because the alternatives occur in the same general vicinity. On the Pacheco Pass and San Joaquin Valley Subsections, the alternatives share a common design. The largest major difference is that while Alternatives 1, 2, and 4 pass through urbanized downtown Gilroy and follow the Monterey Highway, Alternative 3 traverses agricultural lands to the east. These lands provide relatively high-quality Swainson’s hawk foraging habitat and CTS and red-legged frog dispersal habitat.

In the Morgan Hill and Gilroy Subsection, Alternative 2 would affect more habitat and designated critical habitat for SCCC steelhead than Alternatives 1, 3, and 4 because of the TCE over Llagas Creek; at the same time, Alternative 3 would affect more critical habitat for SCCC steelhead than Alternatives 1, 2, and 4 because of additional crossings of the Pajaro River and Llagas Creek.

Indirect impacts (e.g., hydrologic modification, accidental release of contaminants into suitable habitat, introduction of nonnative invasive plants) on special-status species would likely be roughly proportional to impacts on suitable habitat. Specific to Bay checkerspot butterfly, Alternatives 1 and 3 have the potential to alter flight behavior because the shadow created by the viaduct could create a barrier to movement. Alternatives 2 and 4 would have the least impact on flight behavior because both alternatives would be at grade in Coyote Valley.

Table 2-12 Impacts on Special-Status Wildlife Habitat (Acres)

Species	Alternative 1		Alternative 2		Alternative 3		Alternative 4	
	Permanent	Temporary	Permanent	Temporary	Permanent	Temporary	Permanent	Temporary
Special-status fish (steelhead – CCC/SCCC DPS, Chinook salmon – Central Valley Fall-run, Pacific lamprey)	157.3	82.9	159.4	88.2	177.4	80.6	154.9	73.4
Bay checkerspot butterfly	9.8	22.6	14.7	27.8	9.8	22.6	10.9	14.5
Crotch's bumble bee	1,147.2	436.4	1,154.5	461.8	1,148.8	444.0	1,127.0	412.7
California tiger salamander	2,249.1	910.6	2,305.1	1,087.6	2,447.8	956.5	2,126.4	842.2
California red-legged frog	1,990.4	847.2	2,160.0	1,173.5	2,119.3	882.3	1,812.5	657.2
Foothill yellow-legged frog	91.7	41.3	89.2	42.0	91.9	41.0	88.3	39.4
Western spadefoot	528.7	212.1	528.7	212.1	546.2	214.7	528.7	212.1
Western pond turtle	2,610.6	1,290.4	2,806.3	1,581.9	2,545.4	1,266.1	2,461.6	1,055.6
Burrowing owl	1,541.5	635.3	1,649.8	791.3	1,694.3	672.0	1,464.7	549.9
Golden and bald eagle[1]	1,179.8	499.0	1,193.2	525.4	1,169.4	504.7	1,141.5	469.6
Raptors (American peregrine falcon, northern harrier, white-tailed kite)[2]	6,151.5	2,819.5	6,426.4	3,526.1	6,359.4	2,897.6	5,723.2	2,368.3
Swainson's hawk[3]	955.5	578.9	1,045.1	698.4	955.5	578.9	939.1	541.7
Tree-nesting species (purple martin, olive-sided flycatcher, loggerhead shrike)	2,334.3	941.5	2,391.7	1,144.1	2,478.7	993.0	2,171.5	857.7
Riparian species (least Bell's vireo, yellow warbler, yellow-breasted chat)	126.2	94.3	128.5	98.1	131.6	88.9	117.5	77.2
Tricolored blackbird and yellow-headed blackbird	1,763.8	877.2	1,877.0	1,040.6	1,925.5	921.7	1,682.8	826.0
San Joaquin kit fox	2,021.5	860.1	2,021.5	860.1	2,066.2	848.2	2,023.1	857.9
American badger	798.6	374.5	805.4	399.3	799.6	378.9	778.4	350.7
San Francisco dusky-footed woodrat, ringtail	400.1	102.3	399.6	113.2	402.6	110.7	395.9	84.0
Pallid bat, Townsend's big-eared bat, western mastiff bat, western red bat	3,383.1	1,612.8	3,599.7	2,116.9	3,446.2	1,650.5	3,133.7	1,252.7

Source: Authority 2020c

1. For the purpose of this analysis and based on previous buffers for these species recommended by USFWS, it is assumed that any bald or golden eagles nesting within 0.5 mile of the project footprint (generally, topography that blocks line of sight could shorten this typical distance) could be disturbed by construction noise or vibration, potentially causing nest abandonment.
2. For the purpose of this analysis and based on typical guidance on disturbance distances from CDFW, any raptors (American peregrine falcon, northern harrier, and white-tailed kite) nesting within 500 feet of the project footprint (i.e., habitat study area) could potentially be disturbed by construction noise or vibration, potentially causing nest abandonment.
3. For the purpose of this analysis, any Swainson's hawks nesting within 0.5 mile of the project footprint (i.e., habitat study area) could potentially be disturbed by construction noise or vibration, potentially causing nest abandonment.

2.7.2.2.4 Wildlife Corridors

Although the extent and location of construction activities would be broadly similar among the project alternatives, the severity of impacts of the alternatives on wildlife corridors would vary. Alternative 3 would have the most severe impact on wildlife corridors, followed, in descending order, by Alternative 1, Alternative 2, and Alternative 4 for the following reasons:

- Alternatives 1, 2, and 4 would cross less land that is protected to conserve wildlife movement in the Soap Lake floodplain than Alternative 3.
- Alternatives 1, 2, and 4 would cross less of the Santa Cruz Mountains to Diablo Range modeled linkage (Authority 2020c) than Alternative 3.
- Alternatives 1, 2, and 4 would follow a highly developed transportation corridor in downtown Gilroy rather than cross the undeveloped agricultural areas east of Gilroy where Alternative 3 would be constructed. These agricultural areas support wildlife movement.
- Alternatives 1 and 3 would bypass downtown Morgan Hill, fragmenting agricultural lands and requiring construction and infrastructure closer to Coyote Creek, a known wildlife movement corridor.
- Alternative 4 would make use of the existing UPRR right-of-way and would require less area for construction on undeveloped land.

2.7.2.3 Summary of Other 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. Alternative 4 would cause the least adverse impact on the aquatic ecosystem of the four alternatives. Furthermore, an analysis of other environmental effects supports the conclusion that Alternative 4 would not result in significant adverse environmental consequences that would be avoided by one or more of the other alternatives.

A summary of the effect of the alternatives on other environmental resources is presented below for those resources for which there is a notable variation in the level of impact between the alternatives. No summary is included for effects that would be the same or very similar for all the alternatives. A more detailed comparison is provided and organized by resource type in Section 2.6, Comparative Analysis of Project Alternatives, of this Summary Report.

2.7.2.3.1 Agricultural Farmlands

Alternative 3 would temporarily affect the largest area of Important Farmland (671.9 acres) compared to the other alternatives, and the Alternative 4 would temporarily affect the smallest area of Important Farmland (460.9 acres). Alternative 2 would temporarily affect 658.6 acres of Important Farmland, while Alternative 1 would affect 617.6 acres.

Permanent conversion of Important Farmland to nonagricultural use associated with the alternatives would be greatest under Alternative 3 (1,192.5 acres) and least under Alternative 4 (1,032.6 acres). Once converted, this land would be permanently removed from agricultural use. Alternative 2 would affect 1,181.3 acres of Important Farmland, while Alternative 1 would affect 1,035.5 acres of such lands.

Permanent conversion of Important Farmland to nonagricultural use resulting in the creation of remnant parcels would be the greatest under Alternative 3 (252.8 acres) and the least under Alternative 4 (147.0 acres). Alternative 1 would result in 162.9 acres of remnant parcels of Important Farmland and Alternative 2 would result in 244.3 acres of such parcels.

2.7.2.3.2 Parks, Recreation, and Open Space

The use and user experience of parks, recreational facilities, and open space areas would be affected by noise, vibration, and air emissions at 36 resources under both Alternative 1 and Alternative 2, 34 resources under Alternative 3, and 38 resources under Alternative 4.

Temporary changes to access or use of parks, recreational facilities, and open space areas would occur at 10 resources under Alternative 1, 14 resources under Alternative 2, 12 resources under Alternative 3, and five resources under Alternative 4.

Construction of the San Jose to Merced Section would result in the permanent acquisition of portions of eight parks, recreational facilities, and open space areas under Alternative 1, 10 resources under Alternative 2, nine resources under Alternative 3, and eight resources under Alternative 4. In most cases, the permanent acquisition of portions of these resources would not change the use of or diminish the capacity of these resources because the portions of these resources that would be permanently acquired would be relatively small, their use would not change, and acquisition would not result in diminished capacity for use.

Temporary changes in access to or use of school district play areas would occur at three school district play areas under Alternative 1, five under Alternative 2, two under Alternative 3, and none under Alternative 4.

Alternatives 3 and 4 would not require permanent acquisition of school district play areas. Alternative 1 would require acquisition of 8 percent of the play area at South Valley Middle School, and Alternative 2 would require acquisition of 12 percent of the play area at South Valley Middle School. Alternative 2 would also require acquisition of 0.1 percent of the play area at San Martin/Gwinn Elementary School.

Based on Federal Transit Administration criteria, no moderate or severe operational noise impacts for school district play areas would occur under Alternative 1, 2, or 3. However, Alternative 4 would result in moderate and severe noise impacts at Gardner Elementary School, Central High School, San Martin/Gwinn Elementary School, South Valley Middle School, and Gilroy Prep School.

2.7.2.3.3 Cultural Resources

The potential for unknown archaeological resources to be encountered varies among the alternatives. Specifically, Alternative 2 contains the most surface area with the potential to support both general and surface archaeological resources, followed by Alternative 3 and Alternative 1. Alternative 4 contains the least amount of surface area that is sensitive for general and archaeological resources. Consequently, Alternative 2 would have the greatest potential to disturb or damage unknown archaeological resources during construction, and Alternative 4 would have the least potential to disturb or damage unknown archaeological resources.

Alternative 2 would affect the greatest number of known archaeological resources, a total of 30; Alternative 3 would affect 24 sites; Alternative 1 would affect 23 resources; and Alternative 4 would affect 24 archaeological sites.

For permanent demolition, destruction, relocation, or alteration of built resources or setting, Alternative 2 would affect 11, Alternatives 1 and 3 each would affect seven, and Alternative 4 would affect five.

For noise and vibration impacts, surveys identified 35 historic built NRHP-listed and eligible-for-listing properties within the APE. Under Alternatives 1, 2, 3, and 4, none of the 35 historic properties would be adversely affected by construction-related noise or vibration impacts. Additionally, none of the 35 historic properties would be adversely affected by intermittent noise or vibration impacts caused by operations under any of the alternatives.

2.7.2.4 Practicability

2.7.2.4.1 Summary of Alternatives' Consistency with Overall Project Purpose

The analyses in Section 2.6, Comparative Analysis of Project Alternatives, found that Alternatives 1 through 4 are consistent with the overall project purpose, including the No-Fill Alternative.

Table 2-13 Factors Considered in Preliminary LEDPA Determination

	Alternatives			
	Alternative 1	**Alternative 2**	**Alternative 3**	**Alternative 4**
Effects on Jurisdictional Waters, Temporary (acres)	87.5	89.4	80.7	78.3
Effects on Jurisdictional Waters, Permanent (acres)	100.5	108.0	110.8	96.5
Effects on Special-Status Plant Communities, Temporary (acres)	401.8	426.1	400.9	371.0
Effects on Special-Status Plant Communities, Permanent (acres)	867.8	872.9	880.5	839.1
Effects on Special-Status Plants, Temporary (acres of habitat)	460.1	487.1	467.5	429.1
Effects on Special-Status Plants, Permanent (acres of habitat)	1,179.3	1,185.9	1,190.8	1,154.2
Effects on Special-Status Fish and Wildlife, Temporary (acres of habitat)[1]	13,238.9	15,988.4	13,552.9	11,542.8
Effects on Special-Status Fish and Wildlife, Permanent (acres of habitat)[1]	29,440.7	30,755.8	30,515.6	27,881.7
Effects on Critical Habitat, Temporary (acres)	274.3	278.5	274.8	271.1
Effects on Critical Habitat, Permanent (acres)	962.0	967.8	962.0	959.5
Agricultural Farmland Conversion, Temporary (acres)	617.6	658.6	671.9	460.9
Agricultural Farmland Conversion, Permanent (acres)	1,035.5	1,181.3	1,192.5	1,032.6
Creation of Remnant Agricultural Parcels (acres)	162.9	244.3	252.8	147.0
Changes to Use and User Experience of Recreation Resources, Temporary	36 park, recreation, and open space resources	36 park, recreation, and open space resources Morgan Hill Community and Cultural Center unusable during two construction phases	34 park, recreation, and open space resources	38 park, recreation, and open space resources Morgan Hill Community and Cultural Center unusable during two construction phases

	Alternatives			
	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Changes to Access or Use of Parks, Temporary	10 park, recreation, and open space resources	14 park, recreation, and open space resources	12 park, recreation, and open space resources	5 park, recreation, and open space resources
Acquisition of Recreation Resources, Permanent	Portions of 8 park, recreation, and open space resources	Portions of 10 park, recreation, and open space resources	Portions of 9 park, recreation, and open space resources	Portions of 8 park, recreation, and open space resources
Additional Changes to Parks, Recreation, and Open Space Resources, Permanent	Permanent changes to access or circulation at three resources Permanent effects from operational noise on one resource and no permanent effects from vibration on any resource	Permanent changes to access or circulation at three resources Permanent effects from operational noise on two resources and no permanent effects from vibration on any resource	Permanent changes to access or circulation at three resources Permanent effects from operational noise on one resource and no permanent effects from vibration on any resource	Permanent changes to access or circulation at two resources Permanent effects from operational noise on three resources and permanent effects from vibration on one resource
Changes to Access or Use of School District Play Areas, Temporary	3 school district play areas	5 school district play areas	2 school district play areas	None
Acquisition of School District Play Areas, Permanent	8 percent of play area at South Valley Middle School	12 percent of play area at South Valley Middle School 0.1 percent of play area at San Martin/Gwinn Elementary School	None	None
Changes from Noise or Vibration on School District Play Area Character and Use, Permanent	No severe or moderate impacts	No severe or moderate impacts	No severe or moderate impacts	Moderate or severe impacts at Gardner Elementary School, Central High School, San Martin/Gwinn Elementary School, South Valley Middle School, Gilroy Prep School
Disturbance of Unknown Archaeological Sites, Permanent	622 acres generally sensitive 3,251 acres sensitive for buried archaeological resources	683 acres generally sensitive 3,828 acres sensitive for buried archaeological resources	625 acres generally sensitive 3,386 acres sensitive for buried archaeological resources	568 acres are generally sensitive 2,713 acres sensitive for buried archaeological resources
Disturbance of Known Archaeological Sites, Permanent	All or part of 23 known resources	All or part of 30 known resources	All or part of 24 known resources	All or part of 24 known resources
Demolition, Destruction, or Alteration of Built Resources or Setting, Permanent	5 demolished, 1 compromised integrity, 1 setting altered	7 demolished, 2 compromised integrity, 2 setting altered	4 demolished,1 compromised integrity, 2 setting altered	3 demolished, 1 compromised integrity, 1 setting altered
Noise and Vibration Impacts on Built Resources During Construction	None	None	None	None

Alternatives				
	Alternative 1	**Alternative 2**	**Alternative 3**	**Alternative 4**
Consistency with Overall Project Purpose	Consistent	Consistent	Consistent	Consistent
Practicability – Cost Considerations	Practicable	Practicable	Practicable	Practicable
Practicability – Existing Technology Considerations	Practicable	Practicable	Practicable	Practicable
Practicability – Logistical Considerations	Practicable	Practicable	Practicable	Practicable

[1] Includes habitat that overlaps between species.

2.7.2.4.2 Summary of Other Practicability Considerations

The practicability analyses in Section 2.6, Comparative Analysis of Project Alternatives, concludes that Alternatives 1 through 4 are 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 achieved in terms of existing technology but is not practicable based on cost and logistical considerations.

3 COMMUNITY CONSIDERATIONS AND PUBLIC INVOLVEMENT

Under Section 404 of the CWA, the decision made by USACE regarding whether to issue a permit for discharge of dredged or fill material is subject to a "public interest review" involving the evaluation of the probable impact, including cumulative effects, of a proposed activity/LEDPA on factors such as property ownership, local land use, and the needs and welfare of the people affected by the proposal (33 CFR Sections 320.4[a], [g], and [j]). Federal guidance further identifies the importance of local and state land use decisions, indicating that local and state land use decisions should typically be afforded deference, unless there are significant issues of national importance (33 CFR Sections 320.4[j][2]). This guidance thus directs USACE to consider local land use preferences and adopted policies, as well as local economic effects in evaluating permits.

The Authority has proactively sought to initiate meaningful dialogue with stakeholders, including resource agencies, landowners, community leaders, the agricultural community, and other interested members of the general public. During the development of the San Jose to Merced Section Draft EIR/EIS, the Authority consulted with federal, state, and local agencies, and held meetings to provide project updates and obtain feedback from the public, as summarized in Section 3.3, below.

3.1 Effects on Communities

3.1.1 Residential Displacements

The total residential units and residents displaced would be 147 units under Alternative 1, 603 units under Alternative 2, 157 units under Alternative 3, and 196 units under Alternative 4 (Table 3-1). Alternative 2 would have approximately three times more residential displacements than the other three project alternatives, which is a function of both the horizontal and vertical alignment and the types of residences affected. Alternatives 2 and 4 would displace a greater number of multifamily residences than other housing types, while Alternatives 1 and 3 would displace a greater number of single-family residences than other housing types.

Table 3-1 Estimated Number of Displaced Residential Units by Housing Type

Location	Single-Family Residences	Multifamily Residences	Mobile/ Manufactured Homes	Total Residential Units
Alternative 1	116	19	12	**147**
Alternative 2	199	388	16	**603**
Alternative 3	115	29	13	**157**
Alternative 4	12	124	60	**196**

3.1.2 Commercial and Industrial Displacements

The total number of commercial and industrial facilities displaced would be 217 facilities under Alternative 1, 348 facilities under Alternative 2, 157 facilities under Alternative 3, and 69 facilities under Alternative 4. Alternatives 1 and 4 would have a greater number of industrial business displacements than commercial businesses, while Alternatives 2 and 3 would displace similar numbers of commercial and industrial businesses, as shown in Table 3-2.

Table 3-2 Estimated Number of Displaced Commercial and Industrial Businesses

Location	Commercial Businesses	Industrial Businesses	Total
Alternative 1	59	158	**217**
Alternative 2	182	166	**348**
Alternative 3	76	81	**157**
Alternative 4	22	47	**69**

3.1.3 Other Effects

3.1.3.1 Displacements and Relocations of Agricultural Properties

As established in the Draft Relocation Impact Report and the Community Impact Assessment (as cited in Authority 2020a), an estimated 34 to 36 agricultural facilities would be displaced under the project alternatives, with the greatest number of displacements occurring under Alternative 2.

3.1.3.2 Displacement of Community and Public Facilities

Within the RSA for property displacements, the numbers of community and public facility displacements are nine displacements under Alternative 1, nine displacements under Alternative 2, five displacements under Alternative 3, and one displacement under Alternative 4 (Table 3-3). The greatest number of community and public displacements would occur in San Jose under all project alternatives and in Gilroy under Alternatives 1 and 2. Some of the affected community and public facilities would be fully displaced and require relocation, while others would likely be able to be reconfigured on their current sites.

Table 3-3 Estimated Number of Displaced Community and Public Facilities

Location	Public Safety Facility	Cultural Facility	School	Recreation Facility	Religious Facility	Total
Alternative 1	1	1	3	1	3	**9**
Alternative 2	1	1	4	2	1	**9**
Alternative 3	—	1	2	—	2	**5**
Alternative 4	—	—	—	—	1	**1**

3.2 Summary of Public Comments Received During Scoping

The scoping meetings and comments received on the Notice of Intent/Notice of Preparation helped the lead agencies identify general environmental issues to be addressed in the Draft EIR/EIS. The scoping process identified issues with the proposed alignments and stations, suggestions for new or modified alignments and stations, and issues of potential concern related to the project. The scoping period for the environmental process lasted from February 23 to May 1, 2009. A total of 168 written and oral (i.e., provided to a court reporter at a scoping meeting) comments were received.

Issues raised in scoping comments addressed the following resource topics and other concerns:

- transportation;
- air quality;
- noise and vibration;
- electromagnetic fields and electromagnetic interference;
- public utilities and energy;

- biological resources and wetlands;
- hydrology and water resources;
- geology, soils, and seismicity;
- hazardous wastes and materials;
- safety and security;
- socioeconomics, communities, and environmental justice;
- local growth, station planning, and land use;
- agricultural land;
- parks, recreation, and open space;
- aesthetics and visual quality;
- cultural resources;
- cumulative impacts;
- purpose and need; and
- public and agency involvement.

The San Jose to Merced Final Scoping Report (Authority and FRA 2009) is available on the Authority's website.

3.3 Summary of Outreach to Stakeholders

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

- The Authority and FRA confirmed the Purpose and Need for the Project Section (Checkpoint A) in August 2011.
- USACE and EPA concurred in August and September 2014, respectively, with alternatives recommended in Checkpoint B for inclusion in the EIR/EIS.
- The Authority and FRA developed a Checkpoint B Summary Report Addendum 3 in August 2017 to narrow the range of alternatives to three for inclusion in the EIR/EIS.
- USACE and EPA concurred with the range of alternatives in the Checkpoint B Summary Report Addendum 3 on October 20, 2017.
- The Authority and FRA developed a Checkpoint B Summary Report Addendum 4 to review the preliminary effects of a new "least cost" alternative and assess whether to evaluate the new alternative in the EIR/EIS.
- USACE and EPA concurred with the range of alternatives in the Checkpoint B Summary Report Addendum 4 on January 22, 2019, and February 1, 2019, respectively.

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 San Jose to Merced Section alternatives are preferred by local agency and public stakeholders. Details of the Authority's outreach regarding alternatives analysis, in cooperation with the FRA, is provided in Draft EIR/EIS Section 9.3, Alternatives Analysis Process (2010–2016), and a summary is provided here.

The *San Jose to Merced Preliminary Alternatives Analysis Report* (Authority and FRA 2010a) and *San Jose to Merced Supplemental Alternatives Analysis* Report (Authority and FRA 2011a) considered the entire Project Section from the San Jose HSR Station through the Central Valley Wye and north to Merced. The reports provide information to the public regarding the alternatives analysis process, the initial range of alternatives considered, and the criteria for evaluating those alternatives. Project information and announcements were posted on the Authority's website.

Public information meetings were held during the alternatives analysis process to inform the public about the Project Section alternatives analysis recommendations. Various meeting formats, such as open houses, formal presentations, and question and comment sessions, were used to present information and provide opportunities for input by participants. Detailed information displays about the alternatives analysis process, as well as updates to the alignment, were provided at public meetings. In addition to the public information meetings, one-on-one briefings and small group meetings were held throughout the process. Another element of the outreach was to provide updates and presentations to clubs, organizations, and business owners, as well as the Counties of Santa Clara, San Benito, and Merced and the Cities of San Jose, Morgan Hill, Gilroy, and Los Banos, to facilitate an inclusive and transparent process.

The San Jose to Merced Project Section team conducted a number of meetings throughout the alternatives analysis effort with agencies, the general public, and small groups. These meetings included technical working group meetings, eight public information meetings, a community workshop and panel discussion, and a Gilroy City Council study session, all held between September 2009 and May 2010. The purposes of these meetings were to explain the alternatives analysis process, share the results of preliminary studies with the public and agencies, and receive feedback.

Following the release of the Preliminary Alternatives Analysis Report on June 3, 2010, the project team held more than 80 meetings with elected officials and staff, other key stakeholders, and the public. These meetings included two technical working group meetings in Gilroy and Merced and two visual design community working group meetings in San Jose. The Authority also held five public information meetings and two additional public outreach meetings in Gilroy and Morgan Hill between June 2010 and March 2011.

Following issuance of the May 2011 Supplemental Alternatives Analysis Report, the project team held several community working group meetings in San Jose and two community workshops in Morgan Hill and Gilroy. Three public open house meetings were also held to review the contents of the report with the public. The meetings were held in Gilroy (May 19, 2011), Merced (May 25, 2011), and Los Banos (June 13, 2011). The following issues were consistently raised during the alternatives analysis process:

- **Consultation and Outreach**—Commenters wanted to know with which local agencies the Authority was consulting. Commenters were interested in how public and agency input will be elicited and incorporated, including what type of comments were being solicited at the current stage of the study and how public and agency comments will be incorporated. Some commenters expressed concern that the engagement effort in Gilroy (particularly east of US 101), Morgan Hill, and the surrounding unincorporated area needed to be more comprehensive.
- **Support or Opposition**—Commenters generally expressed support for HSR; however, some were concerned about the potential impact on homes. Some commenters expressed concern over the need for an HSR. Some commenters indicated the Altamont Pass alignment would be a shorter route, would destroy less existing infrastructure, and would be less expensive than the route over Pacheco Pass.
- **Business Plan (Funding, Ridership, and Schedule)**—Commenters expressed concerns about overall project funding, the decision-making timeline, and the age of the ridership figures. In addition, commenters wanted more information about the anticipated funding the project would receive from the federal government, and the cost differential of the various vertical profiles (tunnel, trench, at-grade, aerial) and horizontal profiles.
- **Right-of-Way**—Commenters wanted to know the anticipated right-of-way acquisition requirements and planned coordination for right-of-way acquisition for the project as a whole.
- **Project Operations**—Commenters asked for information about train operations, including hours of operation, frequency, and speed.
- **Alternatives**—In the San Jose area, commenters wanted to know the plan for coordinating the San Jose to Merced and San Francisco to San Jose Project Sections for planning and analysis of the San Jose Diridon Station. Commenters asked whether the Draft EIR/EIS would identify a preferred alignment alternative. Commenters questioned the feasibility of the Altamont Pass crossing. Commenters requested consistency in the approach to addressing rail crossings in the San Jose to Merced Project Section and Merced to Fresno Project Section environmental documents.
- **Traffic Impacts**—Commenters requested information on traffic impacts and the magnitude of the access road and TCEs that would be required.

- **Environmental Impacts and Impacts on Agricultural Lands**—Commenters wanted impacts on agricultural lands and operations to be addressed in the environmental review. They expressed further concerns about impacts on wildlife and the environment.
- **Noise and Vibration Impacts**—Meeting attendees expressed concerns about noise and vibration impacts from both construction and operation of the project. Commenters discussed impacts of sound and electromagnetic waves on the environment and on animals.
- **Specific Issues by Subsection**—Commenters expressed concerns regarding alignments or other HSR facilities within specific subsections. These concerns are described in the *Checkpoint B Summary Report Addendum 3* (Authority and FRA 2017).

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4 PRELIMINARY COMPENSATORY MITIGATION OF IMPACTS TO AQUATIC RESOURCES

Appendix A of this Summary Report includes a pCMP for the San Jose to Merced Section. Although the primary purpose of the pCMP is to set out a general approach to compensatory mitigation for impacts on waters of the U.S., the pCMP integrates the requirements of several resource agencies into a comprehensive plan.

In 2008, USACE adopted the *Compensatory Mitigation for Losses of Aquatic Resources: Final Rule* (2008 Final Rule) (33 CFR Part 332), which established compensatory mitigation requirements. The 2008 Final Rule states that compensatory mitigation may be achieved using restoration, enhancement, establishment, and. in certain circumstances, preservation (33 CFR Section 332.3). The final rule prioritizes restoration as the preferred mitigation method because it is typically most successful, has fewer upland impacts than establishment, and adds greater value in terms of aquatic resource function than enhancement or preservation. Additionally, where preservation is used, it is generally required to be done in conjunction with aquatic resource restoration, establishment, or enhancement activities.

The 2008 Final Rule identifies the following mechanisms for providing compensatory mitigation ranked in order from most preferable to least preferable: mitigation banks, in-lieu fee (ILF) mitigation, permittee-responsible mitigation (PRM) under a watershed approach, PRM through on-site and in-kind mitigation, and PRM through off-site or out-of-kind mitigation. The 2008 Final Rule requires use of a watershed approach to establish compensatory mitigation requirements to the extent appropriate and practicable (33 CFR Section 332.3(c)). If available, a watershed plan should be used to guide the watershed approach. Where no such plan is available, the watershed approach should be based on other available sources.

The project would have effects within three HUC-8 watershed boundaries as defined by the U.S. Geological Survey: Coyote, Pajaro, and San Joaquin–Lower Chowchilla. The pCMP proposes providing compensatory mitigation to the maximum extent possible within the same HUC-8 boundary where the impact would occur.

4.1 Summary of Mitigation Options

As described in the pCMP, there are not sufficient mitigation banks and ILF programs available to address the likely mitigation needs for all of the types of waters of the U.S. in which fill would be placed. Therefore, some PRM would be required. The pCMP proposes that a combination of mitigation bank credit purchase, on-site restoration, and off-site restoration be used to satisfy mitigation requirements under Section 404. This approach would address both temporary impacts and permanent impacts.

The mitigation options evaluated in this 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;
- review of the USACE-EPA Regulatory In-Lieu Fee & Bank Information Tracing System (RIBITS);
- review of the USFWS Sacramento Office's conservation bank database; and
- a Marxan analysis.

Consistent with the regulatory and resource agency priorities and policies described in the pCMP, the pCMP uses a watershed-based, landscape-scale approach to identify mitigation sites exhibiting high conservation values, as well as opportunities to restore, enhance, establish, and preserve aquatic resources and special-status species habitats. In particular circumstances, the analyses supporting the pCMP considered biological and management-related geographic boundaries to evaluate potential mitigation opportunities that may be environmentally preferable for a particular resource.

Potential compensatory mitigation was identified through a step-wise process. First, mitigation banks with available credits within the HUC-8 watershed boundaries were identified by cross referencing RIBITS with the aquatic RSA boundary. Available wetland types, as described in RIBITS, were cross referenced with the affected land cover types. This information was collected into a database where available credits were matched to mitigation needs. The second step was to identify available credits through the National Fish and Wildlife Foundation USACE Sacramento District ILF Program. The program has advanced credits for aquatic resources and vernal pools. The last step was to identify properties that could provide compensatory mitigation for those impacts on waters of the U.S. that did not have a compatible mitigation bank or ILF Program match. Wetlands and other waters of the U.S. on these properties would be established, restored, or enhanced and protected as PRM sites. PRM will likely include a combination of turnkey projects, restoration and enhancement activities on conserved lands, or other types of partnerships with local and regional conservation organizations. PRM sites were identified by HSR stakeholders and, in some cases, Marxan analysis. Marxan was used to identify properties that may offer opportunities for restoration or enhancement of aquatic land cover types but that are not typically supported by bank or in-lieu programs, such as palustrine forested wetlands and natural watercourses.

The sources and methods described above were used to identify the following potential compensatory mitigation options, described in detail in Section 2.6 of the pCMP (Appendix A):

- two mitigation banks,
- one conservation bank,
- three ILF programs, and
- six potential PRM sites.

5 FACTUAL DETERMINATIONS REGARDING IMPACTS OF PRELIMINARY LEDPA (40 CFR SECTION 230.11 AND SUBPARTS C, D, E, AND F) AND FINDINGS OF COMPLIANCE (40 CFR SECTION 230.12)

In accordance with 40 C.F.R. Section 230.11, the USACE will determine the potential short-term or long-term effects of the proposed discharge of fill material associated with Alternative 4 on the physical, chemical, and biological components of the aquatic environment in light of subparts C through F of the 404(b)(1) Guidelines. These factual determinations are used by the USACE to make findings of compliance or non-compliance with the restrictions on discharge (40 C.F.R. Section 230.12). The determinations of effects of each proposed discharge include the following: physical substrates, water circulation, fluctuations, and salinity, suspended particulate/turbidity, contaminants, aquatic ecosystems and organisms.

5.1 Overview of Approach

The pending factual determinations will include an evaluation of the potential impacts of the proposed discharge associated with the preliminary LEDPA on the physical, chemical, and biological characteristics of the aquatic ecosystem. The factual determinations will be supported by an analysis of the relevant subparts:

- Subpart C, - Potential Impacts on Physical and Chemical Characteristics of the Aquatic Ecosystem (Sections 230.20 -to 230.25)
- Subpart D, - Potential Impacts on Biological Characteristics of the Aquatic Ecosystem (Sections 230.30 -to 230.32)
- Subpart E, - Potential Impacts on Special Aquatic Sites (Sections 230.40 -to 230.45)
- Subpart F, - Potential Effects on Human Use Characteristics (Sections 230.50 -to 230.54)

The factual determinations are based on the analysis of impacts in the Draft EIR/EIS for the San Jose to Merced Section (Authority 2019a).

5.2 Summary of Conclusions

USACE may not permit a proposed discharge if it would cause or contribute to significant degradation of waters of the U.S., which is based on the factual determinations, after consideration of Subparts C through F. The following factual determinations will be made regarding the Preliminary LEDPA:

- physical substrate;
- water circulation, fluctuation, and salinity;
- suspended particulates/turbidity;
- contaminants;
- aquatic ecosystem and organisms;
- proposed disposal site;
- cumulative effects on the aquatic ecosystem; and
- secondary effects on the aquatic ecosystem.

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6 PRELIMINARY 4(F) ASSESSMENT

Projects that are 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 the 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.

As the lead agency under NEPA assignment, and pursuant to the NEPA Assignment MOU, the Authority is preparing a preliminary Section 4(f) assessment.

The FRA's Procedures for Considering Environmental Impacts (64 Federal Register 25445 [May 26, 1999]) contains the processes and protocols the Authority is following for analyzing the potential use of Section 4(f) resources. In addition, although not subject to the Title 23 CFR Section 774 regulations regarding Section 4(f) for highways and transit projects, the Authority is using these regulations as additional guidance when applying the requirements established in Section 4(f).

The Authority 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 USC 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 Authority may consider whether implementing the alternative would result in any of the following situations:

- It would compromise the project to a degree that would make proceeding with the project in light of its stated purpose and need unreasonable.
- Unacceptable safety or operational problems would occur.
- After reasonable mitigation, the project would result 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 would occur.
- Other unique problems or unusual factors would occur.
- Multiple factors would occur that, while individually minor, cumulatively would cause unique problems or effects of extraordinary magnitude.

If the Authority determines both that there is the possible need to use a Section 4(f) property and that there is no prudent and feasible alternative to the use of the 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 USC Section 303(c)(2)).

If there is more than one alternative that would result in the use of a Section 4(f) property, the Authority must also compare the alternatives to determine which alternative has the potential to cause the least overall harm in light of the preservationist purpose of the statute. 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 of and need for the project;

- after reasonable mitigation, the magnitude of any adverse effects on resources not protected by Section 4(f); and
- 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 account for concerns with the alternatives that are not specific to Section 4(f).

7 COMPLIANCE WITH FEDERAL AND STATE LAWS

The NEPA/Section 404 Integration MOU includes a request to provide a status of 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 CESA; and
- Section 1600 of the California Fish and Game Code.

Table 7-1 shows a status update for the permitting efforts required under the applicable federal and state environmental laws. The Authority has completed fieldwork and has initiated coordination and preparation of various permitting documents in accordance to the agreements, including the NEPA/404/408 MOU (Authority et al. 2010) and the *Section 106 Programmatic Agreement* (Authority et al. 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.

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Table 7-1 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 Permit for Discharge of Dredged or Fill Materials into Waters of the U.S., including wetlands (including Section 401, Certification, and Section 402, National Pollutant Discharge Elimination System (NPDES))	The Authority will submit applications for a Section 404 individual permit and Section 401 water quality certification. The design/build contractor is responsible for obtaining a Section 402 NPDES permit, consistent with the State Water Resources Control Board 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).	Obtain USACE concurrence on the Preliminary Least Environmentally Damaging Practicable Alternative, in support of future permit applications, followed by agency pre-application meetings.
USACE	Section 14 of the Rivers and Harbors Act (U.S. Code Section 408) for alteration, use, or occupation of federal facilities and additional features subject to Section 408 jurisdiction	Coordination with USACE Sacramento District is ongoing. Section 408 Preliminary Determination Hydraulics Analysis Report has been prepared and submitted to the Authority. The design/build contractor is responsible for obtaining Section 408 permission/approval for proposed alterations of federal facilities.	Submit 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.
Authority (pursuant to NEPA Assignment Memorandum of Understanding (MOU)) 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 EIR/EIS is in progress.	Coordinate with agencies with jurisdiction over Section 4(f) properties on use determinations. Respond to comments on the Draft EIR/EIS. Make least harm determinations in Final EIR/EIS.
Authority (pursuant to NEPA Assignment MOU) U.S. Advisory Council on Historic Preservation via the State Historic Preservation Officer (SHPO)	Section 106 of the National Historic Preservation Act of 1966	SHPO concurred with the identification of historic properties for the San Jose to Merced alternatives in the Historic Architectural Survey Report on July 12, 2019 and in the Archaeological Survey Report on August 27, 2019.SHPO concurrence with the Finding of	Submit draft FOE to SHPO at the end of February 2020 for a 30-day review. If there are comments, the FOE will be revised and resubmitted for a final review at the end of May 2020 for a 30-day review.

Agency	Permits/Regulations/Executive Orders	Status	Next Steps
		Effect (FOE) for the Preferred Alternative is in progress.	
Authority (pursuant to NEPA Assignment MOU) EPA	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 EIR/EIS is in progress.	Coordinate with agencies with jurisdiction over the Clean Air Act. Respond to comments on the Draft EIR/EIS. Continue outreach to environmental justice populations.
National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS)	Section 7 Consultation, federal Endangered Species Act	Technical assistance and formal consultation with USFWS and NMFS are being initiated.	Submit the Biological Assessment..
USFWS	Fish and Wildlife Coordination Act	Ongoing coordination with agencies	Consult with the federal and state resource agencies as part of NEPA and the associated permitting processes to demonstrate compliance with Fish and Wildlife Coordination Act requirements.
Office of Environmental Justice	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 EIR/EIS is in progress.	Continue agency coordination and engagement of environmental justice populations. Respond to comments on the Draft 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: Compiled by the Authority, 2020

CEQA = California Environmental Quality Act; EIR/EIS = Environmental Impact Report/Environmental Impact Statement; EPA = U.S. Environmental Protection Agency; NEPA = National Environmental Policy Act

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9 LIST OF PREPARERS AND REVIEWERS

9.1 California High-Speed Rail Authority and Federal Railroad Administration

Project Role	Name, Registration	Years of Experience, Qualifications
Federal Railroad Administration		
Environmental Protection Specialist	Stephanie B. Perez-Arrieta, PG	25 years of experience BS, Geology, Virginia Polytechnic Institute and State University
California High Speed Rail Authority		
Chief Executive Officer	Brian P. Kelly	23 years of experience BA, Government-Journalism, California State University, Sacramento
Chief Counsel	Thomas Fellenz, P.E.	34 years of experience. J.D., McGeorge School of Law, University of the Pacific; B.S., Civil Engineering, University of California, Davis
Northern California Regional Director	Boris Lipkin	11 years of experience MCP, City Planning, University of Pennsylvania BA, Business Economics, Geography, University of California, Los Angeles
Former Northern California Regional Director	Ben Tripousis	30+ years of experience MA, Public Administration, San Jose State University BS, Political Science, University of California, Berkeley
Former Director of Planning and Integration	Melissa Elefante DuMond, AICP	16 years of experience BS, Environmental Studies, University of North Carolina, Wilmington Master of Public Administration, North Carolina State University, Raleigh
Former Northern California Regional Delivery Manager	Guy Preston, PE	30+ years of experience BS, Civil Engineering, University of California, Berkeley
Former Supervising Environmental Planner, Cultural Resources Program Manager/Tribal Liaison	Sarah Allred	26 years of experience BA, Anthropology, California State University, Sacramento
Supervising Transportation Engineer	Joyce Brenner, PE	31 years of experience BS, Civil Engineering, California State University, Chico
Director of Environmental Services	Mark McLoughlin	33 years of experience BS, Ornamental Horticulture, Landscape Construction, California Polytechnic State University, San Luis Obispo

9.2 List of Consultants

Project Role	Name, Registration	Years of Experience, Qualifications
Rail Delivery Partners		
Deputy Director of Environmental Services	Bryan Porter, BA	30 years of experience BA, Political Science, University of California Berkeley MA, Public Administration, California State University, Sacramento AICP
Project Manager, San Jose to Merced	Gary John Kennerley, PE	28 years of experience BS, Civil Engineering, University of Bristol
Northern California Director of Projects	Rebecca Kohlstrand, AICP	35+ years of experience MS, Transportation Engineering, University of California, Berkeley MCP, City and Regional Planning, University of California, Berkeley BS, Resource Recreation Management, Oregon State University
Deputy Project Manager	Dave Shpak, AICP	30+ years of experience BS, Environmental Planning, University of California, Davis
Assistant Project Manager, Environmental	Phyllis Potter, AICP	35+ years of experience MA, Environmental Planning BA, Fine Arts
Assistant Project Manager, Environmental	Chris Diwa, AICP	13 years of experience BA, Sociology, Urban Studies, University of California, Irvine
Transportation, Socioeconomics and Communities, Environmental Justice, Station Planning, Land Use, and Development, Aesthetics and Visual Quality	Bruce Fukuji	25+ years of experience MCP, City Planning, University of California, Berkeley
Transportation	Donald E. Hubbard, TE, AICP	37 years of experience Master of City and Regional Planning, Harvard University, Cambridge BS, Engineering Science, Northwestern University
Air Quality and Greenhouse Gases, Energy	Alice Lovegrove	29 years of experience MS, Environmental and Waste Management, State University of New York, Stony Brook
Air Quality and Greenhouse Gases, Energy	Edward Tadross	18 years of experience BA, Environmental Studies, Tulane University BA, Earth Sciences, Tulane University

Project Role	Name, Registration	Years of Experience, Qualifications
Noise and Vibration	Rob Greene, INCE, BdCert	30+ years of experience BS, Environmental Science, Pacific Western University
Electromagnetic Fields and Electromagnetic Interference	Eric Scotson	50+ years of experience BS (Honors), Electrical Engineering, University of Salford
Public Utilities	Zack Isnasious, PE	35+ years of experience BS, Civil Engineering, Alexandria University
Biological and Aquatic Resources, Hydrology and Water Resources	Mike Aviña, JD	22 years of experience JD, University of California, Davis BA, Anthropology, University of California, Davis
Hydrology and Water Resources	Veronica Seyde	30+ years of experience MS, Environmental Studies, California State University, Fullerton
Biological and Aquatic Resources	John Hunter, PhD	30+ years of experience PhD, Plant Biology, University of California, Davis MA, Ecological and Systematic Biology, San Francisco State University BA, Environmental Studies, University of California, Santa Cruz
Biological and Aquatic Resources	Linda Leeman	18 years of experience MS, Natural Resources, Humboldt State University BS, Wildlife and Fisheries Biology, University of California, Davis
Geology, Soils, and Seismicity	Kelley Kelso	25 years of experience MS, Geological Sciences, Mackay School of Mines MS, Environmental Policy and Management, University of Denver BS, Geological Sciences, University of Washington
Paleontology	Tom Deméré, PhD	40+ years of experience PhD, Evolutionary Biology, University of California, Los Angeles MS, Geological Sciences, University of Southern California BS, Geological Sciences, San Diego State University
Hazardous Materials and Waste	David Van Goethem, PE	23 years of experience MBA, Walsh College BSCE, Civil and Environmental Engineering, Michigan State University

Project Role	Name, Registration	Years of Experience, Qualifications
Safety and Security, Project Costs and Operations	Bryan K. Porter, AICP	30+ years of experience MA, Public Administration, California State University, Sacramento BA, Political Science, University of California, Berkeley
Safety and Security	Lurae Stuart	30+ years of experience BS, Sociology/Psychology, George Fox University
Socioeconomics and Communities, Regional Growth, Relocation Impact Report	Betsy J. Minden, AICP	30+ years of experience Master of Urban and Regional Planning, University of Washington, Seattle BA, Biology, Smith College
Station Planning, Land Use, and Development, Cumulative Impacts, Section 4(f) and Section 6(f) Evaluations	Jennifer Rabby, AICP	15 years of experience Master of Community and Regional Planning, University of Oregon
Parks, Recreation, and Open Space	Scott Polzin	21 years of experience Master of Community and Regional Planning, University of Nebraska, Lincoln
Aesthetics and Visual Quality, Agricultural Farmland	Larissa King Rawlins, AICP	17 years of experience BA, Environmental Planning, Western Washington University
Cultural Resources, Archaeology	Alisa Reynolds, MA, RPA	21 years of experience MA, Anthropology, San Francisco State University BA, Anthropology, University of California, Berkeley
Cultural Resources, Built Environment	Meg Scantlebury	17 years of experience MA, Historic Preservation, Goucher College BS, Environmental Design, University of California, Davis
Cultural Resources, Built Environment	Monte Kim, PhD	15 years of experience PhD, History, University of California, Santa Barbara
Socioeconomics and Communities, Community Impact Assessment, Environmental Justice	Stephanie J. Sprague, AICP	16 years of experience MS, Natural Resource Policy, University of Michigan
Regional Consultant Environmental Team		
Project Manager	Dominic Spaethling	25 years of experience Master of City Planning, University of Pennsylvania BA, International Relations, Brown University
Engineer, Roadways Lead	Lillie Lam, PE	15 years of experience BS, Civil Engineering, University of California, Davis

Project Role	Name, Registration	Years of Experience, Qualifications
Design Manager	John Litzinger, PE	31 years of experience BS, Civil Engineering, Texas A&M, College Station
Environmental Planner	Rosanna McGuire	10 years of experience Master of Environmental Studies, York University BS, Ecology, University of Toronto
Former Engineer, Track Lead	Myat Ohn, PE	11 years of experience BS, Civil Engineering, University of California, Berkeley
Former Design Section Lead	Jimmy Thompson, Chartered Engineer, UK	32 years of experience Bachelor of Engineering, Civil and Structural Engineering, University of Sheffield
Environmental Project Manager	Rich Walter	25 years of experience MA, International Relations/Energy, Environment, Science, and Technology, Johns Hopkins University School for Advanced International Relations BA, History, Stanford University
Environmental Lead	Kim Avila, AICP	25 years of experience MA, International and Public Affairs, Columbia University BA, Government, Harvard University ND, Demographics, University of Edinburgh
Co-Environmental Lead	Lisa Sakata	18 years of experience BA, Peace Studies, Colgate University
Deputy Environmental Lead	Anne Winslow	6 years of experience MS, Environmental Sciences, Stanford University
Former Project Coordinator, Cumulative Impacts	Jamie Genevie, AICP	8 years of experience Master of Urban and Regional Planning, Virginia Polytechnic Institute and State University BA, Global Change and Sociology, University of Michigan
Project Coordinator	Sarah Mello	4 years of experience BS, Integrated Science and Technology, James Madison University
Senior Technical Review	Aaron Carter	13 years of experience BA, Geography (emphasis in Environmental Analysis), California State University, Fullerton

Project Role	Name, Registration	Years of Experience, Qualifications
Senior Technical Review	Randall Coleman	10 years of experience Master of Urban and Regional Planning, University of Colorado BA, History and Spanish, Trinity University
Senior Technical Review	Vicki Heron	17 years of experience MSc., Soils & Environmental Pollution, University of Reading, 2002 BSc., Geography, Liverpool John Moores University, 2001
Senior Technical Review	Donna McCormick	31 years of experience BS, Landscape Architecture, California State Polytechnic University, Pomona
Senior Technical Review	Debra Rogers	25 years of experience MBA, International Business/Marketing, University of North Carolina at Chapel Hill, Kenan Flagler School of Business BS, Business Administration/Marketing, Villanova University
Former Technical Review	Laura (Johnson) Klewicki	7 years of experience Master of Environmental Science, Yale University School of Forestry and Environmental Studies BS, Environmental Technology and Management (minor in Environmental Toxicology and Chemistry), North Carolina State University
NEPA Review, Cumulative Impacts	Hova Woods	16 years of experience Master of Public Administration, Environmental Policy & Science, Indiana University BS, Finance, Indiana University ND, Economics, U.S. Naval Academy
Document Control and Coordinator, Public and Agency Involvement, Environmental Justice	Tiffany Mendoza	14 years of experience BA, Political Science, Wright State University
Transportation	Bill Burton, PE, TE	25 years of experience MS, Civil Engineering, University of California, Berkeley BS, Civil Engineering, University of California, Berkeley
Transportation	Bob Grandy, TE	36 years of experience BS, Civil Engineering, University of California, Berkeley
Transportation	Delia Votsch, EIT	2 years of experience BS, Civil Engineering, Drexel University

Project Role	Name, Registration	Years of Experience, Qualifications
Former Air Quality and Greenhouse Gases	Shannon Hatcher	16 years of experience BS, Environmental Science, Oregon State University BS, Environmental Health and Safety, Oregon State University
Air Quality and Greenhouse Gases	Ed Carr	37 years of experience MS, Atmospheric Science, University of Washington, Seattle BS, Meteorology, San Jose State University
Air Quality and Greenhouse Gases	Laura Yoon	8 years of experience MA, Environmental Management, University of San Francisco BA, Environmental Studies (minor in Resource Management), University of Washington, Seattle
Noise and Vibration	Silas Bensing	9 years of experience BA, Audio Arts and Acoustics, Columbia College
Noise and Vibration	Richard Carman, PhD, PE	40 years of experience PhD, Mechanical Engineering, University of California, Berkeley MS, Mechanical Engineering, University of California, Berkeley BS, Mechanical Engineering, University of California, Berkeley
Noise and Vibration	Timothy Johnson	15 years of experience BS, Mechanical Engineering with Acoustics Concentration, University of Hartford
Noise and Vibration	Deborah Jue	28 years of experience M.S. Mechanical Engineering, University of California, Berkeley, CA B.S. Engineering: Acoustics, Stanford University, Stanford, CA
Noise and Vibration	Jason Volk	17 years of experience BS, Mechanical Engineering, North Carolina State University
Former Electromagnetic Fields and Electromagnetic Interference	Alana DeLoach	11 years of experience MA, Architectural Acoustics, Rensselaer Polytechnic Institute
Electromagnetic Fields and Electromagnetic Interference	David Fugate	26 years of experience PhD, Electrical Engineering, Carnegie Mellon University

Project Role	Name, Registration	Years of Experience, Qualifications
Electromagnetic Fields and Electromagnetic Interference	Sergio Pena	2 years of experience Bachelor of Engineering Sciences, Acoustic Civil Engineering, Universidad Technologica Vicente Perez Rosales
Electromagnetic Fields and Electromagnetic Interference	Matthew Sneddon	35 years of experience BS, Physics University of California, Santa Barbara
Public Utilities and Energy, Safety and Security	Robert Lanza, PE	35 years of experience Master of Engineering, Chemical Engineering, Cornell University BS, Chemical Engineering, Cornell University
Biological and Aquatic Resources	Angela Alcala	18 years of experience BS, Wildlife, Fisheries, Conservation Biology, University of California, Davis
Biological and Aquatic Resources (land cover and aquatic resources)	Joel Butterworth	31 years of experience MS, Geography (minor in Soil Science), Oregon State University BA, Geography, University of California, Santa Barbara
Biological and Aquatic Resources (land cover and aquatic resources)	Kate Carpenter	16 years of experience BA, Plant Biology (minor in Soil Science), University of California, Davis
Biological and Aquatic Resources (wildlife)	Eric Christensen	14 years of experience BS, Evolution and Ecology, University of California, Davis
Biological and Aquatic Resources (plants, wildlife movement, technical lead)	Brad Schafer	20 years of experience BS, Biology, Western Illinois University
Biological and Aquatic Resources (fish, wildlife, wildlife movement)	Rebecca Sloan	14 years of experience MS, Environmental Studies, San Jose State University BS, Marine Science, Eckerd Collage
Biological and Aquatic Resources (plants)	Margaret Widdowson	22 years of experience PhD, Forest Ecology, University of Stirling BS, Botany, University of Aberdeen
Biological and Aquatic Resources (wildlife)	Ross Wilming	14 years of experience BS, Biology, University of Iowa
Biological and Aquatic Resources (fish and waterfowl)	Chris Earle	25 years of experience Ph.D., Forest Ecology, University of Washington
Hydrology and Water Resources	Ashley Chan	4 years of experience BS, Ecology and Evolutionary Biology, University of California, Irvine

Project Role	Name, Registration	Years of Experience, Qualifications
Hydrology and Water Resources	Nicole Belle Isle, MS, EIT	5 years of experience MS, Environmental Engineering, University of California, Berkeley BA, Linguistics and French, Harvard University
Hydrology and Water Resources	Tony Jones, JD, QSD/P, QISP, ToR, CPESC, CESSWI	23 years of experience JD, Law, University of California, Davis BS, Environmental Chemistry, University of California, Davis
Hydrology and Water Resources	Analette Ochoa, PE, QSD/P, ToR	24 years of experience BS, Civil Engineering, University of California, Davis
Hydrology and Water Resources	Phil Petermann	10 years of experience BA, Journalism, California State University, Chico
Hydrology and Water Resources	Laura Rocha, CPSWQ, QSD/P	14 years of experience MS, Environmental Studies, California State University, Fullerton BA, Environmental Studies and Psychology, University of California, Santa Barbara
Hydrology and Water Resources	Kazuya Tsurushita, PE	10 years of experience BS, Civil and Environmental Engineering, University of California, Davis
Hydrology and Water Resources	Cuyler Stapelmann	8 years of experience BS, Conservation and Resource Studies, University of California, Berkeley
Geology, Soils, and Seismicity, Paleontology, Hazardous Materials and Wastes	Alex Bartlett	11 years of experience Bachelor of General Studies, Environmental Studies (concentrations in Biology and Policy), University of Kansas
Geology, Soils, and Seismicity, Hazardous Materials and Wastes	Paul Cottingham, CEG	14 years of experience BS, Geology, Humboldt State University
Geology, Soils, and Seismicity	Matt Clark, EIT	5 years of experience MS, Civil and Environmental Engineering with Geotechnical concentration, California Polytechnic State University BS, Civil and Environmental Engineering, California Polytechnic State University
Geology, Soils, and Seismicity	Mark Gilbert, GE	32 years of experience MS, Geotechnical Engineering, Arizona State University, Tempe BS, Civil Engineering, Arizona State University, Tempe

Project Role	Name, Registration	Years of Experience, Qualifications
Geology, Soils, and Seismicity, Hazardous Materials and Wastes	Abram Magel, PE	5 years of experience MS, Geotechnical Engineering, University of California, Berkeley BS, Civil and Environmental Engineering, University of California, Berkeley BA, Environmental Studies, University of California, Santa Cruz
Geology, Soils, and Seismicity	Phil Stuecheli, CEG	30 years of experience MS, Geology, Ohio State University BS, Geology, Ohio State University
Hazardous Materials and Wastes	Richard Gandolfo, QSD	10 years of experience BS, Environmental Science, California State University, East Bay
Hazardous Materials and Wastes	Jenna Lohmann, PE	3 years of experience BS, Environmental Engineering, Tufts University MS, Civil Engineering, University of California, Berkeley
Hazardous Materials and Wastes	Brooke Spruitt	2 years of experience BS, Civil Engineering, University of Michigan BS, Environmental Engineering, University of Michigan
Hazardous Materials and Wastes	Shawn Munger, PG, CHG	30 years of experience BS, Geological Sciences, University of California, Davis
Paleontology	Geraldine Aron, MS	19 years of experience MS, Geological Sciences (paleontology emphasis), California State University, Long Beach BA, Geological Sciences, California State University, Long Beach
Paleontology	Courtney Richards, MS	15 years of experience MS, Biological Sciences (paleontology emphasis), Marshall University BS, Earth and Space Sciences, University of Washington, Seattle
Alternatives, Socioeconomics and Communities, Station Planning, Land Use, and Development, Cumulative Impacts	Alison Rondone	17 years of experience MA, Environmental Studies, University of Southern California
Socioeconomics and Communities, Parks, Recreation, and Open Space, Section 4(f) and Section 6(f) Evaluations, Environmental Justice	Shilpa Trisal	15 years of experience MCP, Community Planning, University of Cincinnati Bachelor of Planning, School of Planning and Architecture, New Delhi

Project Role	Name, Registration	Years of Experience, Qualifications
Station Planning, Land Use, and Development, Cumulative Impacts	Susan Swift	26 years of experience MA, Planning and Development Studies, University of Southern California BA, Psychology (Environmental emphasis), University of California, Berkeley
Agricultural Farmland	Antero Rivasplata, AICP	38 years of experience BS, Environmental Planning and Management, University of California, Davis
Agricultural Farmland	Diana Roberts	19 years of experience MS, Environmental Studies coursework, San Jose State University (in progress) MA, Linguistics, Cornell University BS, Applied Psychology, Georgia Institute of Technology
Parks, Recreation, and Open Space, Environmental Justice	Greta Brownlow, PhD	19 years of experience PhD, Education, University of California, Berkeley MA, Education, University of California, Berkeley Master of Urban Planning, University of California, Los Angeles BA, Social Sciences, University of California, Berkeley
Former Parks, Recreation, and Open Space, Section 4(f) and Section 6(f) Evaluations	Peter Feldman	7 years of experience BA, Political Science (American Politics), University of California, Irvine
Former Parks, Recreation, and Open Space, Safety and Security	Lawrence Truong	2 years of experience Master of Planning, City/Urban Planning, University of Southern California BS, Community and Regional Development, University of California, Davis
Parks, Recreation, and Open Space, Section 4(f) and Section 6(f) Evaluations	Jennifer Andersen	7 years of experience BA, International Relations, University of Southern California
Parks, Recreation, and Open Space	Caroline Vurlumis	2 years of experience BA, Environmental Analysis, Scripps College
Aesthetics and Visual Quality	Jennifer Ban, PLA	18 years of experience Bachelor of Landscape Architecture, Pennsylvania State University, University Park
Aesthetics and Visual Quality	Michael Kiesling	8 years of experience BA, Architecture, University of California, Berkeley
Aesthetics and Visual Quality	Angela Lin	21 years of experience BA, Art, Wesleyan University

Project Role	Name, Registration	Years of Experience, Qualifications
Cultural Resources, Archaeologist	Lily Arias, MA	9 years of experience MA, Cultural Resources Management, Sonoma State University BA, History, minor in Anthropology, University of California, Los Angeles
Cultural Resources, Archaeologist	Kerry Boutte, MA, RPA	15 years of experience MA, Anthropology, University of Texas BA, Anthropology, University of New Orleans
Cultural Resources, Senior Historical Archaeologist	Melissa Cascella, MA, RPA	12 years of experience MA, Cultural Resource Management, Sonoma State University BA, History and BS, Anthropology, University of California, Riverside GIS Certificate, Pennsylvania State University, State College
Cultural Resources, Senior Geoarchaeologist & Technical Reviewer	Tait Elder, MA, RPA	14 years of experience MA, Anthropology, Portland State University BA, Anthropology, minor in Geology, Western Washington University
Cultural Resources, Architectural Historian	Stacy Farr, MS	10 years of experience MS, Architectural History, University of California, Berkeley BA, History of Art and Architecture, University of California, Santa Barbara
Cultural Resources, Architectural Historian	Aisha Fike, MA	9 years of experience MA, Public History, California State University, Sacramento BA, Philosophy/History, Saint Mary's College of California
Cultural Resources, Senior Preservation Planner	Gretchen Hilyard Boyce, MS	11 years of experience MA, Historic Preservation Planning, University of Pennsylvania BA, Architectural History, University of Virginia
Former Cultural Resources, Senior Historian & Architectural Historian	Kathryn Haley, MA	15 years of experience MA, History (Public History), California State University, Sacramento BA, History, California State University, Sacramento
Cultural Resources, Technical Director & Senior Technical Reviewer	Susan Lassell, MA	25 years of experience MA, Historic Preservation Planning, Cornell University BS, Environmental Design, University of California, Davis

Project Role	Name, Registration	Years of Experience, Qualifications
Cultural Resources, Historian & Architectural Historian	David Lemon, MA	16 years of experience MA, Public History, California State University, Sacramento BA, History, University of California, Santa Barbara
Cultural Resources, Senior Architectural Historian	Daniel Paul, MA	14 years of experience MA, Art History, California State University, Northridge BA, Art History, California State University, Fullerton Historic Preservation Short Course Certificate, University of Southern California
Cultural Resources, Architectural Historian	Amanda Reese, MA	5 years of experience MA, Public History, California State University, Sacramento BA, European History, Mills College
Former Cultural Resources, Senior Pre-contact Archaeologist	Mark Robinson, MS, RPA	29 years of experience MS, Anthropology, University of Oregon MA, English, University of Oregon BA, History and Geology, University of Montana
Cultural Resources, Architectural Historian	Jenifer Rogers, MA	24 years of experience MA, Historic Preservation, Savannah College of Art and Design BA, Anthropology, California State University, Sacramento
Cultural Resources, Architectural Historian	Jonathon Rusch, MA	5 years of experience MA, Historic Preservation Planning, Cornell University BA, Geography and Scandinavian Studies, University of Minnesota
Cultural Resources, Geoarchaeologist	Shane Sparks	13 years of experience MA, Anthropology (in progress), Western Washington University GIS Certificate Program, University of Washington, Seattle BA, Religious-Historical Studies, Hardin Simmons University
Cultural Resources, Architectural Historian	January Tavel, MHP	9 years of experience MHP, Historic Preservation, University of Maryland, College Park BA, Journalism, University of Maryland, College Park

Project Role	Name, Registration	Years of Experience, Qualifications
Cultural Resources, Historian & Architectural Historian	Timothy Yates, PhD	11 years of experience PhD, U.S. History with an emphasis in Cultural, Social, and Urban History, University of California, Davis MA, American Studies, California State University, Fullerton BA, American Studies, University of California, Santa Cruz
Regional Growth	Heidi Mekkelson	15 years of experience BS, Environmental Studies (Biology emphasis), University of Southern California
Regional Growth	Erin Pace	11 years of experience BA, Environmental Policy, San Diego State University
Regional Growth	Darin Smith	20 years of experience Master of City Planning, University of Pennsylvania
Regional Growth	Ed Sullivan	32 years of experience BS, Biology/Earth Sciences, Metropolitan State University of Denver
Former Environmental Justice	Josh Channell	25 years of experience MA, Urban and Environmental Planning and Policy, Tufts University BA, History (focus on Resource and Land Conservation), University of Southern Maine, Portland
Cumulative Impacts	Debra Rogers	20 years of experience MBA, Kenan Flagler Business School, University of North Carolina, Chapel Hill BS, Business Administration, Villanova University
Project Costs and Operations	Michael Brown	3 years of experience BA, Political Science, University of California, Los Angeles
Public and Agency Involvement	Kimberly Stevens	13 years of experience BS, Geography, University of Utah
Geographic Information Systems Manager	William C. Parker	7 years of 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 of Experience, Qualifications
Geographic Information Systems Cultural Resources	Melissa Cascella	11 years of experience MA, Cultural Resources Management, Sonoma State University BS, Anthropology, University of California, Riverside BA, History, University of California, Riverside GIS Certificate, Pennsylvania State University
Geographic Information Systems	Lissa Johnson	14 years of experience BA, Anthropology, University of Idaho BA, Digital Media Studies, University of Denver Graduate Certificate, GIS, University of Denver
Former Geographic Information Systems	Cristina Lopez-Barrios	5 years of experience MA, Geographic Information Science, Saint Mary's University of Minnesota GIS Certification of Completion, San Francisco City College BA, Forestry Engineering, Extremadura University
Geographic Information Systems	Greg Nichols	23 years of experience MA (candidate), Geography, San Diego State University BA, Environmental Studies, California State University, San Bernardino
Geographic Information Systems	Brent Read	16 years of experience MS, Watershed Science, Colorado State University BS, Forestry (with a concentration in Fire Management and minor in Spatial Information Management Systems), Colorado State University
Geographic Information Systems Cultural Resources	Mathew Sisneros	4 years of experience BS, Anthropology, Portland State University, Portland GIS Certificate, Portland Community College
Geographic Information Systems	Jason Thoene	18 years of experience MS, Geographic Information Science, University of Denver BA, Geology, University of Montana
Geographic Information Systems, Paleontology	Barbara Webster	8 years of experience MS, Geographical Information Systems, University of Redlands BA, History and Spanish, Gonzaga University
Geographic Information Systems	Matt Wood	7 years of experience MS, Geography, Portland State University, Portland BS, Environmental Biology/Zoology, Michigan State University, East Lansing

Project Role	Name, Registration	Years of Experience, Qualifications
Lead Editor	Lawrence B. Goral	25 years of experience
Former Editor	Brent Bouldin	41 years of experience MA, Communications, Louisiana State University BA (magna cum laude), Communications, University of Texas at Austin
Editor	Laura Cooper	25 years of experience BA (Phi Beta Kappa), Psychology, Reed College
Editor	Christine McCrory	16 years of experience PhD Candidate, Germanic Languages and Literatures, Washington University in St. Louis Master of Philosophy, European Literature, Oxford University, Lincoln College BA (with distinction), Anthropology and German, University of California, Berkeley
Editor	Sara Wilson	21 years of experience BA (with high distinction), Classical Languages (Ancient Greek, Latin), University of California, Berkeley
Publications Specialist	Anthony Ha	13 years of experience BA, English, Saint Mary's College of California
Publications Specialist	Corrine Ortega	29 years of experience AA, Communications, Cosumnes River College
References	Patrick Maley	10 years of experience MPA, Master of Public Administration, San Francisco State University BA, Humanities, San Francisco State University
References	Kristin Salamack	10 years of experience MS, Biology, University of Denver BS, Wildlife Management, University of New Hampshire, Durham
References	Merin Swenson	10 years of experience BS, Environmental Science, University of Utah