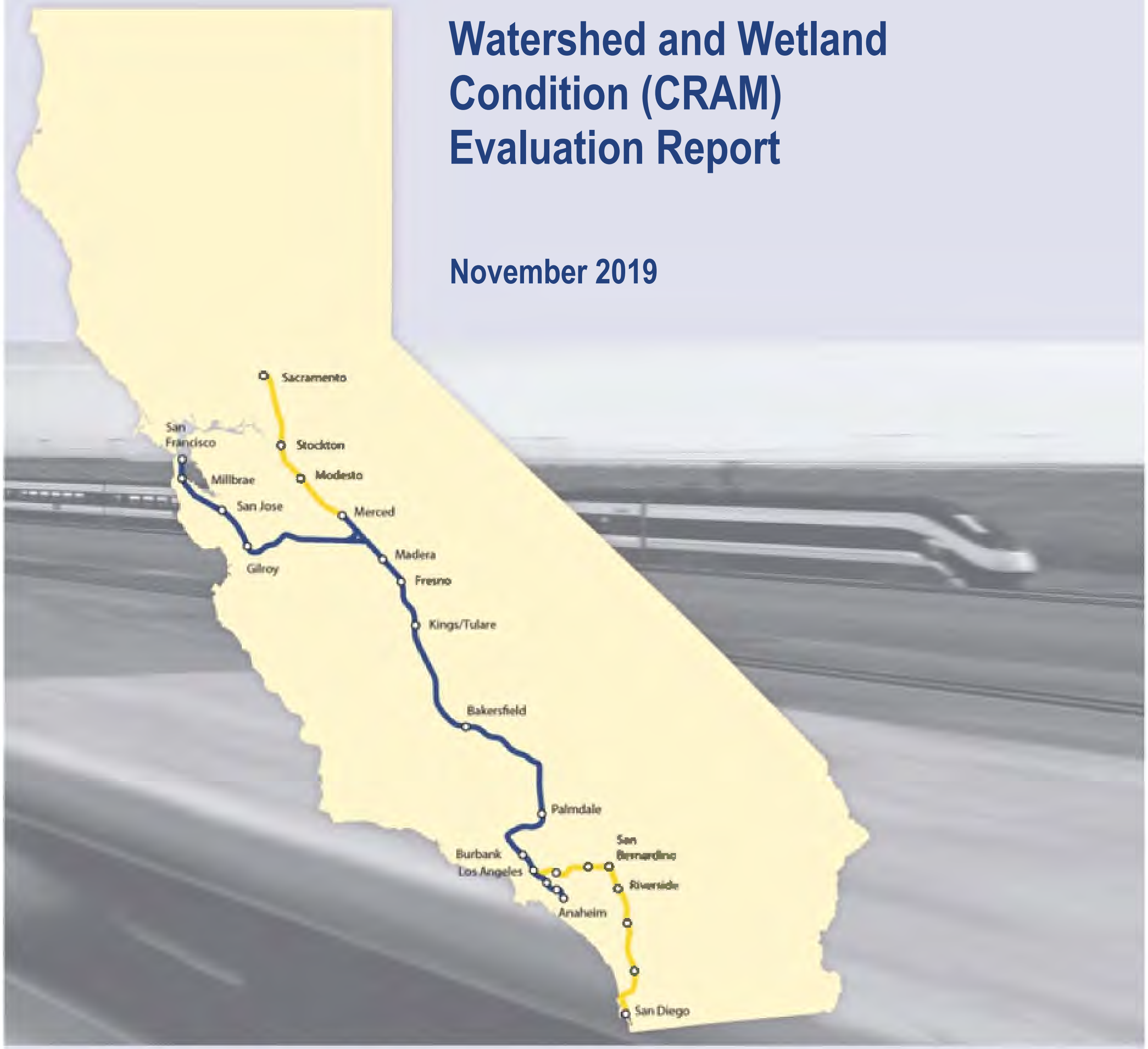
California High-Speed Rail Authority

San Jose to Merced Project Section

Watershed and Wetland Condition (CRAM) Evaluation Report

November 2019



CALIFORNIA High-Speed Rail Authority

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

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ACRONYMS AND ABBREVIATIONS

°F	degrees Fahrenheit
AA	assessment area
ATC	automatic train control
Authority	California High-Speed Rail Authority
BART	Bay Area Rapid Transit
Bay Area	San Francisco Bay Area
C.F.R.	Code of Federal Regulations
CEQA	California Environmental Quality Act
CP	Control Point
CRAM	California Rapid Assessment Method
EIR	environmental impact report
EIS	environmental impact statement
FRA	Federal Railroad Administration
GEA	Grasslands Ecological Area
GIS	geographic information system
HSR	high-speed rail
HUC	hydrologic unit code
I-	Interstate
kV	kilovolt
LEDPA	least environmentally damaging practicable alternative
MOIS	maintenance of infrastructure siding
MOU	memorandum of understanding
MOWF	maintenance of way facility
mph	miles per hour
MT	Mainline Track
NEPA	National Environmental Policy Act
NRCS	Natural Resources Conservation Service
OHWM	ordinary high water mark
PG&E	Pacific Gas and Electric Company
Project Section	San Jose to Merced Project Section
project, project extent	San Jose to Central Valley Wye Project Extent
PTC	positive train control
PTE	permission to enter
SR	State Route

Statewide Program EIR/EIS	*Final Program Environmental Impact Report EIR)/Environmental Impact Statement EIS) for the Proposed California High-Speed Train System*
TPSS	traction power substation
UPRR	Union Pacific Railroad
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
VTA	(Santa Clara) Valley Transportation Authority
WER	watershed evaluation report
WETS Tables	Climate Analysis for Wetlands Tables

1 INTRODUCTION

This combined watershed evaluation report (WER) and California Rapid Assessment Method (CRAM) report for the California High-Speed Rail (HSR) San Jose to Merced Project Section (Project Section) focuses on the portion of the Project Section between San Jose and Carlucci Road—i.e., the San Jose to Central Valley Wye Project Extent (project, or project extent). It was prepared in support of environmental reviews required under the National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA).

1.1 Background of the HSR Program

The California High-Speed Rail Authority (Authority) proposes to construct, operate, and maintain an electric-powered HSR system in California, connecting the San Francisco Bay Area (Bay Area) and Central Valley to Southern California. When completed, the nearly 800-mile train system would provide new passenger rail service to more than 90 percent of the state's population. More than 200 weekday trains would serve the statewide intercity travel market. The system would be capable of operating speeds up to 220 miles per hour (mph) in certain HSR sections, with state-of-the-art safety, signaling, and automatic train control (ATC) systems. The California HSR System would connect and serve the state's major metropolitan areas, extending from San Francisco to Los Angeles and Anaheim in Phase 1, with extensions to Sacramento and San Diego in Phase 2.

The Authority and Federal Railroad Administration (FRA) commenced their tiered environmental planning process with the 2005 *Final Program Environmental Impact Report (EIR)/Environmental Impact Statement (EIS) for the Proposed California High-Speed Train System* (Statewide Program EIR/EIS) (Authority and FRA 2005), followed by the *Bay Area to Central Valley High-Speed Train Final Program EIR/EIS* (Authority and FRA 2008). These documents established the HSR sections constituting the California HSR System and evaluated the effects of proposed HSR corridors. After completion of the first-tier programmatic environmental documents, the Authority and FRA approved the HSR system, selected corridors and stations for further study, and began preparing second-tier project environmental evaluations for sections of the statewide HSR system. Chapter 2, Description of the San Jose to Central Valley Wye Project, of this technical report provides details of the project and the four alternatives under consideration.

1.2 Purpose and Regulatory Context of this Technical Report

This technical report serves a dual purpose: a watershed evaluation and an analysis of aquatic resource condition.

A watershed-level analysis of aquatic resources and current condition analysis of those resources within the project extent has been conducted in conformance with the U.S. Army Corps of Engineers (USACE) and U.S. Environmental Protection Agency (USEPA) April 10, 2008 *Final Rule for Compensatory Mitigation for Losses of Aquatic Resources* (33 Code of Federal Regulations [C.F.R.] Parts 325 and 332 and 40 C.F.R. Part 230) and California's Level 1-2-3 framework for wetland monitoring and assessment. This two-part evaluation accomplishes the following tasks:

- Level 1 Analysis: the amount of aquatic resources (acreage or linear feet) (WER):
  - Develops a data layer of land use types that represent disturbance categories
  - Inventories the aquatic resources within hydrologic unit code (HUC)-8 watershed units (per land use type)
- Level 2 Analysis: the condition of aquatic resources:
  - Determines the type, amount, and relative condition of aquatic resources within the watershed units and within the footprints of the project alternatives
  - Evaluates the relative impact of the alternatives on aquatic resources within the watershed context

The report describes the methods and analysis used to develop a watershed profile, identify the existing conditions of the aquatic resources, estimate direct and indirect impacts on aquatic resources, and estimate the post-project condition of aquatic resources. This information will assist in identifying the regional setting of the aquatic resource impacts expected to result from project implementation.

This document evaluates the wetlands and nonwetland waters at two different scales and therefore two different study areas. The wetland evaluation was conducted at the watershed level, while the CRAM analysis was conducted at the project level. The study area for the wetland evaluation encompasses the wetlands and nonwetland waters throughout the three watersheds that the project extent intersects—the Coyote watershed, the Middle San Joaquin–Lower Chowchilla watershed, and the Pajaro watershed—and evaluates the quality of these waters based on the overlapping land use intensity. This analysis provides a regional context for the conditions of waters that could be affected by the project. The CRAM analysis assesses the condition of the specific wetlands and nonwetland waters that would be affected by the HSR project footprint. The land use intensities overlapping the aquatic resources in each watershed as identified through the WER analysis are ultimately combined (in Chapter 8, Net Watershed Condition) with the condition and identified stressors identified through the CRAM analysis to further characterize aquatic resources across the watersheds.

The *NEPA/404/408 Integration Process Memorandum of Understanding* (MOU) between the USEPA, USACE, FRA, and Authority, dated November 2010, outlines the requirements for Checkpoint C: Preliminary Least Environmentally Damaging Practicable Alternative (LEDPA) Determination for the California High-Speed Rail project. This watershed and wetland condition report provides information and analysis to support the determination of functions and services of the aquatic resources within the study area. In accordance with the MOU and discussions with the project's technical work group—composed of members from the regulatory agencies, FRA, Authority, and regional consultants—these determinations are to be made by conducting a "detailed (rapid assessment or better) assessment of the functions and services of special aquatic sites and other waters of the U.S." (FRA et al. 2010). In addition to supporting the LEDPA decision, these data can also be used during the permitting process with the USACE, which requires an evaluation of impact and mitigation sites to determine final mitigation ratios.

For the purposes of this evaluation, the team used CRAM as the tool for assessing the condition of aquatic resources (CWMW 2009). To date, CRAM has been used across all HSR project sections, thereby providing a uniform approach for assessing the functions and services (condition) of wetlands and other aquatic features. A detailed description of CRAM is not included in this report, but is available on the CRAM website (www.cramwetlands.org) and in the *California Rapid Assessment Method (CRAM) for Wetlands: User's Manual*, Version 6.1 (CWMW 2013a), which includes background information on the development, application, and implementation of CRAM. Additional information on how CRAM was used can be found in the *Draft Checkpoint C: LEDPA Determination: Methodology for Wetland Condition Assessment Using CRAM* that was prepared for the entire statewide HSR system (Authority and FRA 2011a).

This report summarizes the results of CRAM conducted in the study area during spring 2019 (April 22–April 25, 2019). Because access to properties and impact areas were limited at the time of the fieldwork, the evaluation includes an extrapolation of field-collected CRAM scores to the larger study area.

The Aquatic Resource Delineation Report (ARDR) (Authority 2019a) was completed in May 2019. The Authority coordinated with the Corps between May and October 2019 to conduct a review and verification of the location, boundaries, and extent of mapped waters and wetlands. During the verification process, the Corps requested changes and adjustments to the mapping and ultimately, the Corps provided concurrence with the mapped extent of waters and wetlands in October 2019. As of the date of this report, the formal verification from the Corps is still in process but is expected in December 2019. The changes made to the aquatics resource mapping did not affect the results of the CRAM conducted in the study area as CRAM is not based on jurisdictional boundaries or landcover mapping but is ecologically based. The changes in aquatic resource mapping did not change the CRAM wetland type and therefore the field collected data is not affected. However, the extrapolation of the nonsurveyed features was affected. In numerous cases, individual waters and wetlands were subdivided based on coordination and verification with the Corps. This subdivision of individual mapped features had the effect of increasing the number of individual waters and wetlands polygons substantially, while resulting in generally small changes to the actual mapped extent of features. The extrapolation was repeated to capture the addition, removal, and type changes resulting from coordination with the Corps, and Chapter 7 of this document was updated to reflect the new analysis.

1.3 Organization of this WER-CRAM Report

This WER-CRAM report comprises the following sections in addition to this introductory chapter:

- Chapter 2, Description of the San Jose to Central Valley Wye Project, describes the currently proposed alternatives
- Chapter 3, Project Setting, describes the physical landscape setting and biological conditions of the San Jose to Central Valley Wye Project
- Chapter 4, Watershed Evaluation Methods, identifies methodology and procedures for conducting the watershed evaluation
- Chapter 5, CRAM Methods, identifies methodology and procedures for conducting CRAM
- Chapter 6, Results of Watershed Evaluation and CRAM Analysis, presents the Level 1 watershed profile for the watersheds and ecoregions of the study area and Level 2 CRAM scores from the condition assessment conducted in the study area
- Chapter 7, Summary by Alternative, provides a summary of the watershed profiles and CRAM scores for each alternative
- Chapter 8, Discussion, presents the net watershed condition
- Chapter 9, References, provides a list of the references cited in this technical report
- Chapter 10, Preparer Qualifications, lists individuals who assisted in the preparation of this report

Additional details are provided in:

- Appendix A, Supplemental WER Data Tables
- Appendix B, Maps of Assessment Areas, provides individual maps of the assessment areas (AA) evaluated
- Appendix C, Summary Table of CRAM, summarizes the results for the AAs
- Appendix D, Assessment Area Data Forms, provides the data forms for each AA
- Appendix E, Photo Log, provides site photographs of each AA

2 DESCRIPTION OF THE SAN JOSE TO CENTRAL VALLEY WYE PROJECT

The Project Section would provide HSR service between Diridon Station in downtown San Joseand a station in downtown Merced, with a Gilroy station either in downtown Gilroy or east of Gilroy. The Project Section is designed to allow trains to and from the Bay Area to transition smoothly from north-south to east-west travel with a minimum reduction in speed to achieve the Proposition 1A operational service time requirement. Proposition 1A requires that the system be designed to be capable of a nonstop operational service time of 2 hours and 10 minutes between San Jose and Los Angeles Union Station.[1] The Project Section follows existing transportation corridors to the extent feasible, as directed by Proposition 1A.[2]

The Project Section is comprised of three project extents (Figure 2-1):

- From Scott Boulevard in Santa Clara 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. Because the portion of the Project 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 Supplemental EIR/EIS* (Authority 2019b), the analysis in this document focuses on the project extent between Scott Boulevard and Carlucci Road (the project).

[1] Proposition 1A requires that the HSR system be designed to achieve a nonstop operational service time of 2 hours and 40 minutes between San Francisco and Los Angeles Union Station, including a 30-minute ride between San Francisco and San Jose (Streets & Highways Code § 2704.09(b)(4)).

[2] Proposition 1A directs that the HSR system maximize use of existing transportation and utility corridors to the extent feasible (Streets & Highways Code § 2704.09(g)).

Source: Authority 2019c JUNE 2019

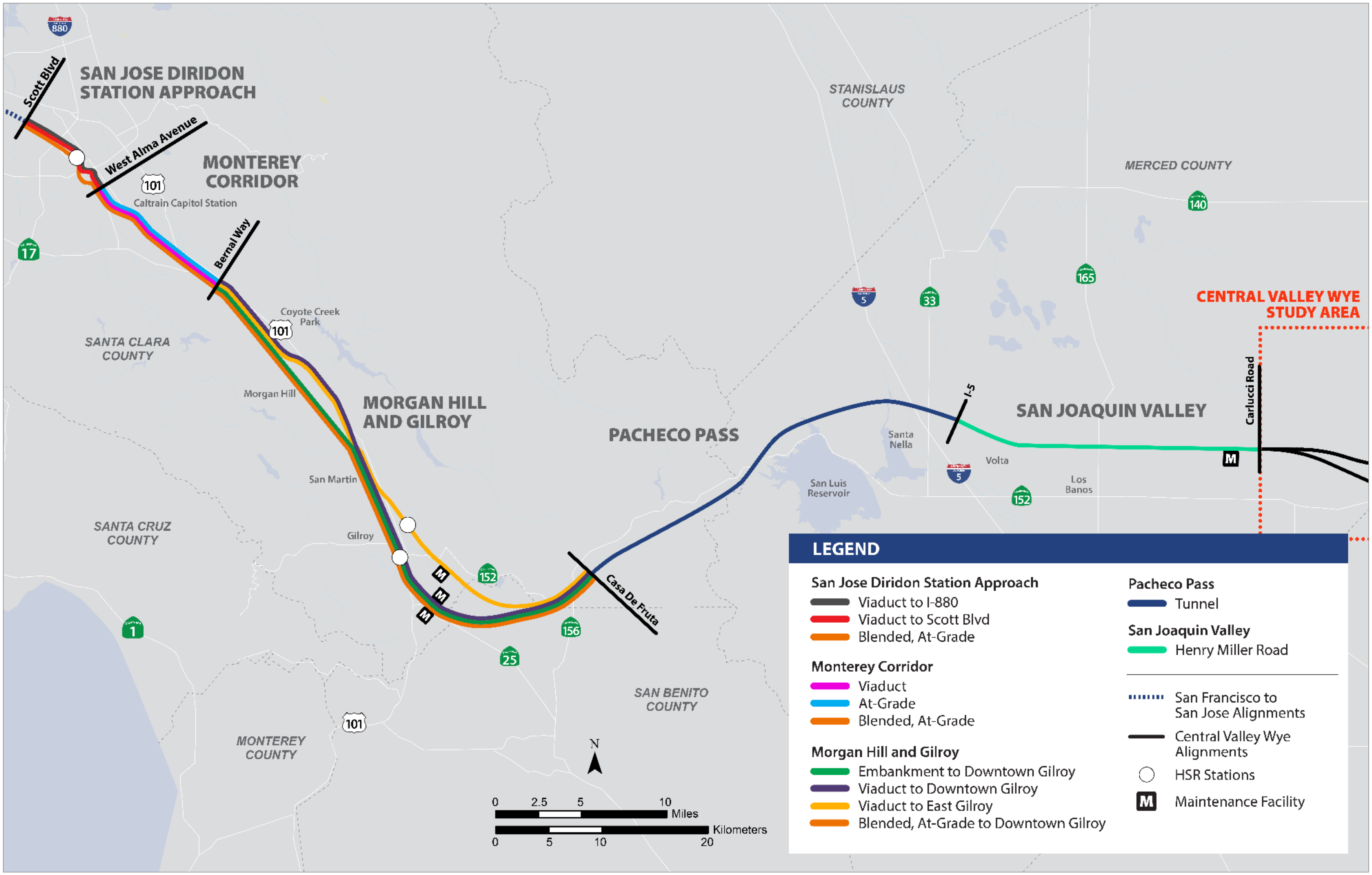
Figure 2-1 Proposed San Jose to Merced Project Section

2.1 Summary of Design Features

While the northern service limit of the project would be the San Jose Diridon Station, the engineering design and evaluation includes infrastructure and train operations north to Scott Boulevard to serve the San Jose Diridon Station; this additional analysis overlaps with the analysis of the San Francisco to San Jose Project Section to the north. The project is an approximately 90-mile portion of the 145-mile-long Project Section, which includes dedicated or blended[3] HSR track and systems; HSR stations located at San Jose Diridon and Gilroy; a maintenance of way facility (MOWF) in the Gilroy area; and a maintenance of way siding (MOWS) west of Turner Island Road in the Central Valley (Figure 2-2). HSR stations at San Jose Diridon and Gilroy would support transit-oriented development, provide an interface with regional and local mass transit services, and provide connectivity to the South Bay and Central Valley highway network.[4] While the northern service limit of the project would be the San Jose Diridon Station, the engineering design and evaluation includes train operations north to Scott Boulevard in Santa Clara to support the independent utility of an HSR station at Diridon Station and to describe the proposed interface of HSR alternatives with blended Caltrain railroad infrastructure. This additional analysis between San Jose Diridon Station and Scott Boulevard overlaps with the analysis of the San Francisco to San Jose Project Section to the north. Under three alternatives, the transition of HSR infrastructure and operations from the blended system between San Francisco and Santa Clara to a fully dedicated system south of the San Jose Diridon Station would occur at either Scott Boulevard or near Interstate (I-) 880. A fourth alternative would extend the blended system through San Jose to Gilroy. The project would extend south from San Jose to Gilroy, then east through the Pacheco Pass to the Central Valley to end at Carlucci Road, the western boundary of the Central Valley Wye.

3 *Blended* refers to operating HSR trains with existing intercity, commuter, and regional trains on shared infrastructure.

4 *South Bay* refers to Santa Clara County.



Source: Authority 2019c

JUNE 2019

Figure 2-2 Overview of Subsection Design Options

The project comprises the following 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 30–32 miles from Bernal Way in the community of South San Jose to Casa de Fruta Parkway/State Route (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 and FRA have 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.

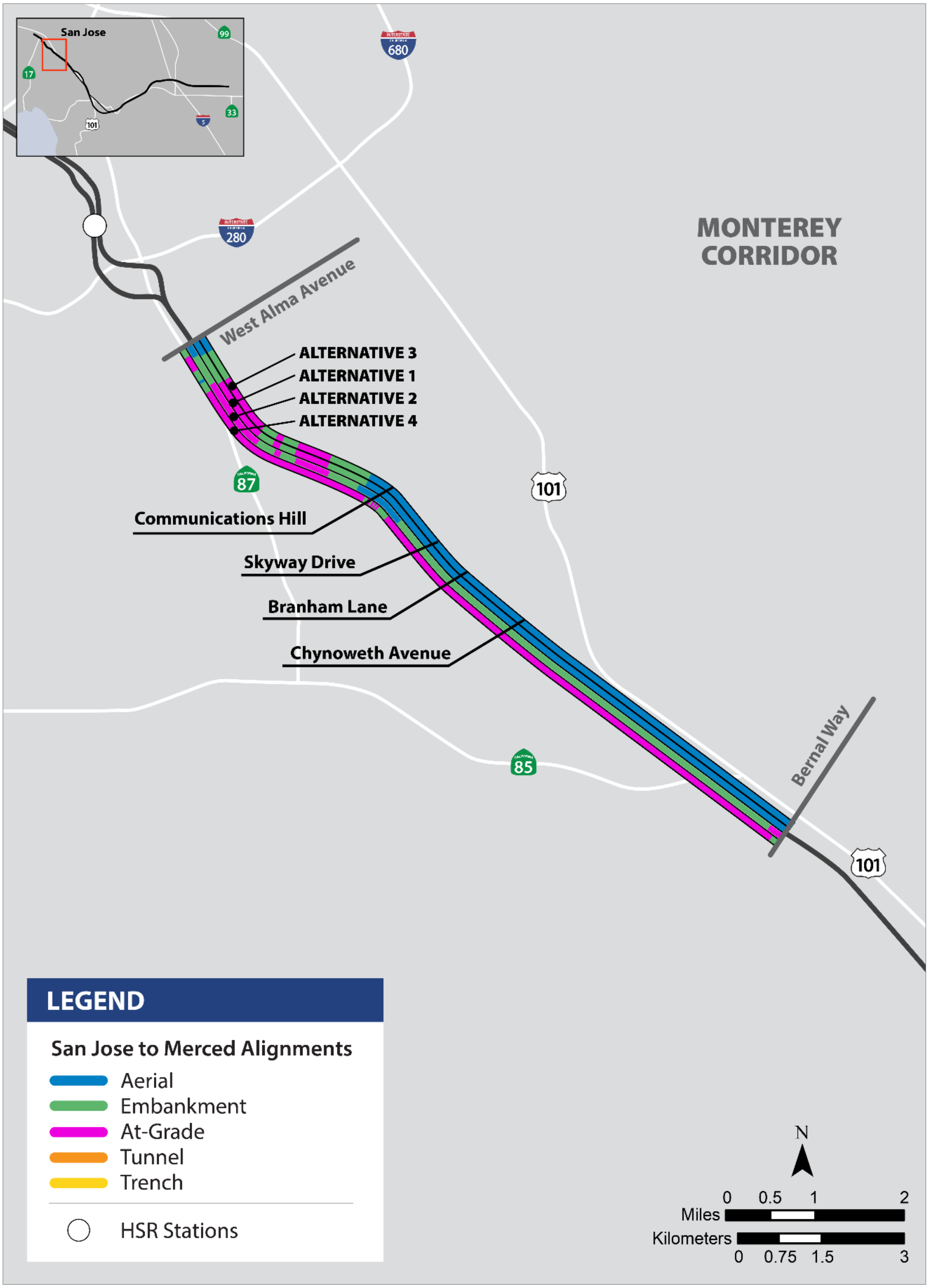
Table 2-1 San Jose to Central Valley Wye Design Options by Subsection

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 2019c

Source: Authority 2019c
JUNE 2019
CEMOF = Centralized Equipment Maintenance and Operation Facility

Figure 2-3 San Jose Diridon Station Approach Subsection



Source: Authority 2019c

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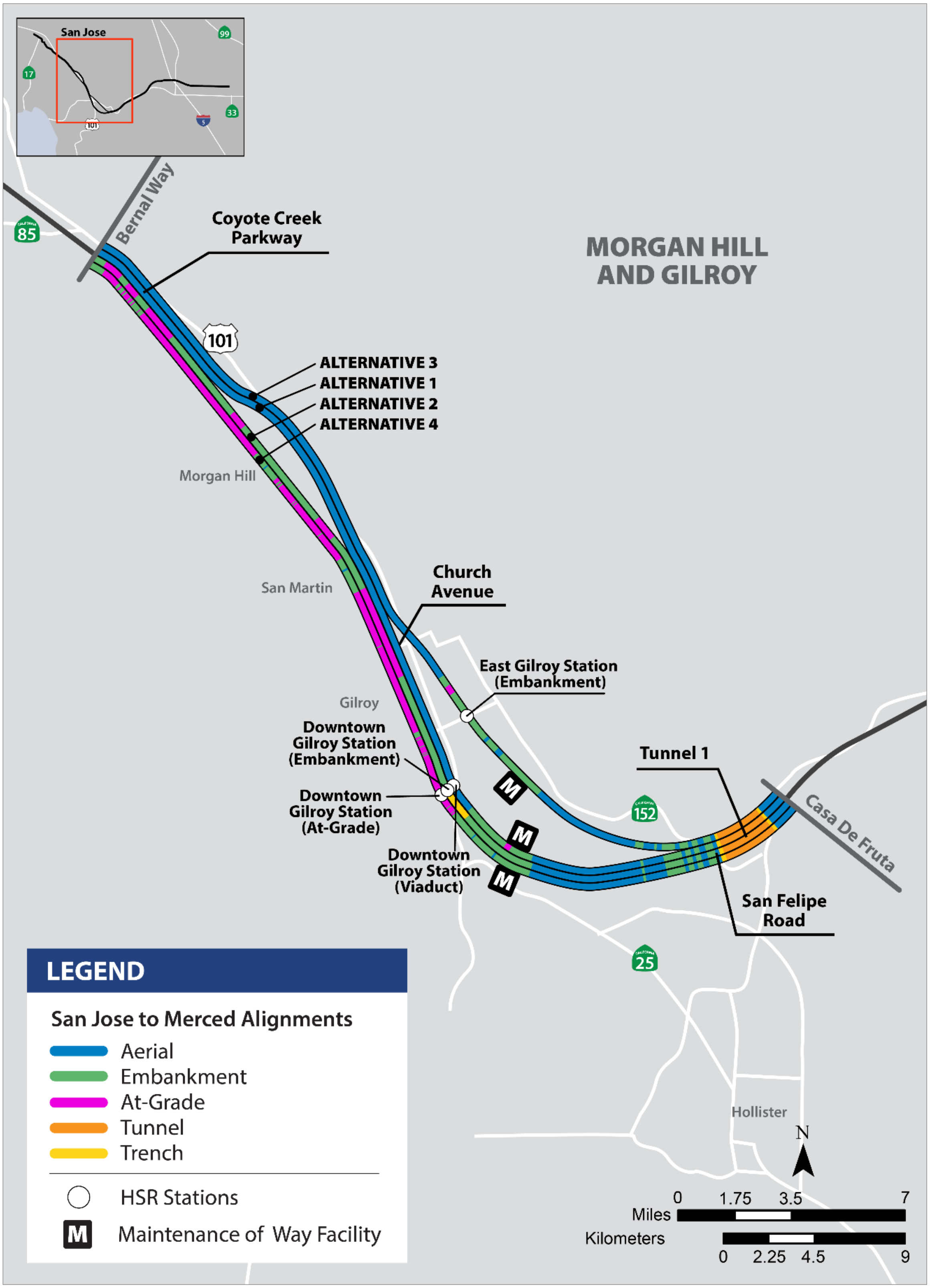
Figure 2-4 Monterey Corridor Subsection



Source: Authority 2019c JUNE 2019

Figure 2-5 Morgan Hill and Gilroy Subsection

Source: Authority 2019c

JUNE 2019

Figure 2-6 Pacheco Pass Subsection

Source: Authority 2019c

JUNE 2019

Figure 2-7 San Joaquin Valley Subsection

2.2 Description of Alternatives

This section describes the proposed design options of the project alternatives in each subsection. The alternatives are similar in length, differing only in the Morgan Hill and Gilroy Subsection, where divergent alignments in Morgan Hill and the alternative alignments through the Downtown Gilroy Station and the East Gilroy Station result in linear variations.

2.2.1 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.

2.2.1.1 San Jose Diridon Station Approach Subsection

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 a predominantly two-track and three-track at-grade alignment. South of De La Cruz Boulevard, the Union Pacific Railroad (UPRR) tracks of the Coast Line from the northeast converge with the Caltrain corridor tracks 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 Maintenance and Operations 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 diverges from the Caltrain corridor at Park Avenue, just south of San Jose Diridon Station, and returns 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. The blended service would entail several minor realignments of existing Caltrain track between Scott Boulevard and I-880. New UPRR and Caltrain track would be constructed just north of the HSR guideway beginning north of I-880 to just past the Santa Clara Station.

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 tracks and continue southeast 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.

Southeast of West Hedding Street, the dedicated HSR tracks would transition from a two-track at-grade configuration to retained fill and finally to a two-track aerial profile. The HSR alignment would begin the short viaduct option by rising on embankment to an approximately 70-foot-high aerial structure. A new bridge structure would be built to carry the realigned UPRR/Caltrain MT2 tracks over the West Taylor Street underpass. University Avenue would become a cul-de-sac. A new pedestrian underpass would be constructed near the alignment of Emory Street to allow Caltrain riders to reach both platforms of the Caltrain College Park Station. The HSR viaduct would also cross over West Taylor Street, then shift horizontally a maximum of 500 feet east of the existing UPRR/Caltrain mainline tracks to maintain high-speed track curvature.

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 undercrossing of UPRR/Caltrain tracks. 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.

Wildlife Crossings

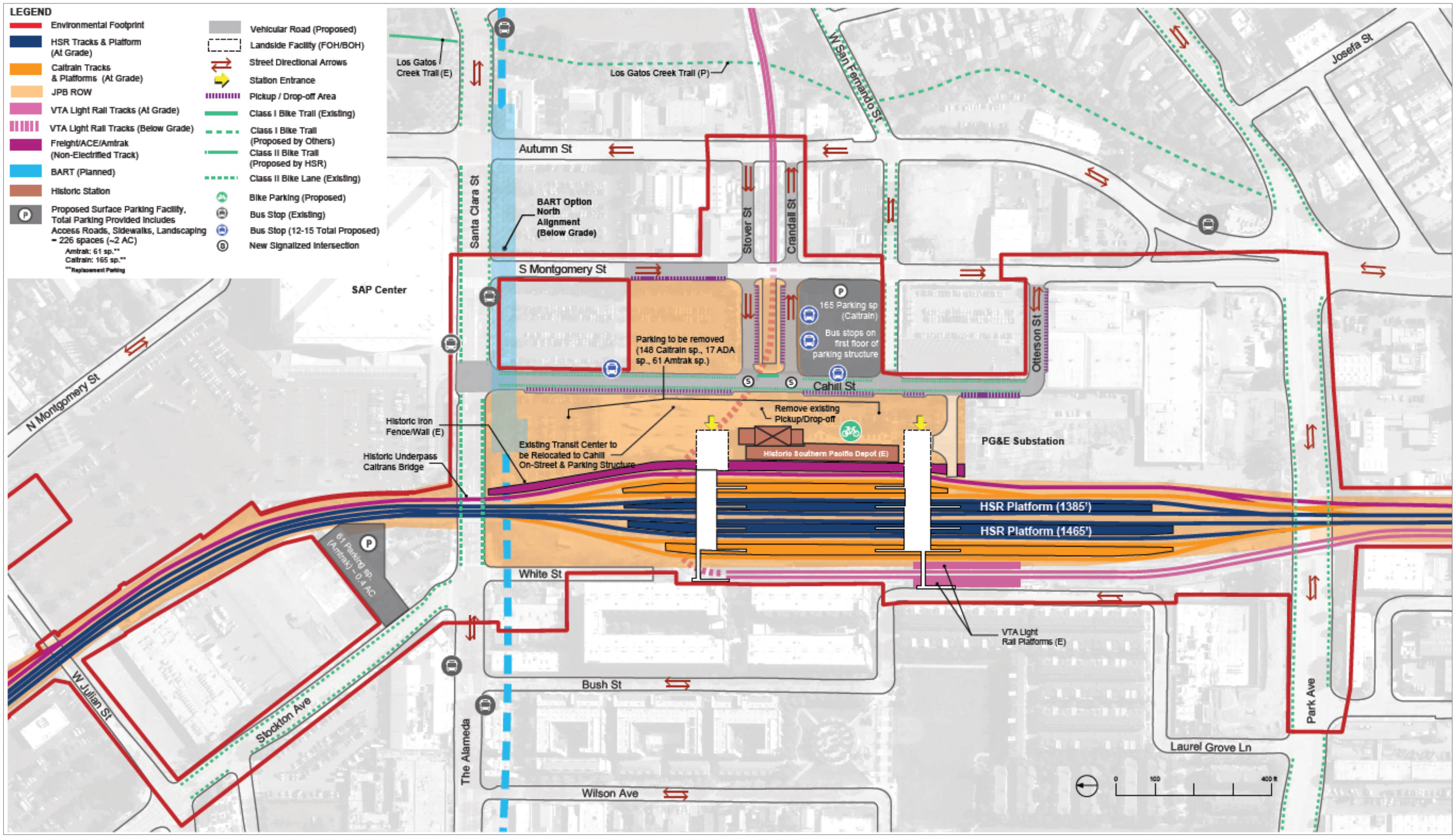
There would be no wildlife crossings in this subsection.

Stations

The HSR San Jose Diridon 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. The existing historic train station would remain in place. As illustrated on Figures 2-8 and 2-9, the primary HSR station building would be constructed north of the existing station building but 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 on the east side of the tracks north of the existing Historic Depot next to the future Bay Area Rapid Transit (BART) alignment; an entrance south of the existing historic Diridon Station building; and an entrance on the east side south of the Pacific Gas and Electric Company (PG&E) power station. 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 4,400-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 (Santa Clara) Valley Transportation Authority (VTA) would fund a San Jose Diridon Station Facilities Master Plan. This grant would 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 located downtown or adjacent to the station.



Source: Authority 2019c

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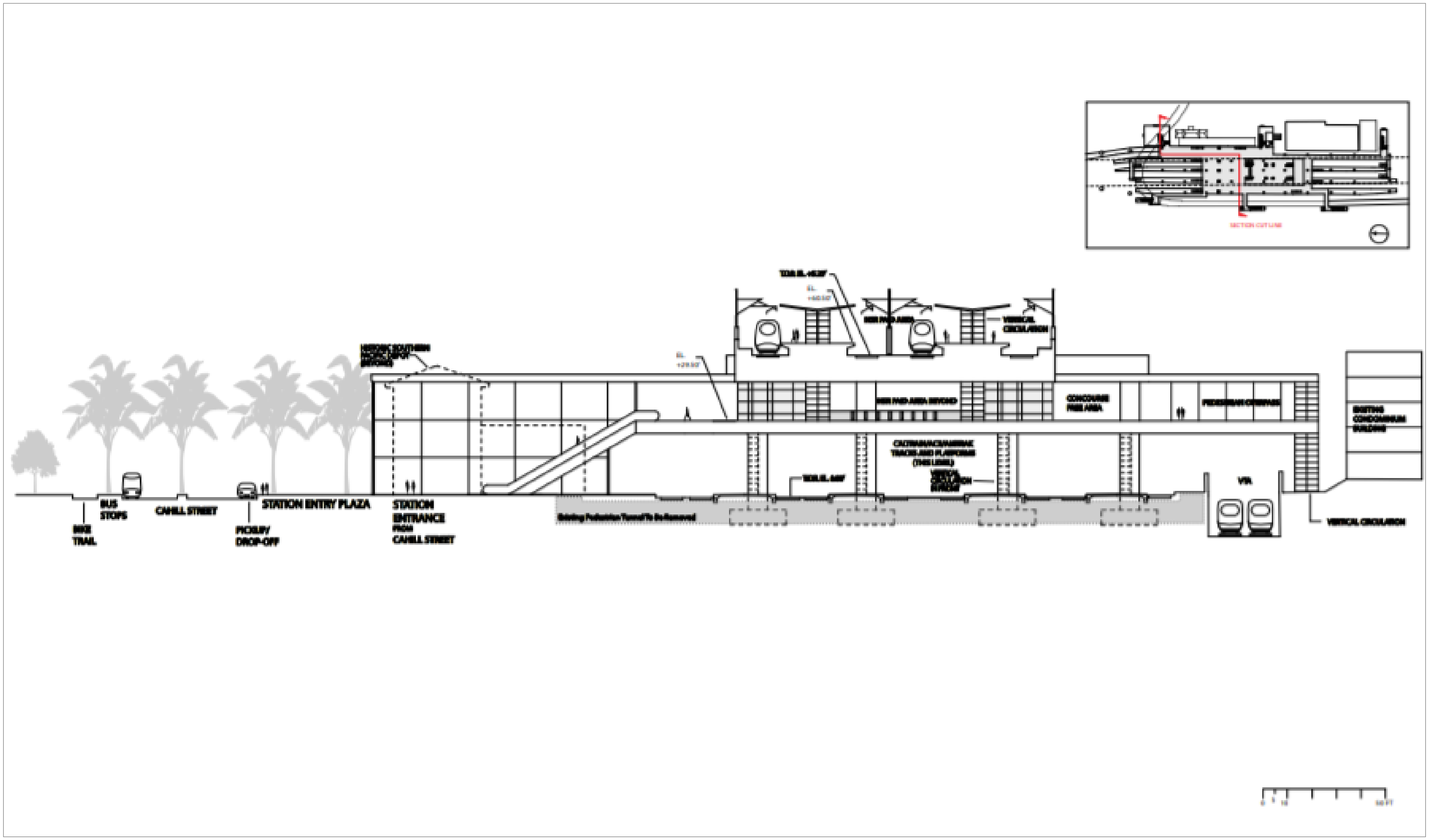
Figure 2-8 Conceptual Diridon Aerial Station Plan



Source: Authority 2019c

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Figure 2-9 Conceptual San Jose Diridon Station Cross Section

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 12–15 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 Corridor 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 Diridon by 2026. As a separate project, VTA has plans to construct new light rail station platforms.

Traction Power Sites and Power Connections

One new traction power substation (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 fenceline of the PG&E FMC substation, just north of the I-880 overcrossing, via an aerial double-circuit 115-kilovolt (kV) tie-line.

Train Control and Communication Facilities

An enhanced ATC system would control the trains and comply with the FRA-mandated positive train control requirements, including safe separation of trains, over-speed prevention, and work zone protection. This system would include communications towers at intervals of approximately 1.5–3 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 a 6- to 8-foot-diameter 100-foot-tall pole. The communications facilities would be located near 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 located 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
- Three sites between Park Avenue and the proposed HSR crossing of SR 87

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

Maintenance Facility

No maintenance facilities are proposed for this subsection.

2.2.1.2 Monterey Corridor Subsection

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 primarily 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.

Railroad bridges over Almaden Road and Almaden Expressway 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 above grade 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 falsework over the station if constructed by cast-in-place methods or would require relocating the station 500 feet to the south if constructed by 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 to a short distance 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.

Wildlife Crossings

There would be no wildlife crossings in this subsection.

Stations

No new HSR stations are proposed for this subsection.

Traction Power Facilities

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

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

Train Control and Communication Facilities

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

Three stand-alone communications radio sites are proposed:

- Near Almaden Road on the east side of the Caltrain corridor (two site options)
- Near Capitol Expressway (two site options)

Maintenance Facility

No maintenance facilities are proposed for this subsection.

2.2.1.3 Morgan Hill and Gilroy Subsection

Alignment and Ancillary Features

The Morgan Hill and Gilroy Subsection would be approximately 30 to 32 miles long and located south of 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 a tunnel (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. Alternative 1 in this subsection would construct 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 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 city limits of Morgan Hill, the alignment would turn west, relocating the cul-de-sac at Fisher Avenue to the west of the HSR facility, 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 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 l. 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 spur UPRR 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 be provided to 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 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 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. HSR guideway on viaduct would be built 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. The alignment would return to viaduct at Lovers Lane. After Lovers Lane, the alignment would continue in a combination of embankment and viaduct until reaching the 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 move onto embankment just beyond Southside Way at the western transition to the Pacheco Pass Subsection.

Wildlife Crossings

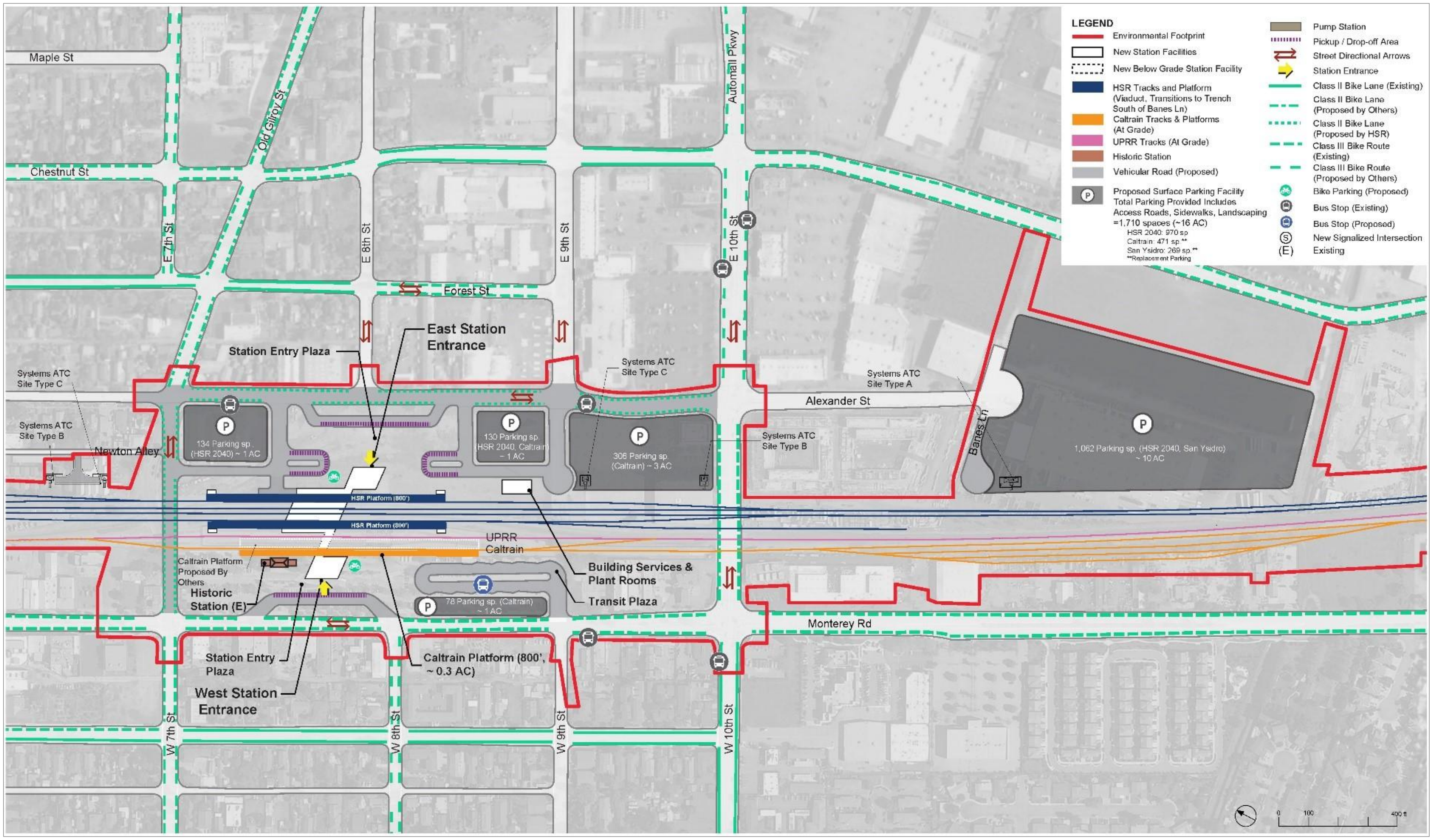
Three wildlife crossings would be provided at the base of Tulare Hill north of the Metcalf Substation connecting to Coyote Creek. The existing culvert under Monterey Road at Fisher Creek would be realigned and replaced with a larger box culvert to improve wildlife movement under Monterey Road and the 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.

Stations

Alternative 1 would enter the Downtown Gilroy Station on aerial structure (Figures 2-10 and 2-11). The HSR Downtown Gilroy Station would be constructed south of the existing Caltrain station. The station approach would be on a low viaduct—approximately 33 feet to top of rail—with dedicated HSR tracks to the east of UPRR between relocated Old Gilroy/7th Streets and 9th Street. The 800-foot platforms would be on the east and west side 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 parking demand would be 970 spaces in 2040. In addition, 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 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 constructed. Class II bike lanes would be provided on 7th and Alexander Streets.



Source: Authority 2019c

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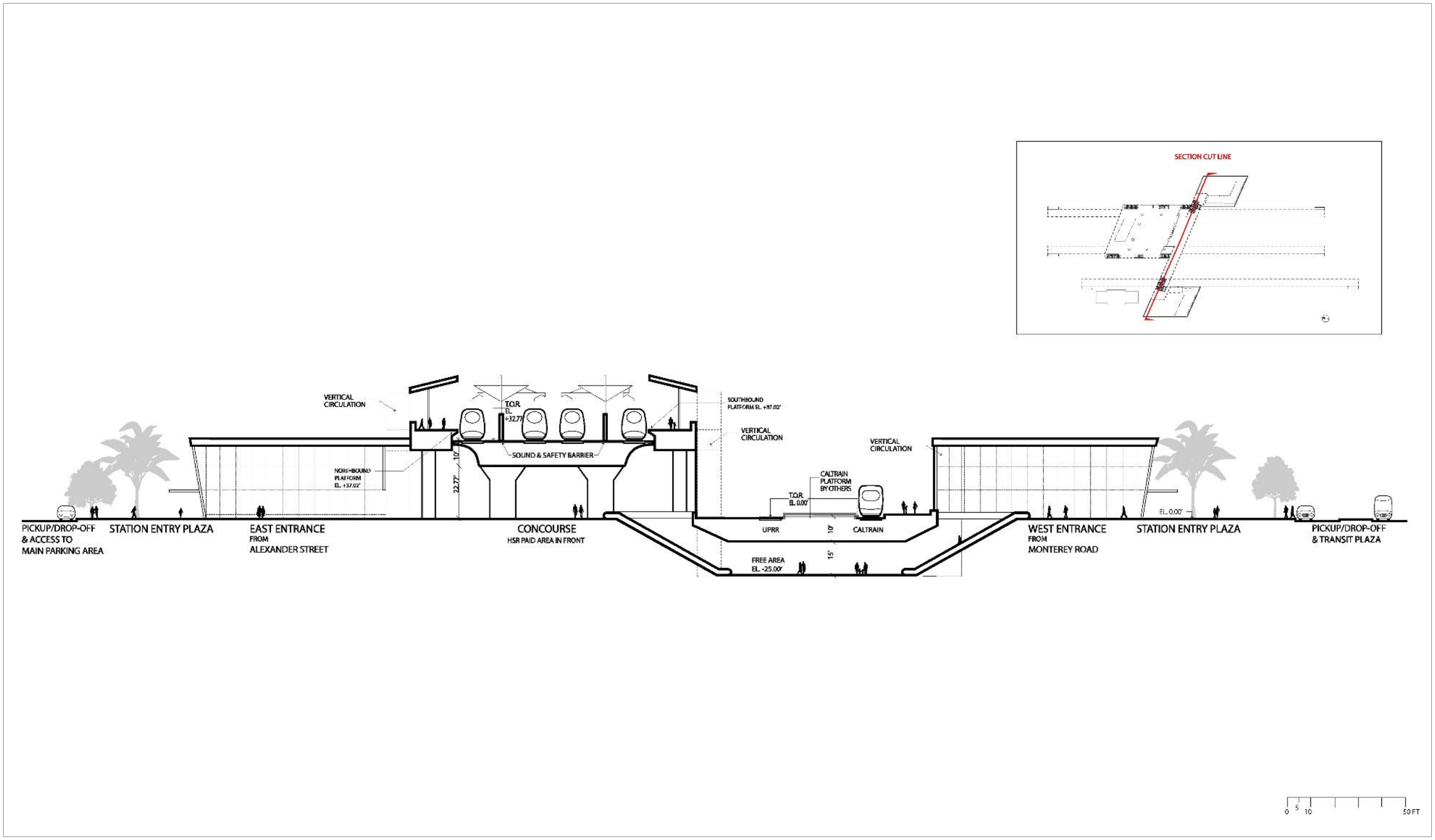
Figure 2-10 Conceptual Downtown Gilroy Aerial Station Plan



Source: Authority 2019c

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Figure 2-11 Cross Section of Downtown Gilroy Station (Viaduct)

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: either east or west of Bloomfield Avenue. At this site, one new PG&E switching station would be co-located with the TPSS. Communication facilities (i.e., redundant [two underground or one underground and one overhead on existing power structures] fiber optic 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
- At Tunnel 1 east portal

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 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 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.

Train Control and Communication Facilities

A total of 17 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
- One site near Lake Road (two site options)

Six stand-alone communication radio sites would be constructed within 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)
- East of the Pajaro River, south of Gilroy

Maintenance Facilities

The MOWF under Alternative 1 would be located in South Gilroy between Carnadero Road and Bloomfield Road (Figure 2-12) to accommodate machinery and inspection and maintenance staff. The MOWF would cover approximately 75 acres. The freight connection would be provided as described above.

2.2.1.4 Pacheco Pass Subsection

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 (Figure 2-6). Tunnel is the only design option in this subsection.

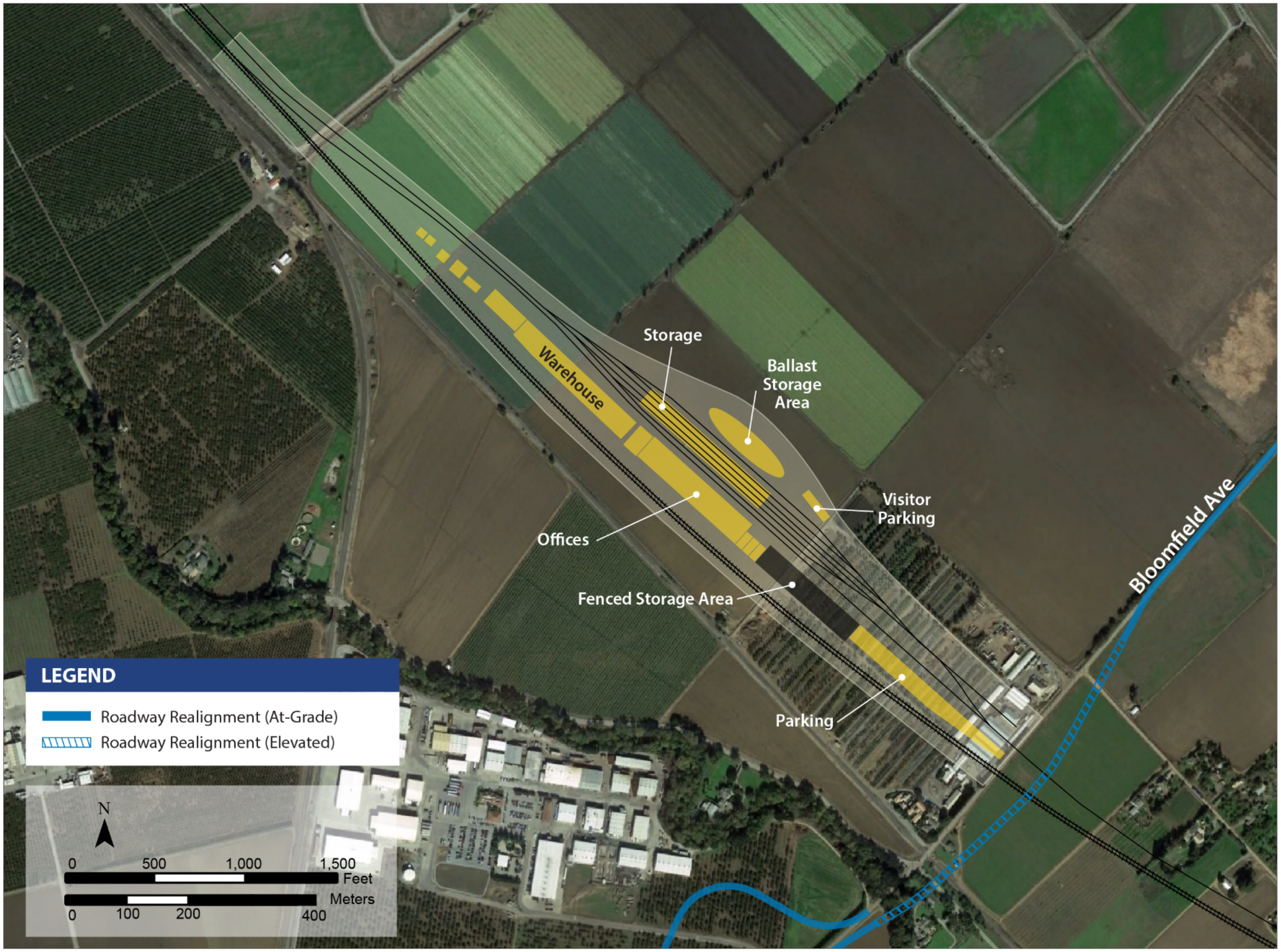
From the eastern limit of the Morgan Hill and Gilroy Subsection, the guideway would transition from aerial structure to embankment along the southern boundary of Casa de Fruta. This stretch of embankment would be on fill or in excavated hillside cuts to accommodate a level HSR guideway profile over varied 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 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 CA-152. Tunnel 2 would extend northeast approximately 13.5 miles. 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 CCID Outside Canal before transitioning to the San Joaquin Valley Subsection at Fahey Road.

Wildlife Crossings

Four wildlife crossing culverts would be provided west of the California Aqueduct, with an additional two wildlife crossings 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.

Stations

No new HSR stations are proposed for this subsection.



Source: Authority 2019c

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Figure 2-12 South Gilroy Maintenance of Way Facility

Traction Power Facilities

One new TPSS, Site 5—O'Neill, would be constructed approximately 1.2 miles west of the California Aqueduct. A new 230-kV double-circuit tie-line would be constructed from the expanded Quinto switching station to the TPSS, paralleling an existing 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 [two underground or one underground and one overhead on existing power structures] 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
- One station located either southeast or northwest of the alignment crossing of Fahey Road

Train Control and Communication Facilities

Three 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
- Adjacent to TPSS Site 5

One stand-alone communications radio antenna site would be constructed in the Pacheco Pass Subsection:

- Near SR 152 and the Tunnel 2 west portal
- 1 mile west of Tunnel 2
- Delta-Mendota Canal crossing

Maintenance Facilities

No maintenance facilities are proposed for this subsection.

2.2.1.5 San Joaquin Valley Subsection

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 (Figure 2-7). The single design option in this subsection is a combination of viaduct and embankment along Henry Miller Road, identified as the Henry Miller Road design option.

South of Fahey Road, the guideway would continue east and cross over three irrigation ditches, Cherokee Road, the CCID 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 (Volta) 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 0.8-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 Banos State Wildlife Area across Mud Slough to maintain wildlife movement within the Grasslands Ecological Area (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, Lone 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.

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 be provided through the remainder of this subsection. In total, there would be 64 wildlife crossings in this subsection.

Stations

No new HSR stations are proposed for this subsection.

Traction Power Facilit*i*es

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)
- Intersection of Henry Miller Road and Box Car Road (two site options either north or south of the alignment)

Train Control and Communication Facilities

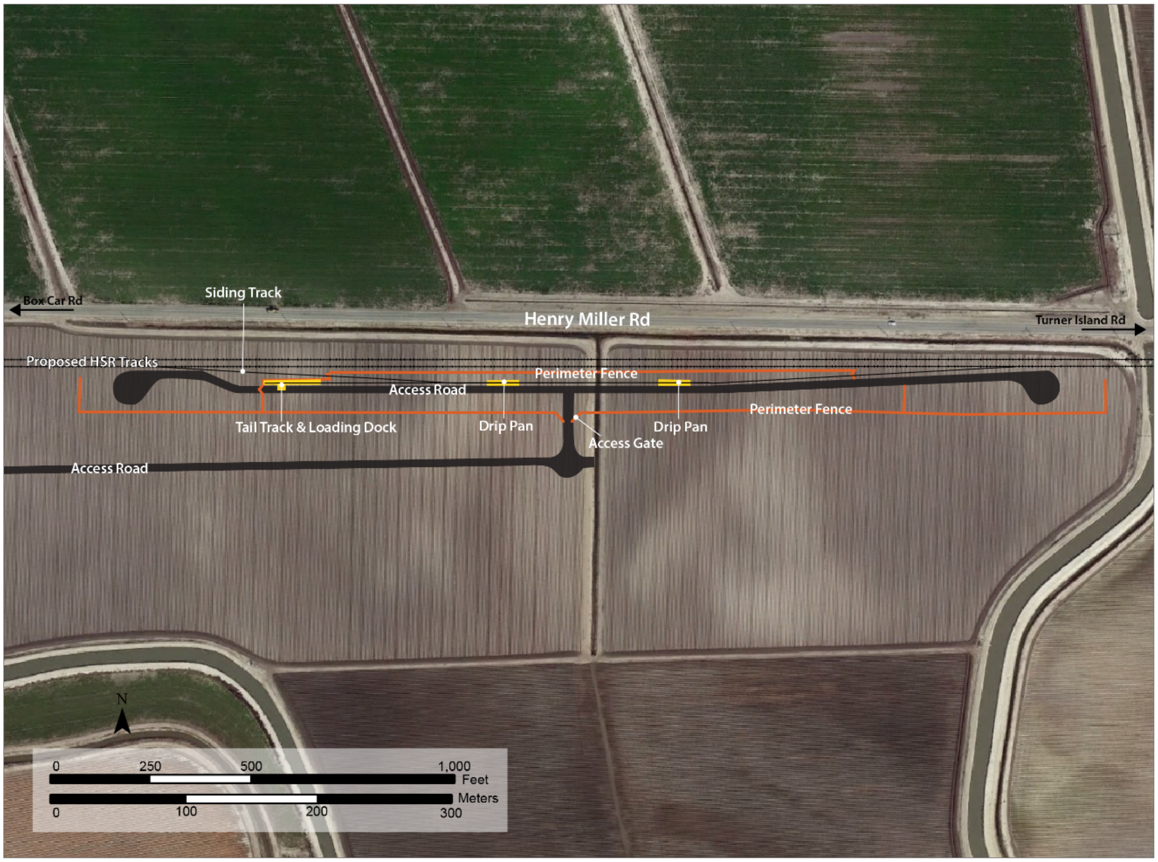
Four ATC sites would be constructed in the San Joaquin Valley Subsection:

- One site east of the CCID Main Canal (two options)
- Three sites near Johnson Road
- One site near Box Car Road (two site options)

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

Maintenance Facility

An MOWS is proposed near Turner Island Road near the eastern limit of the project (Figure 2-13). The MOWS 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.



Source: Authority 2019c APRIL 2019

Figure 2-13 Maintenance of Infrastructure Siding near Turner Island Road

2.2.2 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 HSR guideway under 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.

2.2.2.1 San Jose Diridon Station Approach Subsection

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 HSR viaduct would then ascend to 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 on a viaduct 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 West Alma, Alternative 2 would be identical to Alternative 1. 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 undercrossing of UPRR/Caltrain tracks. 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.

Wildlife Crossings

There would be no wildlife crossings in this subsection.

Stations

The San Jose Diridon Station would be the same as described for Alternative 1.

Traction Power Facilities

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

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
- One site just north of the San Jose Diridon Station
- Three sites between Park Avenue and the proposed HSR crossing of SR 87 (same as under Alternative 1)

No stand-alone communications radio sites would be built in this subsection under Alternative 2.

Maintenance Facilities

No maintenance facilities are proposed for this subsection.

2.2.2.2 Monterey Corridor Subsection

Alignment and Ancillary Features

The Monterey Corridor Subsection is approximately 9 miles long and entirely within the San Jose city limits. 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 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 located northwest 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 northwest of the intersection of Skyway Drive and Monterey Road would be provided by a driveway 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 to just south of Blossom Hill Road, where 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 to the east of their current locations.

Wildlife Crossings

There would be no wildlife crossings in this subsection.

Stations

No new HSR stations are proposed for this subsection.

Traction Power Facilities

In the Monterey Corridor Subsection, traction power stations would be in the same area under 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)
- Either the south side of SR 85 or between Bernal Road and the Bernal Road ramp onto Monterey Road

Train Control and Communication Facilities

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

Maintenance Facilities

No maintenance facilities are proposed for this subsection.

2.2.2.3 Morgan Hill and Gilroy Subsection

Alignment and Ancillary Features

The Morgan Hill and Gilroy Subsection under Alternative 2 would be approximately 31 miles long and located south of 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 eastward across the Pajaro River floodplain and through a portion of northern San Benito County before entering a tunnel (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 2-8).

Continuing 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. Due to the proximity of the alignment to UPRR, a 3-foot-thick continuous intrusion barrier would be constructed between the proposed HSR and UPRR tracks. In contrast to the other alternatives, Alternative 2 would require the construction of new roadway grade separations to maintain east-west connectivity across the Monterey Corridor. 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 until 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 and 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.

As the alignment proceeds 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 17–30 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 constructed 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 and 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 HSR 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). East 7th Street and Old Gilroy would be realigned (as under Alternative 1). 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, crossing 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 South 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.

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.

Stations

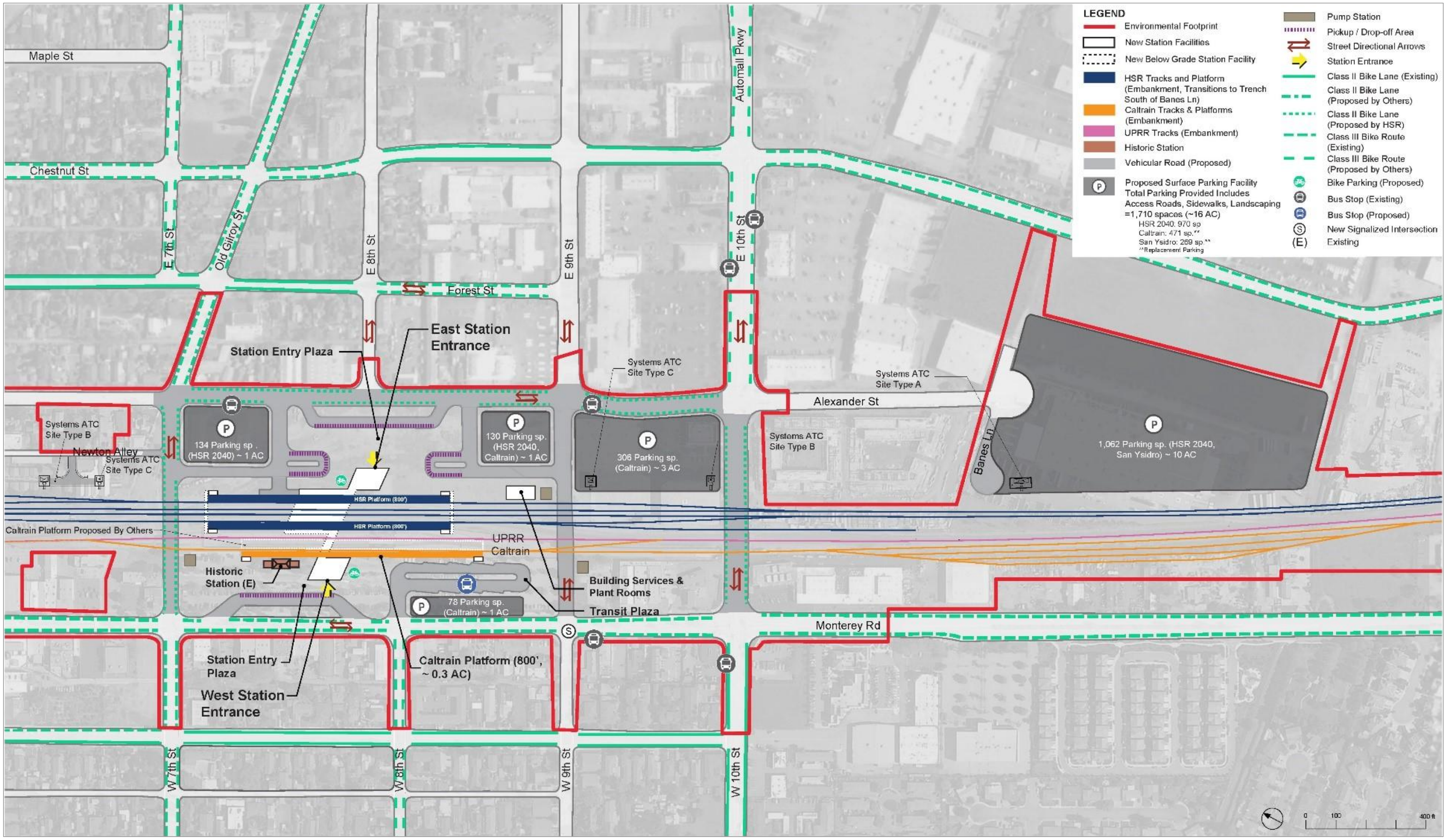
Alternative 2 would enter the Downtown Gilroy Station on embankment (Figures 2-14 and 2-15). The station layout and configuration would be similar to that described for Alternative 1, except that UPRR and Caltrain would be elevated to the same height as HSR on the embankment. The embankment station would also lower East 7th/Old Gilroy Street, East 9th Street, and East 10th Street by approximately 16 feet to maintain street access.

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 located 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 that includes a parking strategy would be developed in coordination with local agencies prior to design and construction of the station. 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 constructed. Class II bike lanes would be provided on 7th, Alexander, and 10th Streets.

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: either 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 [two underground or one underground and one overhead on existing power structures] fiber optic lines) would also be required to support the electrical interconnection of the TPSS to a new utility switching station or to existing PG&E facilities, 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.

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.



Source: Authority 2019c

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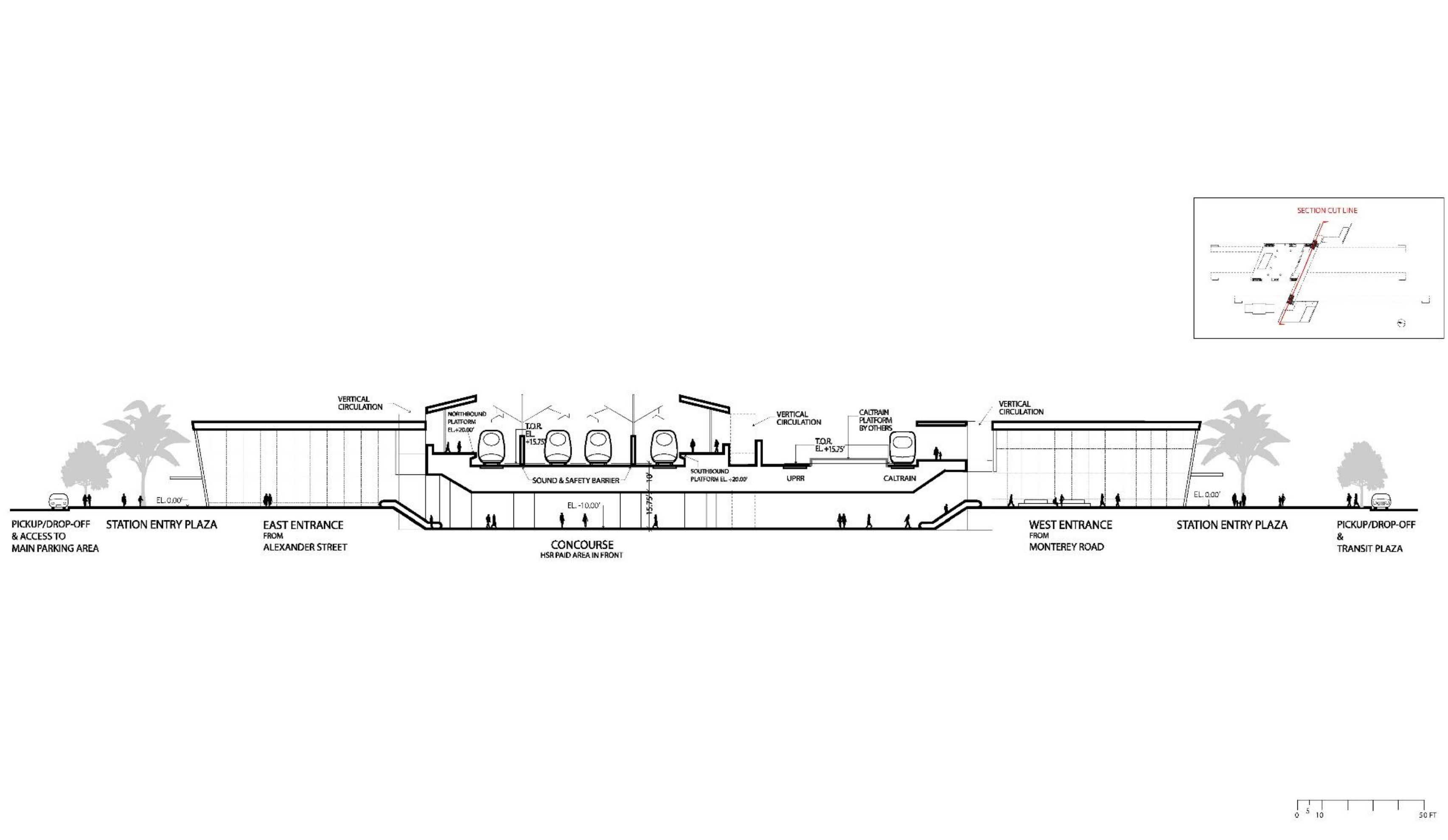
Figure 2-14 Conceptual Downtown Gilroy Embankment Station Plan



Source: Authority 2019c

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

Four 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
- 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
- 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 replacing (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.

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 north of Paquita Espana Court or at Palm Avenue, co-located with the TPSS (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

South of US 101, Alternative 2 would have the same ATC sites as Alternative 1:

- Five sites north of Carnadero Avenue
- Three sites east of the Pajaro River
- One site near Lake Road (two site options)

A total of six stand-alone communication radio sites would be constructed in this subsection at the following locations:

- 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)

South of US 101, Alternative 2 would have the same radio sites as Alternative 1:

- East of the Pajaro River south of Gilroy.

Maintenance Facilities

The MOWF under Alternative 2 would be constructed along the HSR alignment near Carnadero Avenue as described for Alternative 1 and illustrated on Figure 2-12. The freight connection would be provided as described above.

2.2.2.4 Pacheco Pass Subsection

Alignment and Ancillary Features

The characteristics of the Pacheco Pass Subsection under Alternative 2 would be the same as those described for Alternative 1 in Section 2.2.1.4, Pacheco Pass Subsection.

Wildlife Crossings

The wildlife crossings under Alternative 2 would be the same as described for Alternative 1.

Stations

No new HSR stations are proposed for this subsection.

Traction Power Facilities

One new TPSS, Site 5—O'Neill, would be constructed approximately 1.2 miles west of the California Aqueduct as described for Alternative 1.

Train Control and Communication Facilities

Train control and communications facilities of Alternative 2 would be the same as for Alternative 1.

Maintenance Facilities

No maintenance facilities are proposed for this subsection.

2.2.2.5 San Joaquin Valley Subsection

Alignment and Ancillary Features

The characteristics of the San Joaquin Valley Subsection of Alternative 2 would be the same as those described for Alternative 1 in Section 2.2.1.5, San Joaquin Valley Subsection.

Wildlife Crossings

The wildlife crossings under Alternative 2 would be as described for Alternative 1.

Stations

No new HSR stations are proposed for this subsection.

Traction Power Facilities

Traction power facilities under Alternative 2 would be as described for Alternative 1.

Train Control and Communication Facilities

Train control and communications facilities of Alternative 2 would be as described for Alternative 1.

Maintenance Facilities

An MOIS would be constructed west of Turner Island Road near Carlucci Road as described for Alternative 1 and illustrated on Figure 2-15.

2.2.3 Alternative 3

Alternative 3 was designed to minimize the project footprint through the use of viaduct and by going around downtown Morgan Hill, as is proposed in 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. The HSR guideway under 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.

2.2.3.1 San Jose Diridon Station Approach Subsection

Alignment and Ancillary Features

Under Alternative 3, the alignment and characteristics of this subsection would be the same as described for Alternative 2 in Section 2.2.2.1, San Jose Diridon Station Approach Subsection.

Wildlife Crossings

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

Stations

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

Traction Power Facilities

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

Train Control and Communication Facilities

Train control and communications facilities of Alternative 3 would be as described for Alternative 2. No stand-alone communication radio antenna would be constructed in this subsection of Alternative 3.

Maintenance Facilities

No maintenance facilities are proposed for this subsection.

2.2.3.2 Monterey Corridor Subsection

Alignment and Ancillary Features

The alignment and characteristics of Alternative 3 in this subsection would the same as those described for Alternative 1 in Section 2.2.1.2, Monterey Corridor Subsection.

Wildlife Crossings

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

Stations

No new HSR stations are proposed for this subsection.

Traction Power Facilities

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

Train Control and Communication Facilities

Train control and communications facilities of Alternative 3 would be as described for Alternative 1 and Alternative 2.

Maintenance Facilities

No maintenance facilities are proposed for this subsection.

2.2.3.3 Morgan Hill and Gilroy Subsection

Alignment and Ancillary Features

The Morgan Hill and Gilroy Subsection under Alternative 3 would be approximately 30 miles long and located south of 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 in Section 2.2.1.3, Morgan Hill and Gilroy Subsection. The Alternative 3 alignment would diverge from Alternative 1 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 a tunnel (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 2-8), where the Alternative 3 alignment would converge with that of Alternatives 1 and 2.

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 from 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 to the MOWF. The HSR 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. At the north end of the East Gilroy Station site, the alignment would cross beneath Las Animas Avenue; at the south end of the station site, Leavesley Road would be raised on a bridge 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 south 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 under Alternatives 1 and 2 and would similarly be on an 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 at Tunnel 1 with those of the other alternatives.

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.

Stations

Alternative 3 would enter the East Gilroy Station on embankment (approximately 17 feet to top of rail) north of Leavesley Road (Figures 2-16 and 2-17). The station platforms would be 800 feet long and the station buildings would be constructed on both the east and west sides of the tracks with a connections 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 on the west side would also provide 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 in 2040. Spaces would be located 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.

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 constructed; a new Class III bike route would be provided from the outlet mall to the site entrance; then Class II lanes from the station entrance to the parking. Class I bidirectional off-street path would be provided adjacent to parking which connects to the bike station. This would be a new station without any other rail operators in the station area.

Traction Power Facilities

Under Alternative 3, one new TPSS, Site 4—Gilroy, would be constructed at one of two sites: north of HSR either east or west of the former SR 152. Communication facilities (i.e., redundant [two underground or one underground and one overhead on existing power structures] fiber optic lines) would also be required to support the electrical interconnection of the TPSS to a new utility switching station and/or to existing PG&E facilities, 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:

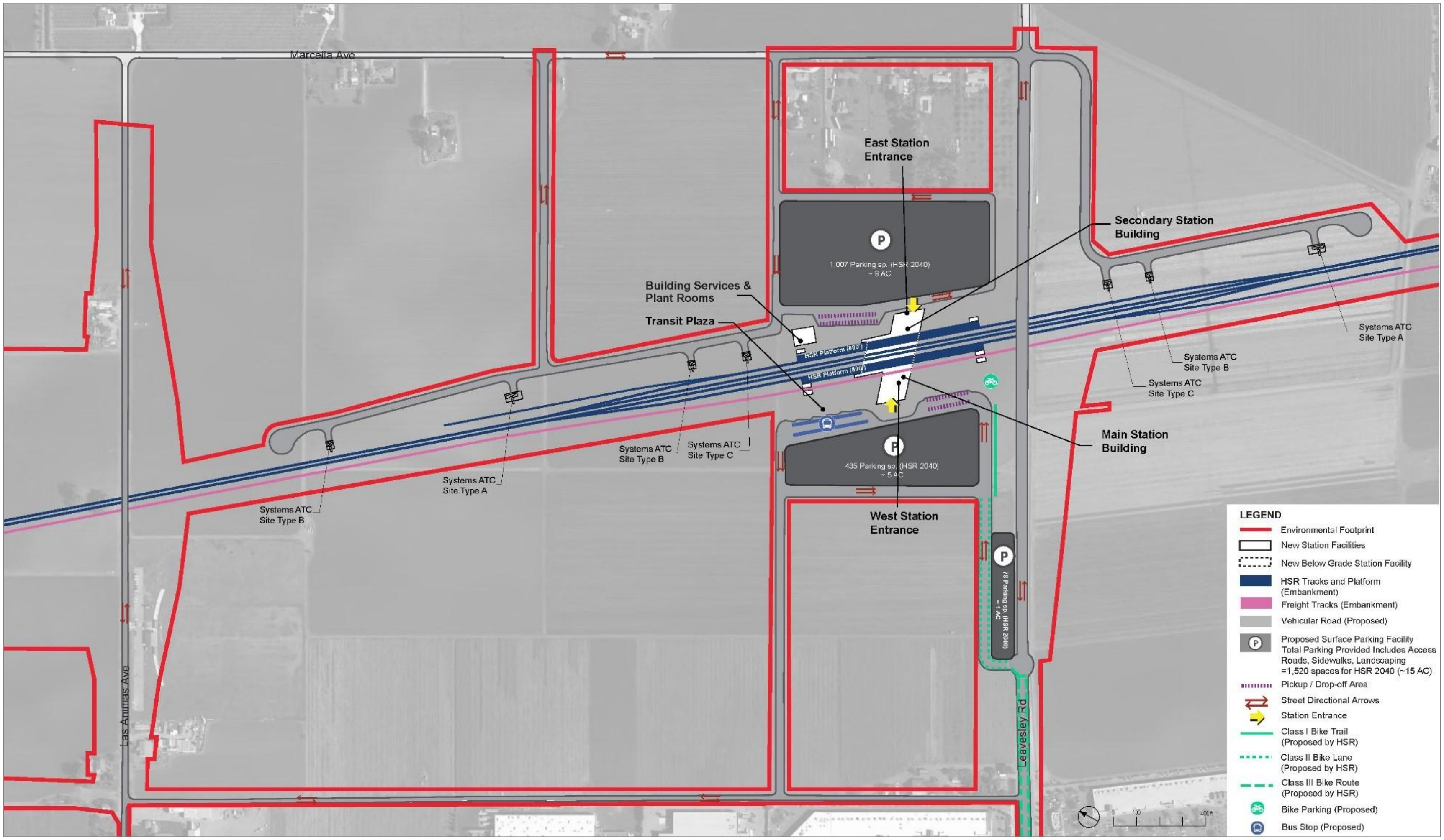
- South of the alignment, located either south of Diana Avenue or at the intersection of San Pedro Avenue and Walnut Grove Drive (like Alternative 1)
- Either at the northwest or southeast corner of the HSR crossing of Masten Avenue
- South of Gilroy at one of three site options: on Lake Road north of the alignment, on Lake Road south of the alignment, or at Lovers Lane south of the alignment
- 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).

Train Control and Communication Facilities

A total of 19 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 near 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
- One site near Lake Road (two site options)



Source: Authority 2019c

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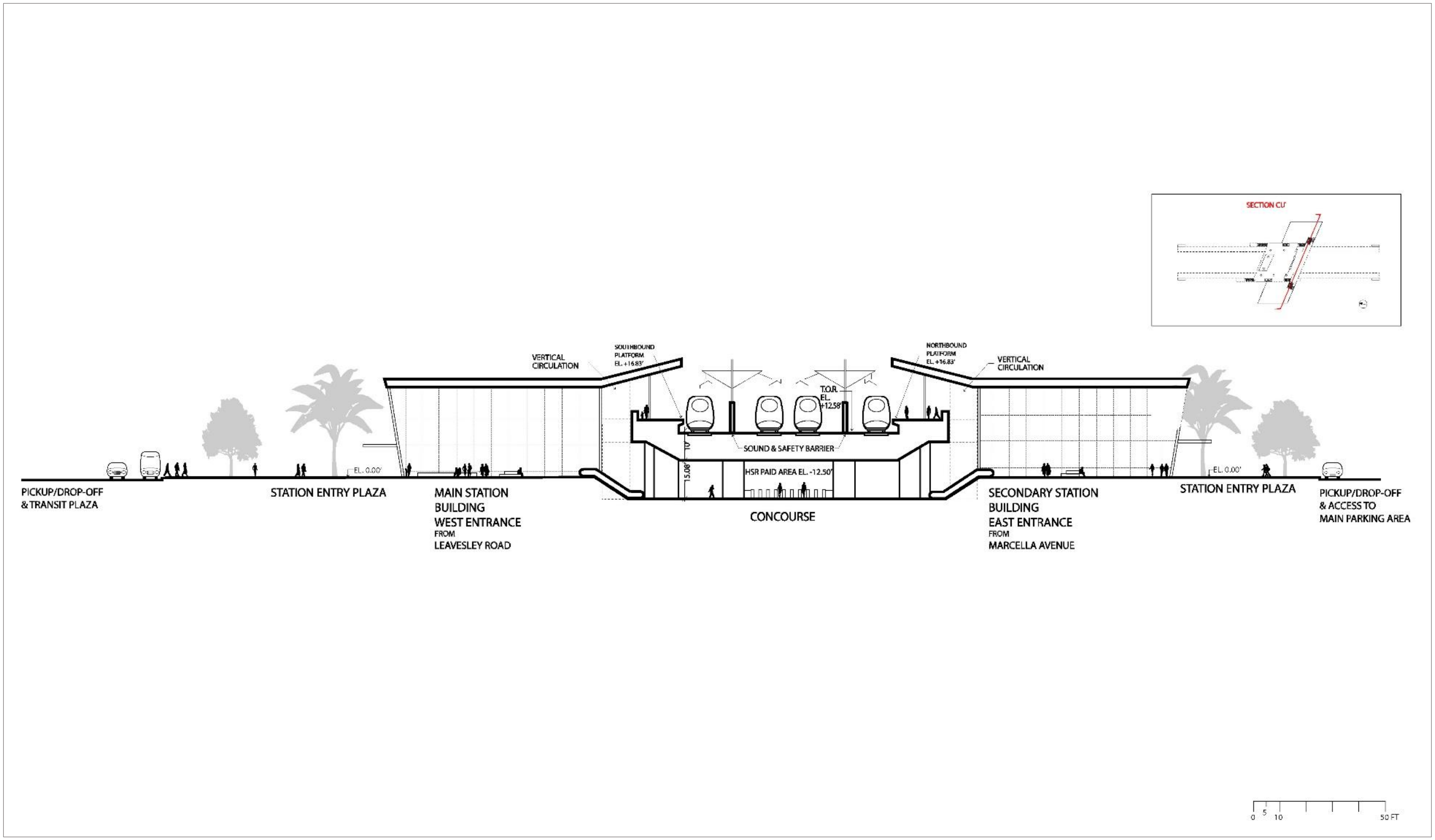
Figure 2-16 Conceptual East Gilroy Station Plan



Source: Authority 2019c

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Figure 2-17 Cross Section of East Gilroy Station

A total of six stand-alone communication radio sites would be constructed in this subsection (five locations are the same as those for Alternative 1):

- 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)
- At Bloomfield Avenue

Maintenance Facilities

The East Gilroy MOWF would be located west of the HSR mainline, south of the community of Old Gilroy. The MOWF would encompass approximately 75 acres and extend along the west side of the HSR alignment from the intersection of the SR 152 and Frazer Lake Road south to Jones Creek (Figure 2-18). The freight connection would be provided as described in the discussion of the alignment and ancillary facilities.

2.2.3.4 Pacheco Pass Subsection

Alignment and Ancillary Features

The characteristics of the Pacheco Pass Subsection of Alternative 3 would be the same as Alternatives 1 and 2.

Wildlife Crossings

The wildlife crossings under Alternative 3 would be as described under Alternative 1.

Stations

No new HSR stations are proposed for this subsection.

Traction Power Facilities

Traction power facilities of Alternative 3 would be as described for Alternatives 1 and 2.

Train Control and Communication Facilities

Train control and communications facilities of Alternative 3 would be as described for Alternatives 1 and 2.

Maintenance Facilities

No maintenance facilities are proposed for this subsection.

2.2.3.5 San Joaquin Valley Subsection

Alignment and Ancillary Features

The characteristics of the San Joaquin Valley Subsection under Alternative 3 would be the same as under Alternatives 1 and 2.

Wildlife Crossings

The wildlife crossings under Alternative 3 would be as described for Alternatives 1 and 2.

Stations

No new HSR stations are proposed for this subsection.

Traction Power Facilities

Traction power facilities of Alternative 3 would be as described for Alternatives 1 and 2.

Train Control and Communication Facilities

Train control and communications facilities would be as described for Alternatives 1 and 2.

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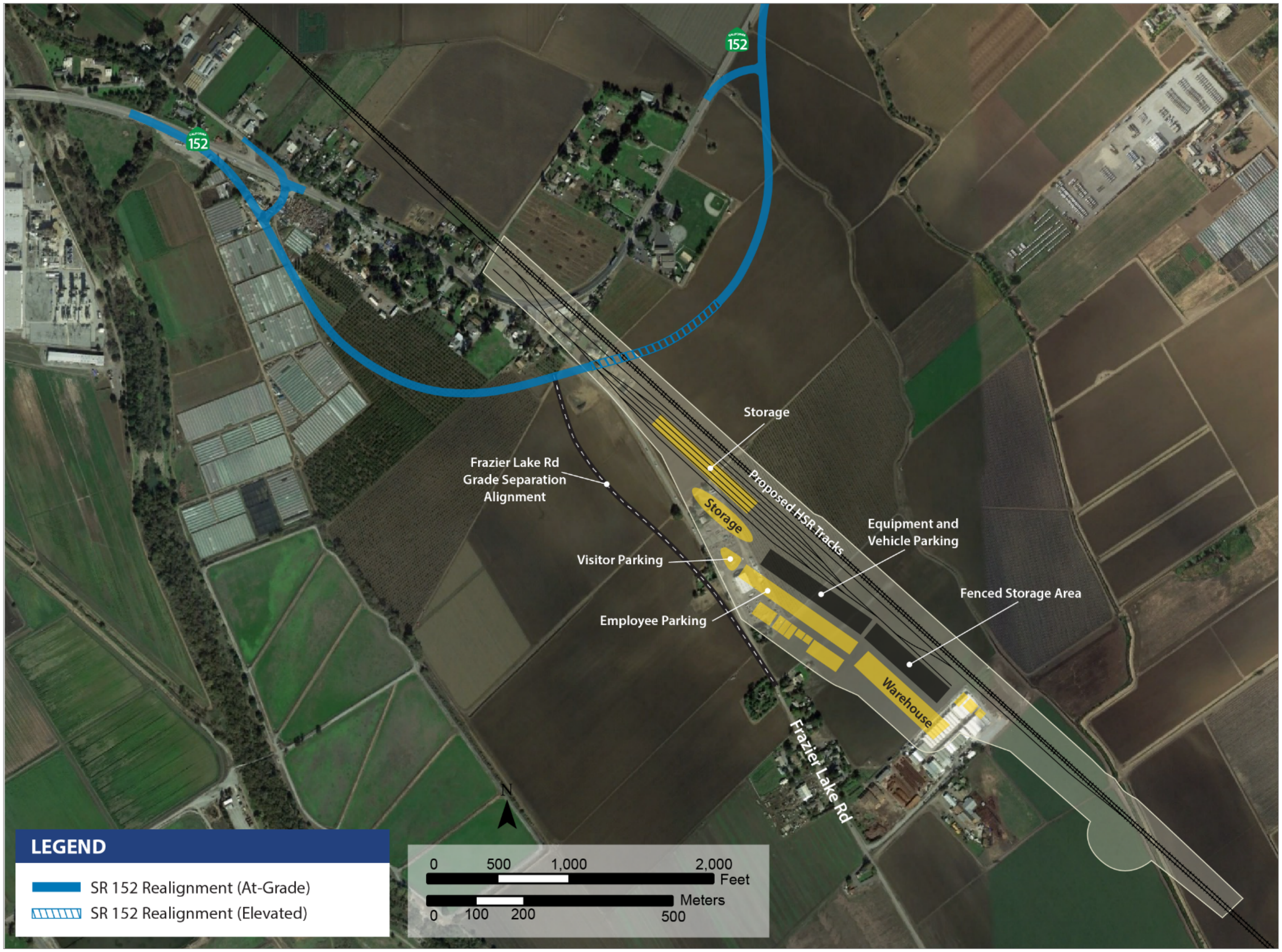

Source: Authority 2019c

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Figure 2-18 East Gilroy Maintenance of Way Facility

Maintenance Facilities

An MOIS would be constructed west of Turner Island Road near Carlucci Road as described for Alternatives 1 and 2 (Figure 2-13)

2.2.4 Alternative 4 (State's Preferred Alternative, CEQA Proposed Project)

On September 17, 2019, the Authority Board of Directors reviewed a staff recommendation on the State's Preferred Alternative and a summary of key identified outreach concerns. The Board confirmed that Alternative 4 is the State's Preferred Alternative for purposes of the Draft EIR/EIS and serves as the CEQA proposed project for purposes of State CEQA Guidelines Section 15124.

The process for considering and the rationale for selecting the State's Preferred Alternative are presented in Chapter 8, State's Preferred Alternative, of the Draft EIS/EIR.

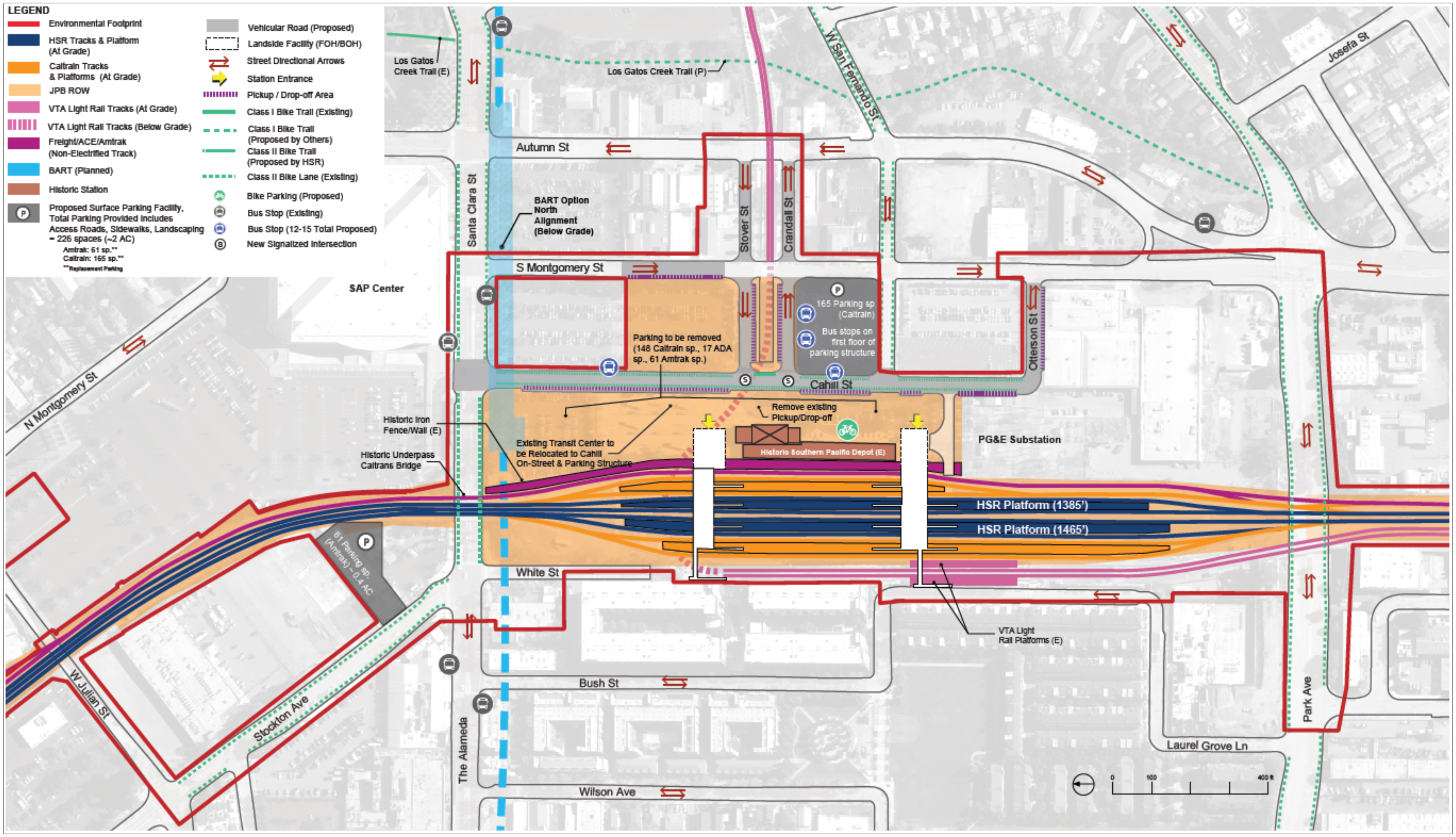
Development of Alternative 4 was intended to extend blended electric-powered passenger railroad infrastructure from the southern limit of the Caltrain Peninsula Corridor Electrification Project through Gilroy. South and east of Gilroy, HSR would operate in a dedicated guideway similar to Alternatives 1, 2, and 3. 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 three other 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.

2.2.4.1 San Jose Diridon Station Approach Subsection

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 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.



Source: Authority 2019c

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

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.

Wildlife Crossings

There would be no wildlife crossings in this subsection.

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 2-19). The existing historic train 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 (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. 2027–2029 is indicated in red. 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.

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

Maintenance Facilities

No maintenance facilities are proposed within this subsection.

2.2.4.2 Monterey Corridor Subsection

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 at West Alma Avenue, just south of the Caltrain Tamien Station, the alignment would extend primarily 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 tracks, 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 Corridor 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 2 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 structures. 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, Branhan 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.

Wildlife Crossings

There would be no wildlife crossings in this subsection.

Stations

There would be no HSR stations within this subsection.

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.

Train Control and Communication Facilities

Five ATC sites would be built in the subsection:

- 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 Communications Hill on the east side of the Caltrain corridor near Chateau La Salle Drive or Montecito Vista Way (two site options)
- 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)
- Near Branham Lane on the west side of the Caltrain corridor

Two stand-alone communications radio sites built:

- Near Almaden Road on the east side of the Caltrain corridor
- 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
- One site co-located with the ATC site at Branham Lane

2.2.4.3 Morgan Hill and Gilroy Subsection

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 blended service with Caltrain on an at-grade profile within the Caltrain and 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 roads crossing would be eliminated and alternate access provided to those properties. The existing Bailey Avenue overpass would remain in place. Under Alternative 4 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 constructed 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 constructed 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 a separate 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 Road on a new structure. Four-quadrant barrier gates and intrusion deterrents would be installed at Bloomfield Road 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 join Alternative 1 as described for Alternative 1.

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
- 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 Road.

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.

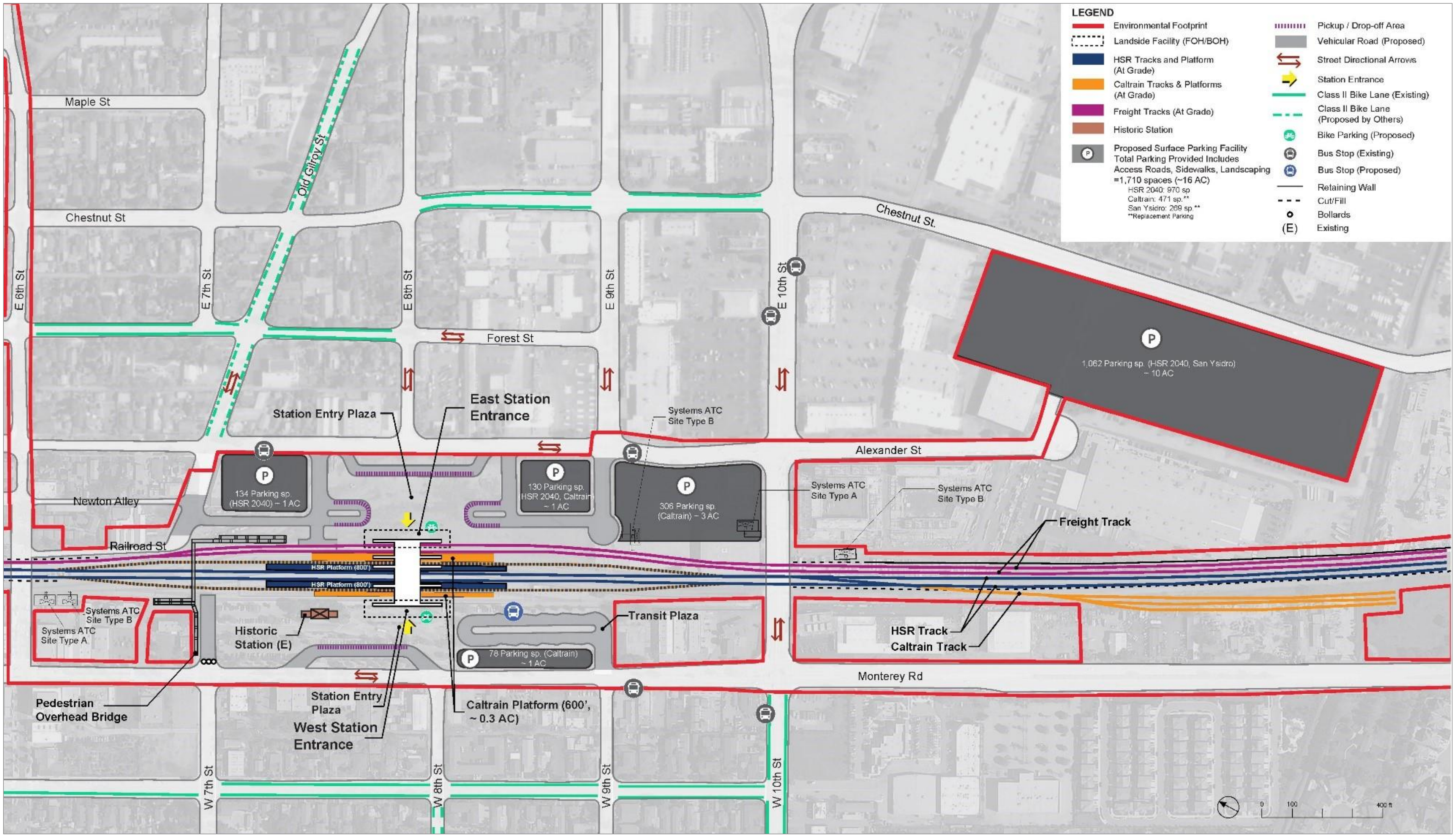
The existing 489 Caltrain parking spaces on the west side of the station would be replaced 1:1 in parking lots on the east and west sides of the alignment. The existing 269 parking spaces at the San Ysidro housing development would be replaced 1:1 with new surface parking at the south end of Alexander 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 constructed. Figure 2-20 illustrates the conceptual at-grade Downtown Gilroy Station.

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 constructed at the south end of the platform.

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 [two underground or one underground and one overhead on existing power structures] fiber optic lines) would also be required to support the electrical interconnections of the TPSS to a new PG&E switching station and/or to existing PG&E facilities, typically within tie-line/utility corridors.



Source: Authority 2019c

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

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

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 (like Alternative 1)
- Near the Tunnel 1 east portal, either at the portal or east of SR 152 in the southern area of Casa de Fruta (like Alternatives 1 and 2)

PG&E would reinforce the electric power distribution network to meet HSR traction and distribution power requirements by replacing (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.

Train Control and Communication Facilities

Twenty-two 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 north 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
- One site near Lake Road (two site options) (like 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
- One site south of East 6th Street

Five stand-alone 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
- East of the Pajaro River south of Gilroy

Maintenance Facilities

The South Gilroy MOWF (Figure 2-21) near Bloomfield Road 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.

2.2.4.4 Pacheco Pass Subsection

Alignment and Ancillary Features

Alternative 4 would be as described for Alternatives 1–3 for this subsection.

Wildlife Crossings

The wildlife crossings under Alternative 4 would be as described for Alternatives 1–3.

Stations

No new HSR stations are proposed for this subsection.

Traction Power Facilities

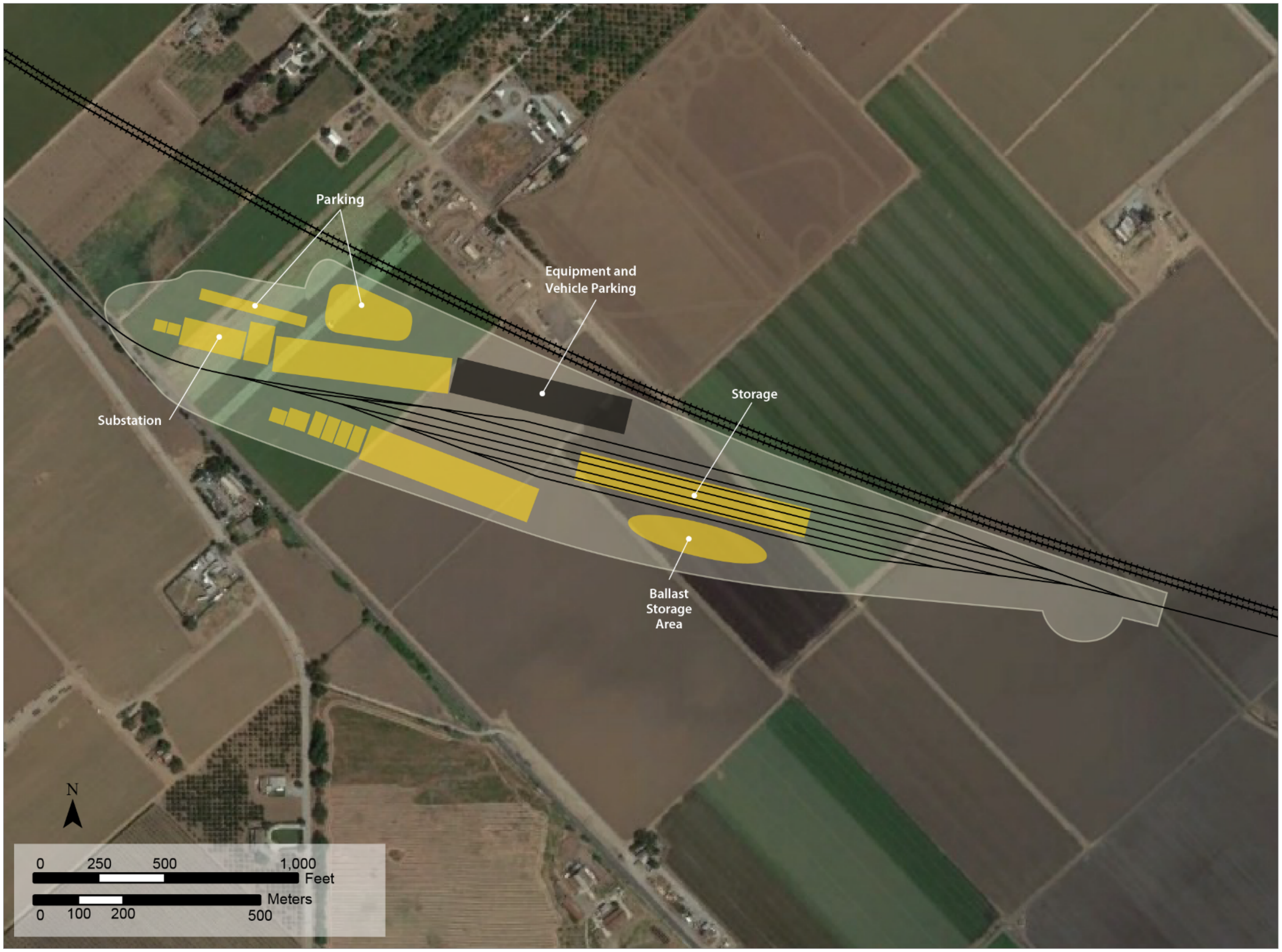
Traction power facilities of Alternative 4 would be as described for Alternatives 1–3.

Train Control and Communication Facilities

Train control and communications facilities would be as described for Alternatives 1–3.

Maintenance Facilities

An MOIS would be built west of Turner Island Road near Carlucci Road as described for Alternatives 1–3 (Figure 2-13).



Source: Authority 2019c

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

2.2.4.5 San Joaquin Valley Subsection

Alignment and Ancillary Features

Alternative 4 would be the same as described for Alternatives 1–3 for this subsection.

Wildlife Crossings

The wildlife crossings under Alternative 4 would be as described for Alternatives 1–3.

Stations

No new HSR stations are proposed for this subsection.

Traction Power Facilities

Traction power facilities would be as described for Alternatives 1–3.

Train Control and Communication Facilities

Train control and communications facilities would be as described for Alternatives 1–3.

Maintenance Facilities

An MOIS would be built west of Turner Island Road near Carlucci Road as described for Alternatives 1–3 (Figure 2-13).

3 PROJECT SETTING

The project extent passes through three major geophysical regions (distinct landscapes): the Santa Clara Valley, the southern reaches of the Diablo Range, and the Central Valley. Within these regions, the alignment crosses the Santa Clara Valley, Pacheco Peak Valley, Pacheco Pass, and the San Joaquin Valley. The dominant land cover/land use in the western portion of the study area is urban/suburban development giving way to rural residential in scattered communities. Farther east the study area transitions to agriculture that consists of row and field crops, orchards, vineyards, livestock grazing, and natural open space. Elevations in the project extent range from 150 feet to 1,200 feet above mean sea level.

3.1 Vegetation Communities

The project extent is located within the California Floristic Province and traverses the San Francisco Bay Area subregion of the Central Western California region, and the San Joaquin Valley subregion of the Great Central Valley region. The San Francisco Bay Area subregion is physiographically defined by features such as Mount Tamalpais, the Santa Cruz Mountains, and the northern Diablo Range, including Mount Diablo and Mount Hamilton. The southern boundary is somewhat arbitrary, following SR 156 and SR 152 from the Coast Ranges east of Castroville, through Hollister and Pacheco Pass, to the San Joaquin Valley subregion. The San Francisco Bay Area subregion encompasses a diversity of vegetation types, from very wet redwood forest to dry oak/pine woodland and chaparral. The San Joaquin Valley subregion extends from the northern border of Contra Costa and San Joaquin Counties south to the northern border of Ventura and Santa Barbara Counties.

The study area contains natural vegetation types, agricultural lands, and developed areas. Detailed 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. Terrestrial land cover types were classified in accordance with the 2011 *Administrative Draft San Jose to Merced Section Biological Resources and Wetlands Technical Report* (Authority and FRA 2011b), or identified using the *Manual of California Vegetation* (Sawyer et al. 2009; CNPS 2017) or the *California Wildlife Habitat Relationships Habitat Classification Scheme* (CDFW 2014). Aquatic land cover types were further classified in accordance with the USFWS's *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al. 1979). Land cover mapping was verified in the field during the field surveys (Authority 2019a).

The natural vegetation types observed in the study area consist of both upland and wetland vegetation communities. Upland vegetation communities include blue oak–foothill pine woodland, California sycamore woodland, coastal oak woodland, coastal scrub, mixed chaparral, and California annual grassland. Wetland vegetation communities include alkali marsh, alkali scrub, alkali vernal pools and complexes, freshwater marsh, palustrine forested riparian, seasonal wetlands, and vernal pools. Nonwetland waters (e.g., rivers and streams) are present as inclusions in these upland and wetland vegetation types and include natural watercourses, freshwater ponds, constructed basins, constructed watercourses, and reservoirs. Chapter 5 provides descriptions of the wetland communities.

3.1.1 Agricultural Lands

Four agricultural land cover types were identified in the study area: agricultural field crops, orchard, row crop, and vineyard. Water features, such as constructed watercourses 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.

3.1.2 Developed Lands

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

3.1.3 Upland Natural and Semi-Natural Habitats

The terms *natural* and *semi-natural* refer to native and introduced terrestrial vegetation communities, respectively. Areas mapped as natural and semi-natural habitats are not considered waters of the U.S. because they lack one or more of the federal wetland criteria (i.e., wetland hydrology, hydric soil, and hydrophytic vegetation) (Environmental Laboratory 1987: page 11; USACE 2008: pages 3–4).

Riparian communities are located on the banks of natural waterways, including streams, sloughs, rivers, and, in some cases, along constructed waterways where they form transition zones between terrestrial and wetland ecosystems. Some of the riparian areas are characterized by a prevalence of hydrophytic vegetation but do not meet the other federal criteria for wetlands. Specifically, such riparian communities may consist of overstory species that are facultative wetland; however, the communities' soils, hydrology, or understory vegetation are not representative of federally regulated wetland communities. These types of riparian areas would be regulated by the state (e.g., under Cal. Fish and Game Code Section 1602) but would not be federally regulated (under CWA 404).

The most common semi-natural habitat in the study area is California annual grassland, which is characterized by nonnative annual grasses such as ripgut brome (*Bromus diandrus*), soft chess (*Bromus tectorum*), Mediterranean barley (*Hordeum marinum*), medusa-head (*Elymus caput-medusae*), and common wild oat (*Avena fatua*). Native annual and perennial herbaceous species may also be present in the California annual grassland community. Two nonvegetated upland habitats occur in the study area: barren and rock outcrop.

3.1.4 Waters of the U.S.

Potential waters of the U.S. mapped in the study area include alkali marsh, alkali scrub, alkali vernal pools and complexes, freshwater marsh, mixed riparian-natural watercourse, palustrine forested riparian, palustrine forested riparian-natural watercourse,seasonal wetlands, vernal pool, constructed basins, freshwater ponds, constructed watercourses, natural watercourses, and reservoirs. These resources may be grouped into two categories: (1) palustrine wetlands and (2) nonwetland waters.

Palustrine wetlands are a broad class of nontidal wetlands that include marshes, swamps, bogs, fens, and prairies (Cowardin et al. 1979: page 10). In the study area, alkali marsh, alkali scrub, alkali vernal pools and complexes, freshwater marsh, mixed riparian-natural watercourse, palustrine forested riparian, palustrine forested riparian-natural watercourse , seasonal wetlands, and vernal pools are considered palustrine wetlands.

Nonwetland waters include aquatic features that do not meet the wetland criteria established by the USACE, but do meet requirements (i.e., have an ordinary high water mark [OHWM]) to be considered nonwetland waters of the U.S. In the study area, constructed basins, freshwater ponds, constructed watercourses, natural watercourses, and reservoirs are considered nonwetland waters. Descriptions of these aquatic resource types are provided in the following sections.

3.1.4.1 Wetlands

Alkali Marsh

Alkali marsh areas are herbaceous communities with 30 percent or more cover dominated by alkali heath (*Frankenia salina*). Associate species include grasses and forbs adapted to saline aquatic environments such as alkali weed (*Cressa truxillensis*), salt grass (*Distichlis spicata*), and salt bush (*Atriplex canescens*). Alkali marshes occur in coastal salt marshes, brackish marshes, alkali meadows, and alkali playas. Soils are saline, sandy to clayey alluvium (CNPS 2017).

Alkali Scrub Wetland

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 occur in dry lakebed margins, hummocks, playas perched above drainages, and seeps (CNPS 2017).

Alkali Vernal Pool

Alkali vernal pool areas are herbaceous communities with alkali weed or salt grass as the dominant species. Associate species include vernal pool grasses and forbs adapted to saline aquatic environments such as seaside barley (*Hordeum marinum*), flatface downingia (*Downingia pulchella*), dwarf popcornflower (*Plagiobothrys humistratus*), and prostrate navarretia (*Navarretia prostrata*). Alkali vernal pools are located within alkaline or saline vernal playas and alkali sinks. Soils are seasonally inundated and formed from saline alluvium that lose water mostly through evaporation (CNPS 2017).

Alkali Vernal Pool Complex/California Annual Grassland Complex

Alkali vernal pool/California annual grassland complexes contain both (nonwetland) California annual grasslands and alkali vernal pools. These areas are characterized by a dense, interconnected mosaic of the two vegetation communities. The communities are interconnected to an extent that it was not possible to map the vernal pool areas separately from the annual grassland areas without the benefit of field surveys. However, using soil survey mapping and aerial image interpretation, an estimated percent of each vegetation community was applied based on the soil map unit associated with the community (NRCS 2017a). The soil map unit contains a hydric soil component (i.e., Pedcat series soil) that was used to estimate the amount of alkali vernal pools that could occur within the complex: 55 percent California annual grassland and 45 percent alkali vernal pool.

Freshwater Marsh

Freshwater marshes are nontidal, flooded, depressional wetlands and designated as palustrine emergent semi-permanently flooded wetlands in Cowardin et al. (1979). 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, backwater areas, and within the channels of rivers and sloughs.

Mixed Riparian-Natural Watercourse

The mixed riparian-natural watercourse wetland 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 LiDAR to determine the OHWM of the natural watercourses and then analyzing areas where the vegetation cover meets or exceeds 30% of the area. Mixed riparian-natural watercourse wetlands are classified by Cowardin as palustrine scrub-shrub wetlands (PSS).

Palustrine Forested Wetland

Palustrine forested wetland communities are located on the banks of natural waterways including streams, sloughs, 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 (*Populus fremontii*) or mixed with other tree species including box elder (*Acer negundo*), Oregon ash (*Fraxinus latifolia)*, northern California black walnut (*Juglans hindsii*), and California sycamore (*Platanus racemosa*). The shrub layer in this community is typically dominated by willow species (*Salix* sp.)and California wild grape (*Vitis californica*). The understory of palustrine forested wetlands may support emergent perennial vegetation such as cattails, sedges, and rushes.

Palustrine Forested Wetland-Natural Watercourse

The palustrine forested-natural watercourse wetland 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% of the area. Palustrine forested wetland-natural watercourse wetlands are classified by Cowardin as palustrine forested wetlands (PFO).

Seasonal Wetland

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 usually by the absence of a distinct claypan or hardpan layer. 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 winter and spring, and the seasonal wetlands are dry during the summer and fall.

Vernal Pool

Vernal pools are a type of seasonal wetland characterized by annual forbs and grasses. Vernal pools occur as depressions in soils with a very slowly permeable layer that causes a shallow perched water table to form, which fills the depression, and gradually evaporates in the spring and summer until the pool is completely dry.

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

3.1.4.2 Nonwetland Waters

Constructed Basin

Constructed basins in the study area consist of constructed stormwater retention basins, dairy waste settling ponds, and agricultural tailwater ponds. Constructed basins are highly disturbed and may be routinely managed through vegetation removal and dredging. Depending on substrate and management regimes, vegetative type and cover vary, although most constructed basins lack wetland vegetation and may support upland vegetation. Palustrine wetlands may be associated with constructed basins at their margins and in shallow areas where deep water does not preclude vegetation establishment. Hydrology also varies in relation to precipitation events, irrigation inputs or removal, and other management objectives. Constructed basins are classified as palustrine unconsolidated bottom deepwater habitats by Cowardin et al. (1979: page 14). The constructed basins presented in this report do not include wastewater treatment facilities.

Constructed Watercourse

Canals and ditches in the study area are channelized water features that have been constructed primarily for the conveyance of agricultural irrigation water. Most of these features are linear, excavated U-shaped or trapezoidal channels that are routinely maintained. Constructed watercourses range in size from small, shallow ditches (10 feet wide and 3–4 feet deep) to broad channels (50 feet wide and 10 feet deep). Scattered emergent vegetation is present in some areas, but most constructed watercourses are routinely cleared of vegetation, sprayed with herbicides, or both. Constructed watercourses are classified as nonwetland riverine systems, similar to natural watercourses, using the Cowardin system; palustrine wetlands may also be associated with these constructed features (Cowardin et al. 1979: page 7). However, an altered hydroperiod and routine maintenance of constructed watercourses limits the establishment of palustrine wetlands.

Freshwater Pond

Freshwater ponds in the study area are most commonly ephemeral constructed water features. They are inland depressions or dammed riverine channels containing standing water (Cowardin et al. 1979). They differ from constructed basins in that they are located in semi-natural grassland areas, are not regularly maintained, and function as a water source for livestock.

Natural Watercourse

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 their flow has been impounded or diverted upstream into other watercourses for agricultural purposes.

Reservoir

Reservoirs in the study area are permanently flooded constructed water features. They are inland depressions or dammed river channels containing standing water (Cowardin et al. 1979).

3.2 Topography and Climate

The project extent is located within three ecological sections: Central California Coast, Central California Coast Ranges, and Great Valley (Miles and Goudey 1998).

In the Central California Coast section, the project extent crosses the Santa Clara Valley subsection, which consists of an alluvial plain in the Santa Clara Valley that extends from Hollister to San Francisco Bay and an alluvial plain along the southwestern side of San Francisco Bay. Elevations range from sea level to approximately 250 feet on the alluvial plains and to about 1,000 feet on the hills west of Hollister (Miles and Goudey 1998).

Within the Central California Coast Ranges section the project extent crosses three subsections: Eastern Hills, Diablo Range, and Western Diablo Range. The Eastern Hills subsection consists of hills and low mountains in parts of the Diablo Range as well as some hills south of the Diablo Range. Elevations range from approximately 100 to 3,000 feet. The Diablo Range subsection consists of the steep, mountainous central part of the Diablo Range and steep hills along the east-northeast side of the San Andreas fault between Hollister and Parkfield. Elevations range from approximately 1,000 feet adjacent to the Santa Clara Valley to 4,000–5,000 feet on the higher mountains. The Western Diablo Range subsection consists of mountains with rounded ridges, steep and moderately steep sides, and narrow canyons. Elevations range from approximately 1,000 to 4,000 feet (Miles and Goudey 1998).

Within the Great Valley section the project extent crosses two subsections: San Joaquin Basin and Westside Alluvial Fans and Terraces. The San Joaquin Basin subsection consists of floodplains and the basin floor in the middle of the San Joaquin Valley. Elevations range between 60 and 100 feet above sea level. The Westside Alluvial Fans and Terraces subsection is along the western edge of the San Joaquin Valley, adjacent to the Coast Ranges. Elevations range from sea level to approximately 1,500 feet (Miles and Goudey 1998).

Elevations in the study area range from 55 feet at its western tip in Santa Clara to 1,583 feet at Pacheco Pass. Slopes range from nearly level in the Santa Clara Valley and between I-5 and the eastern tip of the study area to approximately 75 percent in the Pacheco Pass area. Some areas east of I-5 have been levelled for agricultural use.

The Mediterranean climate typical of the region consists of cool, wet winters and hot, dry summers. Mean annual temperatures in the study area range from a low of 36 degrees Fahrenheit (°F) in December to a high of 95°F in July. The Natural Resources Conservation Service (NRCS) Climate Analysis for Wetlands Tables (WETS Tables) (NRCS 2017b) show a growing season (defined as a 50 percent probability of temperatures at or above 28°F) of 342 days for Gilroy and 339 days for Los Banos. Precipitation is greater in the Central California Coast section (Santa Clara Valley subsection) than in the Great Valley sectionas illustrated by the average annual precipitation in Gilroy (20.56 inches) and Los Banos (9.79 inches). Approximately 79 to 85 percent of the annual rainfall occurs from November to March (NRCS 2017b).

3.3 Hydrology

The natural hydrology of the region has been substantially altered by the construction of dams, storage reservoirs, diversion dams, and canals, as well as by groundwater pumping, which is associated primarily with agricultural irrigation. This section discusses the study area's watersheds and hydrology, as well as wetland hydrology, and provides a brief description of the growing season.

3.3.1 Watersheds and Hydrology

The western part of the project extent crosses watersheds that drain to the San Francisco Bay; these drainages include Pacheco Creek, Pajaro River, Dexter Creek, Llagas Creek, Coyote Creek, Dry Creek, and Guadalupe River. Pacheco Pass is the divide between these watersheds and the San Joaquin River watershed to the east.

The eastern part of the project extent lies in the southern portion of the San Joaquin River watershed. The San Joaquin River watershed extends from the Sacramento–San Joaquin Delta in the north to the northern boundary of the Tulare Lake Basin in the south, and from the crest of the Sierra Nevada in the east to the crest of the Coast Ranges in the west. The watershed encompasses about 13,500 square miles and includes large areas of high elevation along the western slope of the Sierra Nevada. As a result, the San Joaquin River experiences significant snowmelt runoff during the late spring and early summer. Unrestricted flood flows historically occurred between April and June following snowmelt in the Sierra Nevada.

The study area crosses three U.S. Geological Survey (USGS) HUC-8 watershed subbasins: Coyote (HUC 18050003), Pajaro (HUC 18060002), and Middle San Joaquin–Lower Chowchilla (HUC 180400001) (USGS 2017) (Figure 3-1). Prominent water features in the Coyote watershed include Coyote Creek, Guadalupe River, Los Gatos Creek, Saratoga Creek, and Steven Creek. The natural hydrology of parts of the watershed has been substantially altered by dense urbanization.

Prominent water features in the Pajaro watershed include the San Benito River, Pajaro River, Llagos Creek, and Tres Pinos Creek. The Pajaro River historically flowed through an extensive area of open water lagoons, seasonal and perennial wetlands, and riparian vegetation. This area has been drained and converted to agricultural land uses, but it still frequently floods.The hydrology of the Pajaro watershed has also been altered by groundwater pumping and water imports from the Central Valley Project.

Prominent water features in the Middle San Joaquin–Lower Chowchilla watershed include Mud Slough, the Delta-Mendota Canal, the California Aqueduct, and the San Joaquin River. The natural hydrology of this part of the study area has been substantially altered by construction of canals, ditches, and flood-control channels, and by groundwater pumping associated primarily with agricultural irrigation. In particular, Friant Dam and the levee and bypass system along the San Joaquin River have largely eliminated seasonal inundation of large areas of the watershed. Surface water deliveries, including interbasin transfers via the Delta-Mendota Canal, support irrigated agriculture through an extensive system of canals and ditches. In the Grasslands Ecological Area, which the project traverses, these water delieveries are used to mimic historical inundation patterns to provide extensive areas of habitat for waterfowl. All drainages east of Pacheco Pass drain to the San Joaquin River, which drains into the Sacramento–San Joaquin Delta and San Francisco Bay.

3.3.2 Historical Hydrology

Prior to Euroamerican settlement and agricultural development, the Santa Clara Valley and San Joaquin Basin supported rich and diverse natural communities. Aquatic habitats included sloughs, creeks, rivers, lakes, ponds, and perennial wetlands and their associated plants and animals. Terrestrial habitats included seasonal wetlands, riparian forest, valley oak savanna, grassland, and San Joaquin saltbush communities (USGS 1998: page 6).

Large portions of the southern Central Valley floor were subject to frequent flood events. Regular flooding is now largely controlled by dams, diversions, levees, and dredging. The former floodplain and riparian habitats have also largely been replaced by agriculture or urban development. Infrequent but catastrophic floods now occur in parts of the San Joaquin Valley; the flood effects are exacerbated by the loss of the flood-attenuating functions provided by riparian and wetland habitats (Vileisis 1997).

Most of the San Joaquin Valley floor is underlain by continental and marine sediments up to several miles thick. These include coarse-grained, water-bearing zones. Groundwater exists under both unconfined and semi-confined conditions. Groundwater levels vary with seasonal rainfall, withdrawal, and recharge. Depth to groundwater in the valley ranges from a few inches to more than 100 feet (USBR 2003: pages 6-26 to 6-33).

In spring 2000, depth to groundwater in the unconfined aquifer was as shallow as approximately 10 feet below ground surface near the eastern part of the study area. Shallow perched groundwater occurs locally (USBR 2003: page 6-29). In the San Joaquin Valley floor portion of the study area, groundwater recharge occurs through percolation of applied irrigation water, leaking water from agricultural ditches, and infiltration of rainfall and streamflow. High levels of soluble salts and boron in groundwater are of local concern, especially west of the San Joaquin River (SCS 1990: page 2; USBR 2003: page 6-34).

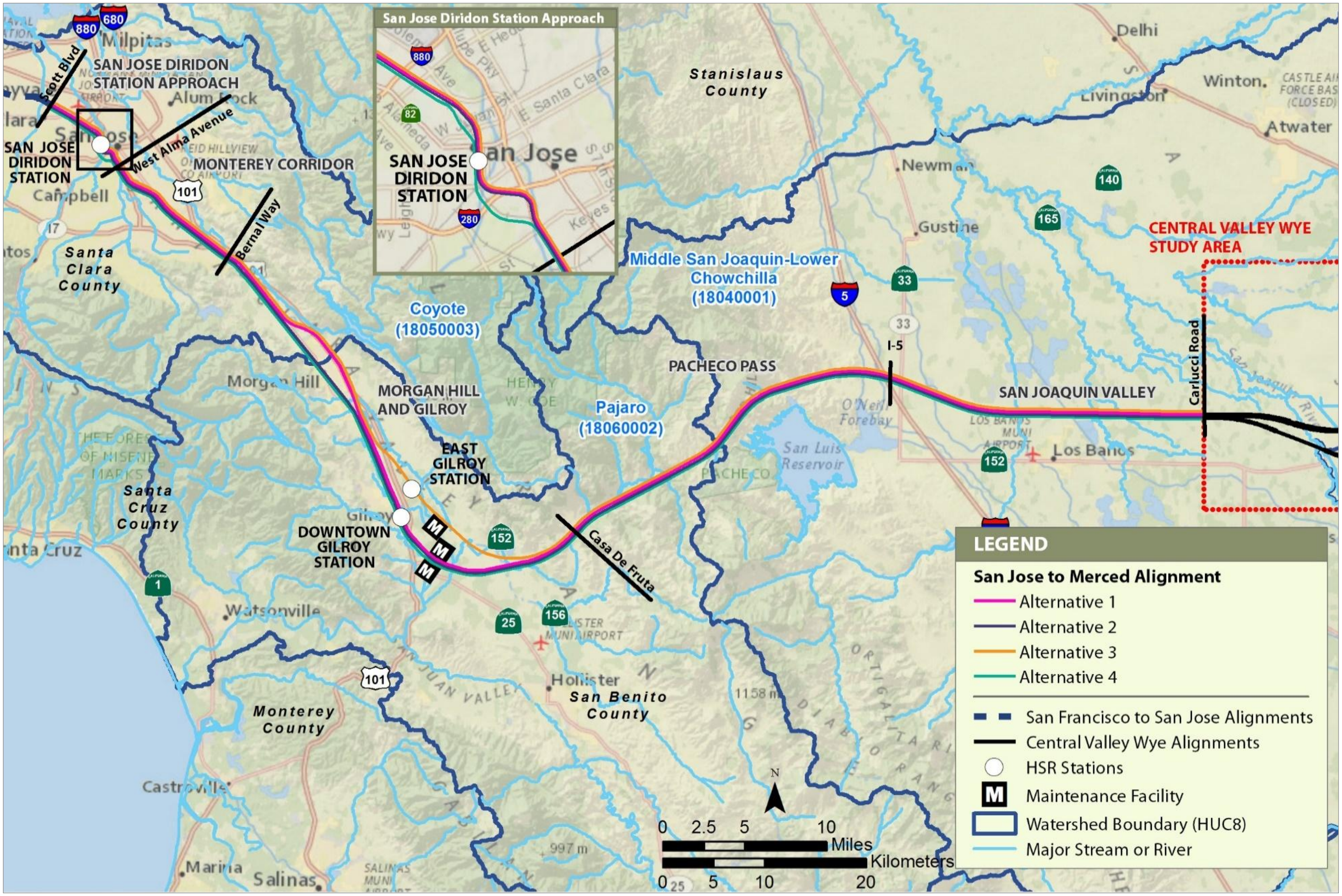
Most of the streams and rivers in the San Joaquin Valley floor and parts of the Santa Clara Valley portion of the study area have been dredged, culverted, diverted, dewatered, or channelized; some have had their active floodplains severely reduced by levee construction. Groundwater pumping for large agricultural and urban demands has resulted in groundwater level decline in many areas of the Central Valley (Vileisis 1997).

The Santa Clara Valley floor contains urban development and extensive impervious surfaces. Portions of southern Santa Clara Valley, however, remain agricultural. In the Santa Clara Valley, groundwater varies from artesian conditions near San Francisco Bay to 85 feet below the ground surface in San Jose south of I-280.

3.3.3 Wetland Hydrology

Alterations to both surface and groundwater in the region have resulted in a decline in historical wetland areas. This decline is reflected in “drained” or “partially drained” hydric soils that have been mapped in the area.

Hydrologic conditions in the study area are highly manipulated in urban and agricultural areas. Most of the surface water present in the study area is diverted by the numerous constructed and natural watercourses throughout the Santa Clara and San Joaquin Valleys. Therefore, most of the surface water in the study area is either in irrigation canals or in water retention and detention basins, but a small portion remains in river channels and precipitation-fed wetlands. Many of the wetlands that remain in the study area are not directly connected hydrologically to the historical floodplains or regional aquifers.



Source: USGS 2017

JANUARY 2019

Figure 3-1 Watersheds and Major Hydrological Features of the Project

3.3.4 Growing Season Analysis

The growing season is defined as the period when the soil temperature at a depth of 12 inches below the ground surface is greater than 41˚F. The length of the growing season is typically approximated using an air temperature threshold of 28˚F at a frequency of 5 years in 10 (i.e., 50 percent) (USACE 2008 pages 59–61).

Table 3-1 shows a growing season analysis for the two climate stations in the study area that provide growing season data (NRCS 2017b). The two stations were selected to capture the geographic variability (and consequently, the climatic variability) of the study area and to represent the range of growing seasons in the area.

To meet the USACE criterion for wetland hydrology, the required minimum number of days of continuous soil saturation in the major part of the root zone or inundation to the surface is approximately 17 days, which is equal to 5 percent of the 333- to 338-day length of the local growing season at a temperature threshold of 28˚F. Observations of soil saturation or inundation during the early spring would be strong indicators for meeting the wetland hydrology criterion, assuming that soil temperature is in the typical range. The table shows the amount of precipitation that occurred in the period prior to the primary aerial image date (March 2017) that was used in the aerial photo interpretation.

Table 3-1 Growing Season Analysis and Precipitation Data

Station	Location Within Project Extent	Elevation (feet above msl)	Mean Rainfall July 1–Feb 28 (inches)	Actual Rainfall July 1, 2016–Feb 28, 2017 (average % of mean annual)	28°F Growing Season Dates	Number of Growing Season Days
Los Banos (CA5118)	East	120	6.64	166	1/15–12/20	339
Gilroy (CA3417)	Southwest	194	15.02	126	1/12–12/20	342

Sources: USACE 2008; NRCS 2017b
msl = mean sea level
°F = degrees Fahrenheit

3.4 Soils

Table 3-2 shows the general soil map units that occur in the study area, their county of occurrence, and the geomorphic surfaces upon which they occur. Each of the generalized geomorphic surfaces found in the study area is described in this section. The extent of the general soil map units in the study area is illustrated on Figures 3-2 through 3-6.

Many of the soils in the study area have been disturbed by agricultural activities. In particular, many of the soils in the San Joaquin Valley and Santa Clara Valley parts of the study area have been leveled, drained, or protected from flooding for agricultural purposes. Drainage systems and levees in the San Joaquin Valley date back many decades, but these were not always as efficient as modern systems for dewatering soils. Local water tables have also dropped because of groundwater overdraft.

Table 3-2 General Soil Map Units of the Project Extent

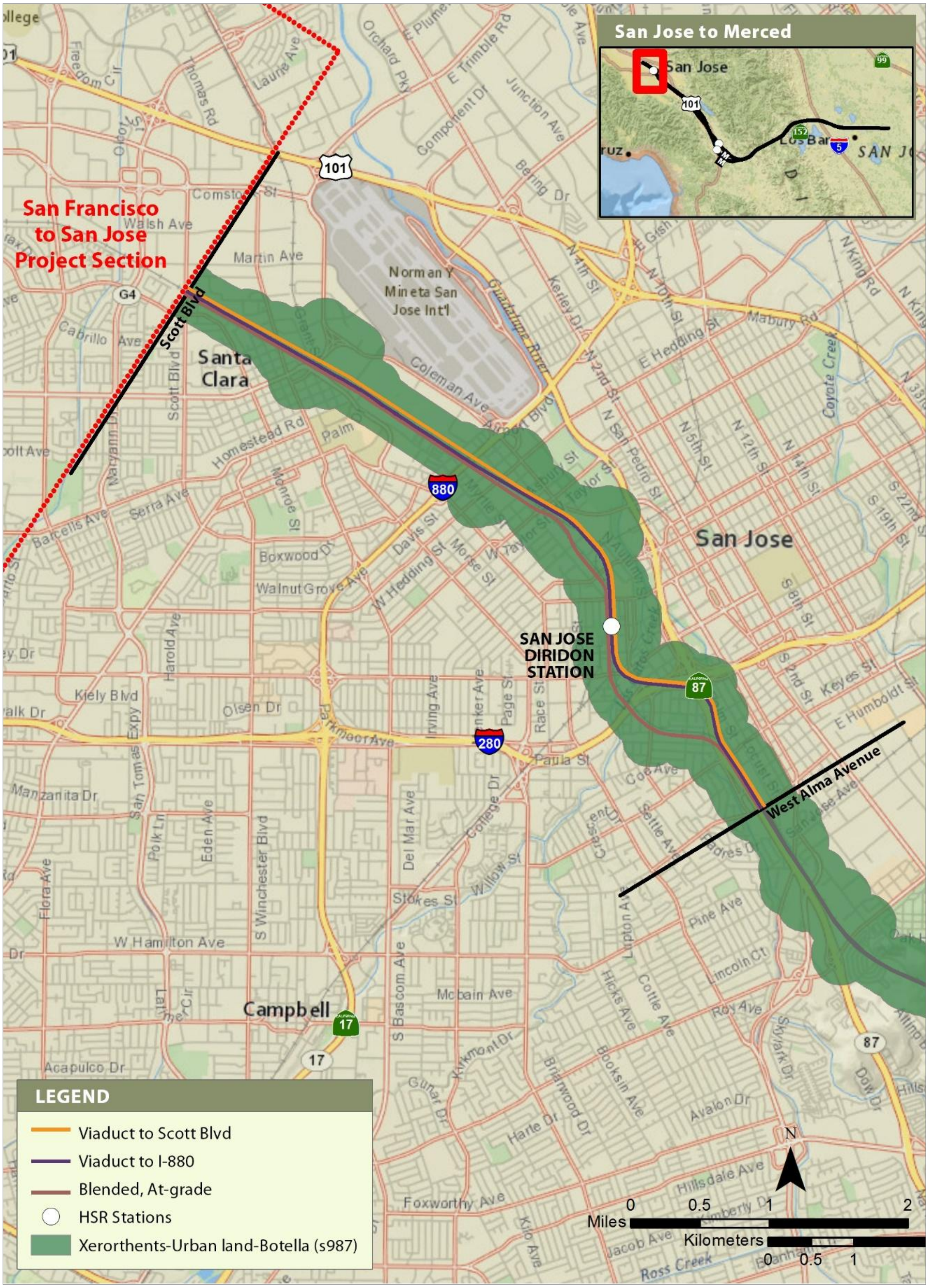
General Soil Map Unit (Map Symbol)	County of Occurrence	Landform
Elnido-Dospalos-Bolfar-Alros (s785)	Merced	Floodplains of the valley basin
Turlock-Triangle-Britto (s786)	Merced	Valley basin and valley basin rim
Dosamigos-Deldota-Chateau (s788)	Merced	Low alluvial fans
Woo-Stanislaus (s789)	Merced	Alluvial fans
Volta-Pedcat-Marcuse (s787)	Merced	Alluvial fans and valley basin rim
Oneil-Apollo (s791)	Merced	Foothills
Los Banos-Damluis-Bapos (s790)	Merced	Terraces
Millsholm-Honker-Gonzaga-Fifield (s793)	Merced	Mountains
Salinas-Mocho-Metz-Cropley (s940)	Santa Clara	Fans and terraces
Sheridan-San Benito-Diablo (s964) Montara-Henneke (s683) Vallecitos-Parrish-Los Gatos-Gaviota (s970)	Santa Clara	Uplands
Willows-Pacheco-Clear Lake (s960)	Santa Clara	Alluvial fans and plains
Pacheco-Clear Lake-Campbell (s967)	Santa Clara	Valley bottoms and alluvial plains
San Ysidro-Pleasanton-Arbuckle (s966)	Santa Clara	Old fans and terraces
Xerorthents-Urban land-Botella (s987)	Santa Clara	Valley bottoms and alluvial fans

Source: NRCS 2017c

3.4.1 Basin and Basin Rim

The lowest landform on the landscape is the basin. Basin parent materials are recent (Holocene age [within the last 12,000 years]) alluvial deposits. Because of their relatively young age, soils in these positions have not had time to develop subsurface restrictive layers and therefore tend to lack vernal pools. Examples of basin soils in the study area are the Clear Lake and Willows series, which occur in the vicinity of Gilroy (NRCS 2017a, 2017c).. The geomorphic surface immediately above the basin is known as the basin rim, which occupies the gradually transitioning area between the older alluvial fans and plains upslope and the younger basin downslope; this surface occurs in the eastern part of the study area.

The parent material in the basin rim landscape position is Pleistocene-age (2.6 million to 12,000 years old) alluvium. The soils are better developed and commonly have a subsoil layer of clay accumulation (i.e., an Argillic horizon). Soils in this position also tend to have high concentrations of sodium and soluble salts, a result of past evaporation of saline waters. Sodium in the soil disperses clay particles, resulting in increased clay movement and subsequent clay accumulation in the subsoil (i.e., a Natric horizon) and slow permeability in the soil profile.



Source: NRCS 2017c

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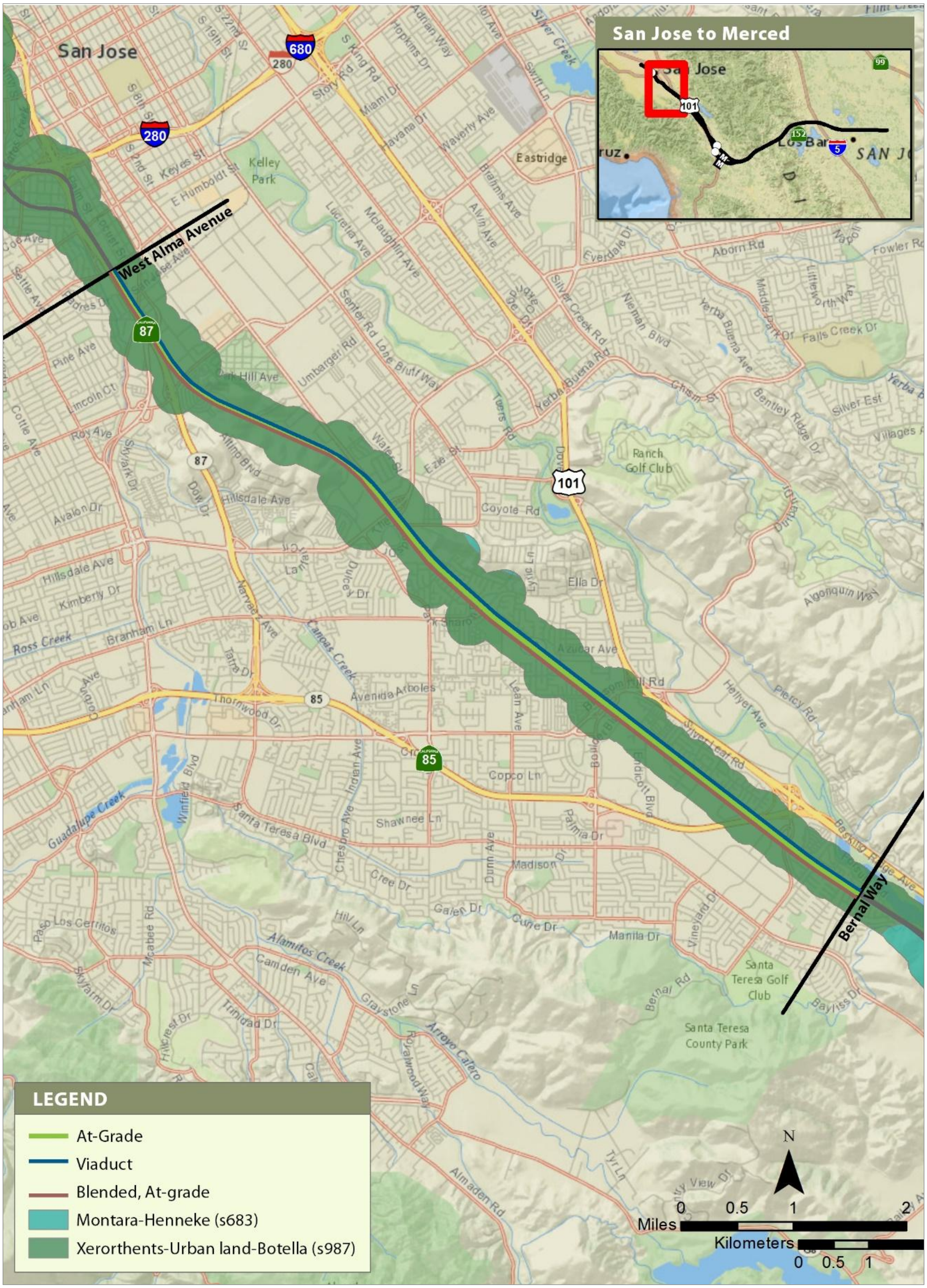
Figure 3-2 General Soil Map Units—San Jose Diridon Station Approach Subsection



Source: NRCS 2017c

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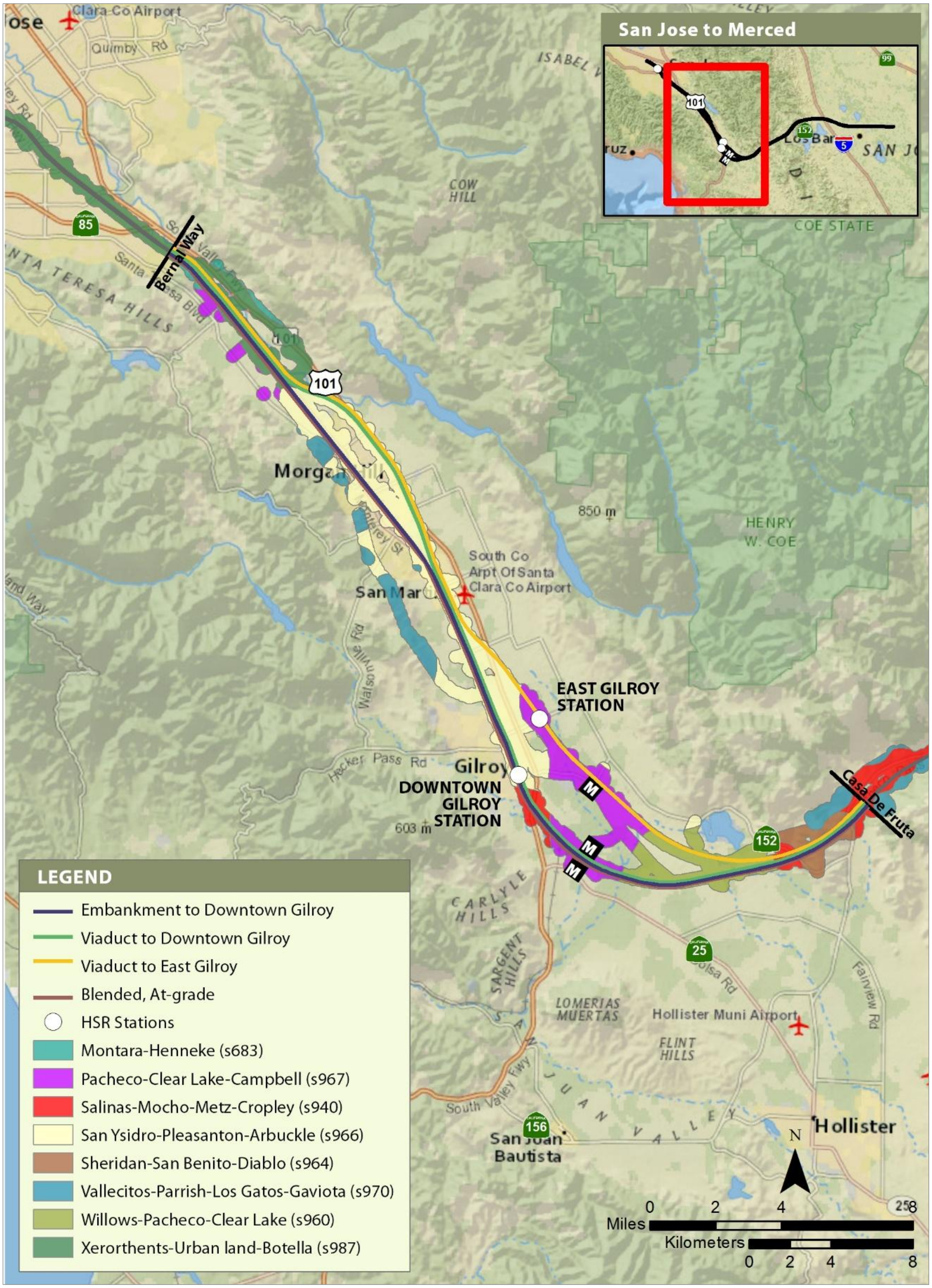
Figure 3-3 General Soil Map Units—Monterey Corridor Subsection



Source: NRCS 2017c

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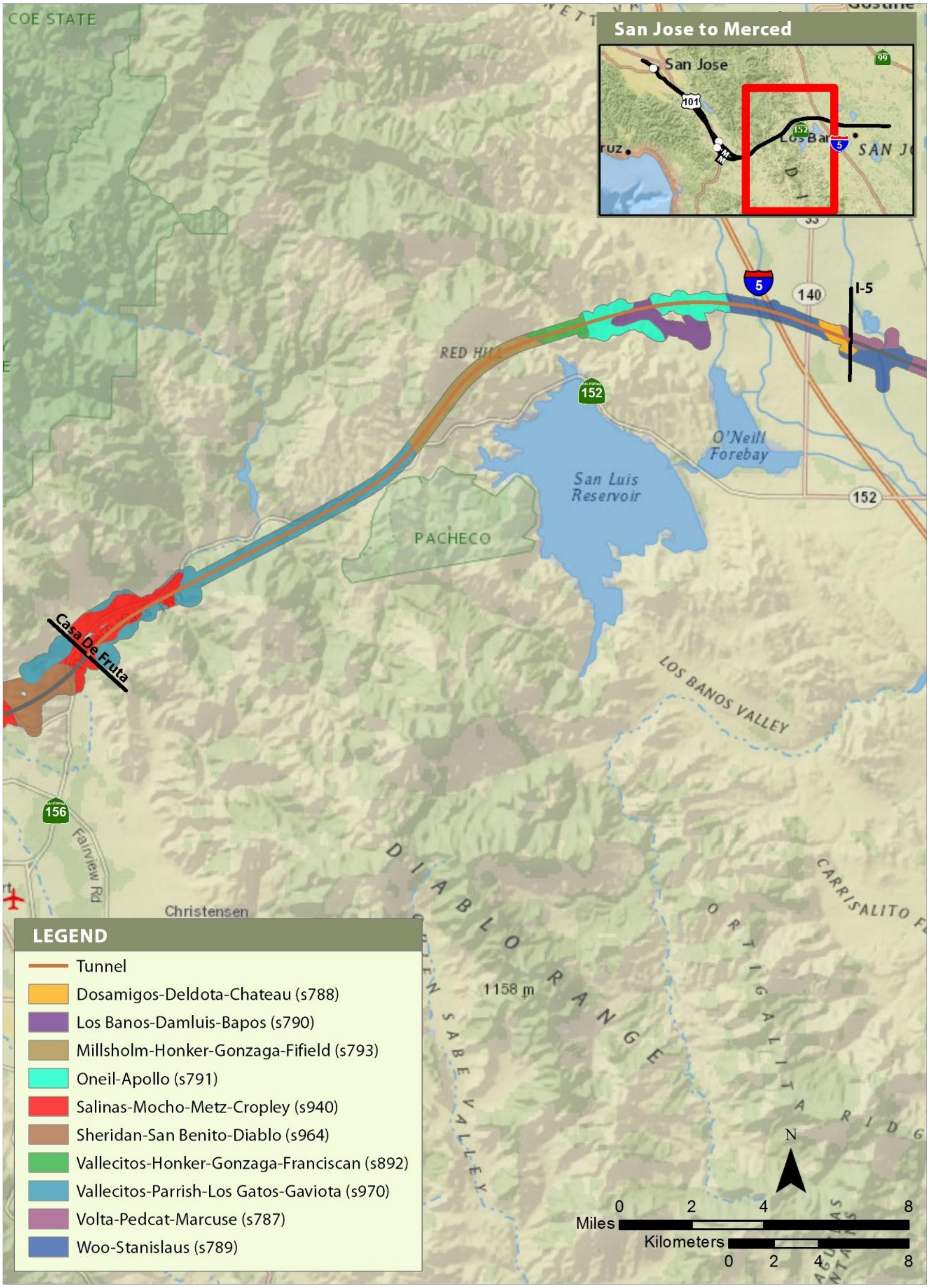
Figure 3-4 General Soil Map Units—Morgan Hill and Gilroy Subsection



Source: NRCS 2017c

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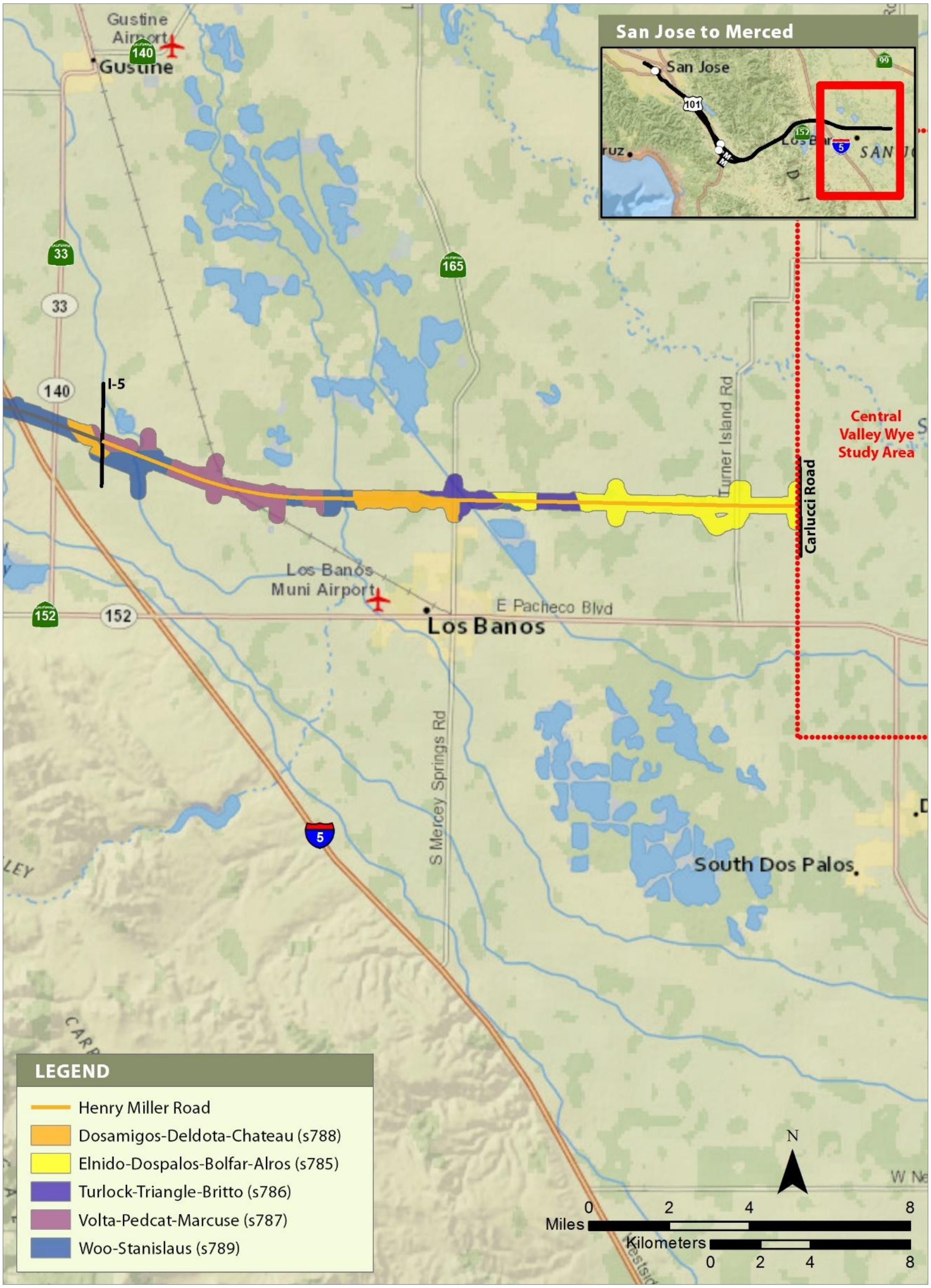
Figure 3-5 General Soil Map Units—Pacheco Pass Subsection



Source: NRCS 2017c

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Figure 3-6 General Soil Map Units—San Joaquin Valley Subsection

3.4.2 Floodplain, Alluvial Plain, and Alluvial Fan

The geomorphic surface between the basin rim and the terrace consists of floodplains, alluvial plains, alluvial fans, and valley bottoms. Most areas of these nearly level to gently sloping surfaces consist of alluvium that was deposited more than 12,000 years ago, but in areas adjacent to active stream channels, the alluvium can be much younger. The soils are weakly to moderately developed, with the most mature among them having a subsoil layer of clay accumulation (i.e., an Argillic horizon), such as the Pedcat series. Intensive agricultural practices (e.g., deep ripping, levelling) may have substantially altered some of the claypans where they historically occurred or otherwise cause the soil to no longer support wetlands (NRCS 2017a, 2017c).

3.4.3 Terrace

The terrace is an intermediate geomorphic surface in the study area. Soil parent material on this surface is Pleistocene-age alluvium. The microtopography is sometimes undulating. Soils such as the Herito and San Ysidro series developed on these surfaces commonly have clay-enriched subsoil layers. The claypan subsoil may cause a shallow perched water table to form in the soil, and where associated with depressions, the claypans are responsible for the occurrence of vernal pools (NRCS 2017a, 2017c). Agricultural development occurred first and most extensively on the low terraces; consequently, wetlands are rare on these surfaces.

3.4.4 Upland and Mountain

The highest geomorphic surfaces in the study area are uplands and mountains. Most areas of these surfaces are moderately sloping to steep. The soils formed from weathered bedrock or colluvium, are generally well drained, shallow to moderately deep, and weakly to moderately developed. Common soils on mountains and hills in the study area are the Vallecitos and Los Gatos series (NRCS 2017a, 2017c). Wetlands are not extensive on these surfaces.

4 WATERSHED EVALUATION METHODS

A Level 1 Watershed Profile was developed to support an analysis and description of each of the three HUC-8 watersheds that intersect the project extent. For each watershed, the profile includes a description of the major aquatic features and associated land uses. In the analysis, land use is a proxy to distinguish higher-quality aquatic features from features that are likely degraded. Aquatic features in high-intensity land use types were considered to be degraded based simply on surrounding land uses. Conversely, aquatic features in low-intensity and natural land use types were considered less disturbed and consequently of higher quality. The land uses for each watershed were identified using an existing dataset that was developed by the U.S. Department of the Interior, LANDFIRE. (accessed March 12, 2019)

The various land uses were assigned land use intensity in the following categories: (1) relatively undisturbed (natural), (2) low-intensity agriculture, (3) high/moderate-intensity agriculture, and (4) developed (Figure 4-1). These categories were assigned based on the LANDFIRE data attribute EVT_GP_N (Existing Vegetation Type Group Name) as listed below:

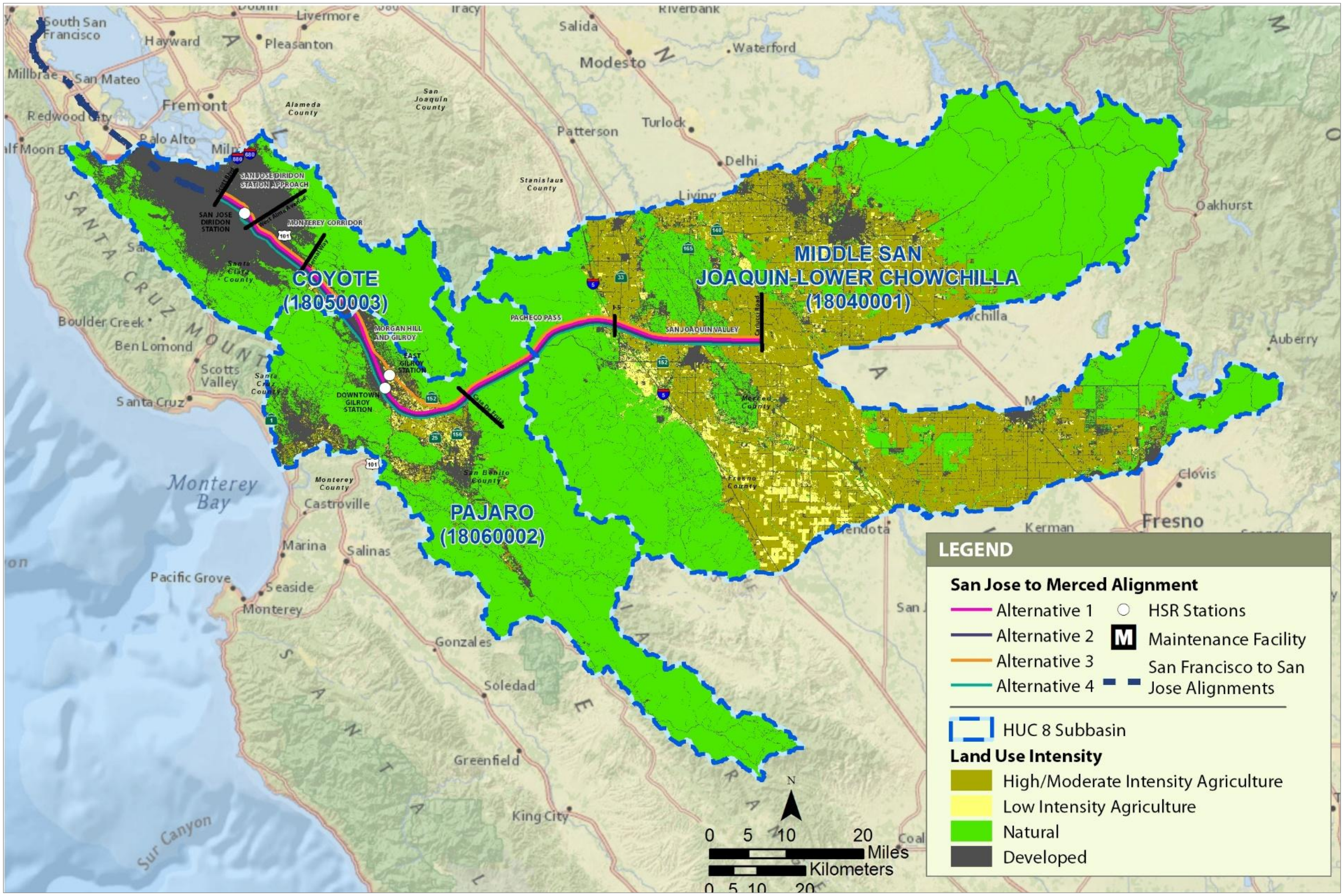
- High/Moderate-Intensity Agriculture
  - Agricultural–bush fruit and berries
  - Agricultural–close grown crop
  - Agricultural–orchard
  - Agricultural–row crop
  - Agricultural–row crop-close grown crop
  - Agricultural–vineyard
  - Agricultural–wheat
- Low-Intensity Agriculture
  - Agricultural–fallow/idle cropland
  - Agricultural–pasture and hayland
- Developed
  - Any features with where the group name included ‘Developed’ or ‘Quarries’ in the description
- Natural
  - All other features (includes.g., barren, chaparral, grasslands, marsh, open water, scrubs, woodlands not classified as developed or agriculture)

Aquatic features within each watershed were mapped using several available databases that are widely accepted and used for understanding the locations and types of aquatic resources within a given region. Aquatic resources were identified using the following sources:

The National Wetlands Inventory (USFWS 2011) identifies the approximate location and type of wetlands at the project level. This dataset was used to calculate acreage and map locations of the following wetland types within each watershed:

- Emergent wetland: herbaceous marsh, fen, swale, or wet meadow
- Forested/shrub wetland: forested swamp or wetland shrub bog or wetland
- Freshwater pond: pond.
- Lake: lake or reservoir basin
- Other wetland: farmed wetland, saline seep, or other miscellaneous wetland
- Riverine: river or stream channel

The National Hydrography Dataset (USGS and USEPA 1999) identifies the approximate locations and types of rivers, streams, canals, and ditches in each watershed. In maps and tables, this dataset is divided into natural features (stream/river) and constructed or altered features (canals/ditches). Results from this dataset were used to calculate linear feet of these feature types.



Source: LANDFIRE 2016

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Figure 4-1 Land Use Intensity

The Holland Central Valley Vernal Pool Complexes data layer (Holland 2009) identifies vernal pool landscapes (not individual vernal pools). These data are presented as acres of vernal pool complex, which include both upland and aquatic habitats. The acreage associated with the data is often significantly greater than the actual area of aquatic features present within a given area.

A combination of the land use and aquatic feature databases was used to provide a profile for each of the watersheds that intersect the project extent. The Level 1 Watershed Profile lists:

(1) the types of aquatic features,

(2) the extent or amount of each aquatic feature within a watershed, and

(3) the relative condition of the aquatic features within each of the watersheds.

Because of the significant variation in topography, soil, vegetation, and land uses in the watersheds crossed by the project extent, the types, extent, and conditions vary greatly. To provide a more meaningful analysis of the watershed profile as it relates to the project, the watershed profile was divided into ecological sections based on the USDA's ecological subregions (Cleland et al. 2007).

Both the types and extent of aquatic features present in each watershed were generated directly from the aquatic feature databases. The extents of some aquatic features are represented as polygons, which translate into areas (acreages); other features, typically linear features, are represented as line features, which translate into miles.

The assessment of the condition of an aquatic feature in a watershed was based on the location of the aquatic feature within a given land use type. The ecological condition of the aquatic feature was categorized as either poor, fair, or good based on the land use type and intensity intersecting the feature. A feature in relatively undisturbed (natural) land was given a condition of *good*. A feature in a low-intensity agricultural area was considered fair, and a feature in a high-intensity agricultural/developed land area was considered poor. The land use types are as follows:

Aquatic features in high-intensity land use types (e.g., orchard and vineyard, croplands, urban) are subject to a number of significant human-induced alterations, inputs, and constraints and are typically in poor ecological condition. High-intensity land uses:

- Provide limited or no buffers to aquatic resources
- Often control or significantly alter the natural hydrology
- Have limited wildlife and biological value
- Often remove the physical structure of aquatic features and often include artificial features

Aquatic features in low-intensity land use types (e.g., pasture/hayland) are subject to limited human-induced alterations, inputs, and constraints and are typically in fair ecological condition. Low-intensity land uses:

- Provide some buffers to aquatic resources
- May mildly to significantly alter the natural hydrology
- Have some wildlife and biological value
- Often retain the natural physical structure of aquatic features, though some characteristics may be removed or altered

Aquatic features in natural land use cover types (e.g., annual grassland, alkali desert scrub, blue oak woodland) are generally subject to minor human-induced alterations, inputs, and constraints and are typically in good ecological condition. Natural land uses:

- Provide important buffers to aquatic resources
- Typically have natural or near-natural hydrology, though upstream or downstream land uses may affect aquatic features

- Have considerable wildlife and biological value
- Retain natural physical structure, though historical land use practices have reduced or altered some of the natural characteristics

In general, these databases may over- or underestimate the extent of natural aquatic features in urban or agricultural regions; such regions are subject to constant manipulation, and even though the data presented are relatively current, the data may not reflect present-day conditions.

5 CRAM METHODS

The methodology for conducting CRAM is described in the *California Rapid Assessment Method for Wetlands: User's Manual, Version 6.1* (CWMW 2013a). This section provides details on pre-field preparations, the CRAM team for the San Jose to Merced segment, and field methods and limitations particular to this section of the HSR.

5.1 Wetland Classification

CRAM uses a wetland classification derived primarily from the functional classification described in the Hydrogeomorphic Method (Brinson 1993). The CRAM typology includes five wetland types: riverine wetlands, depressional wetlands, estuarine wetlands, lacustrine wetlands, and slope wetlands. All but lacustrine wetlands have been divided into subtypes. Based on the resources within the study area, riverine wetlands, depressional wetlands, slope wetlands, and their associated subtypes were used in the CRAM assessment. The only wetland types not encountered were lacustrine and estuarine wetlands.

The *San Jose to Merced Project Section, Biological and Aquatic Resources Technical Report* (Authority 2019d) described aquatic resource types identified in the study area using the Cowardin system (Section 3.1, Vegetation Communities). This system is similar but not equivalent to the standard CRAM typology. A "crosswalk" was used to standardize the aquatic feature terms to standard wetland classification in accordance with CRAM (Table 5-1).

Table 5-1 Crosswalk of Biological and Aquatic Resources Technical Report and CRAM Classifications

Biological and Aquatic Resources Technical Report	CRAM Type
Alkali marsh	Depressional wetlands (subtype: depressional) and slope wetlands (subtype: nonchanneled wet meadow)
Alkali scrub wetland	Depressional wetlands (subtype: depressional) and slope wetlands (subtype: nonchanneled wet meadow)
Constructed basin	Depressional wetlands (subtype: depressional)
Constructed watercourse	Riverine wetlands (subtype: nonconfined riverine)
Freshwater marsh	Depressional wetlands (subtype: depressional) and slope wetlands (subtype: nonchanneled wet meadow)
Freshwater pond	Depressional wetlands (subtype: depressional)
Mixed riparian-natural watercourse	Riverine wetlands (subtype: confined and nonconfined riverine)
Natural watercourse	Riverine wetlands (subtype: confined and nonconfined riverine)
Palustrine forested wetland	Slope wetlands (nonchanneled forested slope)
Palustrine forested wetland-natural watercourse	Riverine wetlands (subtype: confined and nonconfined riverine)
Reservoir	Lacustrine wetlands (not surveyed)
Season wetland	Slope wetlands (subtype: nonchanneled wet meadow)
Alkali vernal pool, alkali vernal pool complex, and vernal pool	Depressional wetlands (suptypes: individual vernal pools and vernal pool systems) (not surveyed)

CRAM = California Rapid Assessment Method

5.2 CRAM Team Members

Six trained CRAM practitioners, including one CRAM trainer, conducted 31 CRAM assessments within the project extent. The team consisted of ICF biologists Linnea Spears-Lebrun (CRAM trainer and coordinator), Lanika Cervantes, R. J. Van Sant, Kristen Klinefelter, Marty Lewis, and Donna Maniscalco.

5.3 Procedures for Using CRAM

CRAM evaluates wetlands by scoring four key attributes: buffer and landscape context, hydrology, physical structure, and biotic structure. All CRAM modules assess these four attributes using various metrics and submetrics. In all modules, the CRAM *index score*, or overall score, is calculated as the average of the four attribute scores. The condition assessment of wetlands for the project extent used CRAM according to the most recent field books for three modules: riverine (CWMW 2013b), depressional (CWMW 2013c), and slope wetlands (CWMW 2017). The lacustrine module was not used because the reservoir would not be affected and did not need to be assessed. The vernal pool module was not used due to lack of access to these resources.

5.4 Assessment Areas

In CRAM, the conditions attributed to wetland areas in a site or region are based on the conditions sampled in AAs, which are selected to represent the wetlands within the site or region. The AAs in the study area were identified by the CRAM team and GIS analysts in areas without site access constraints and were reviewed by Linnea Spears-Lebrun, the CRAM task coordinator.

Each feature being assessed was assigned a CRAM wetland type and subtype to determine the CRAM module to be used in the field for each AA. Previously mapped land use and wetland categories were helpful in the assignment of the CRAM wetland type, but these exact boundaries were not used in the CRAM assessment. The CRAM procedures used to determine AA boundaries were based on the appropriate module (CWMW 2013b, 2013c, 2017). CRAM AAs were based on hydrologic breaks and maximum and minimum size and did not follow jurisdictional limits or vegetation mapping. For example, a natural watercourse surrounded by other riparian would have been included in one riparian CRAM feature and assessed as a whole.

Before conducting CRAM fieldwork, a field packet was created for each prospective AA that included maps at necessary scales showing a preliminary boundary for each AA, as well as a field book with necessary text and work tables for conducting CRAM. Figure 5-1 illustrates the location of all the AAs in the study area. Appendix B provides individual maps of all the AAs evaluated for this report.

5.5 Sample Size

The 2009 Technical Bulletin *Using CRAM to Assess Wetlands Projects* (CWMW 2009) describes the process for establishing a project-based sampling protocol to (1) establish a separate map of the study area showing all the aquatic features of each wetland type (i.e., the sample frame for that type), (2) identify possible AAs within each sample frame for the study area, and (3) sample a subset of AAs. To confirm that the sample size accurately describes the real variation in condition in each sample frame, the Technical Bulletin states that one AA should be randomly selected and compared to the average index score of the other AAs. If the randomly selected AA's index score differs from the average index score of the other AAs by more than 10 CRAM points, additional samples should be added and the process repeated until the difference is less than 10 CRAM points.

The sample frames (the set of wetlands of each type from which the sample of AAs is drawn) for the study area were determined by the locations of aquatic features of each wetland type that intersected with the footprint of any of the four alignments. However, the total number of possible wetland features to include in the CRAM analysis was restricted by the properties with PTE. It is an unavoidable consequence of the arrangement of aquatic features that the combination of proximity and property access limited the locations and numbers of AAs that could be sampled.

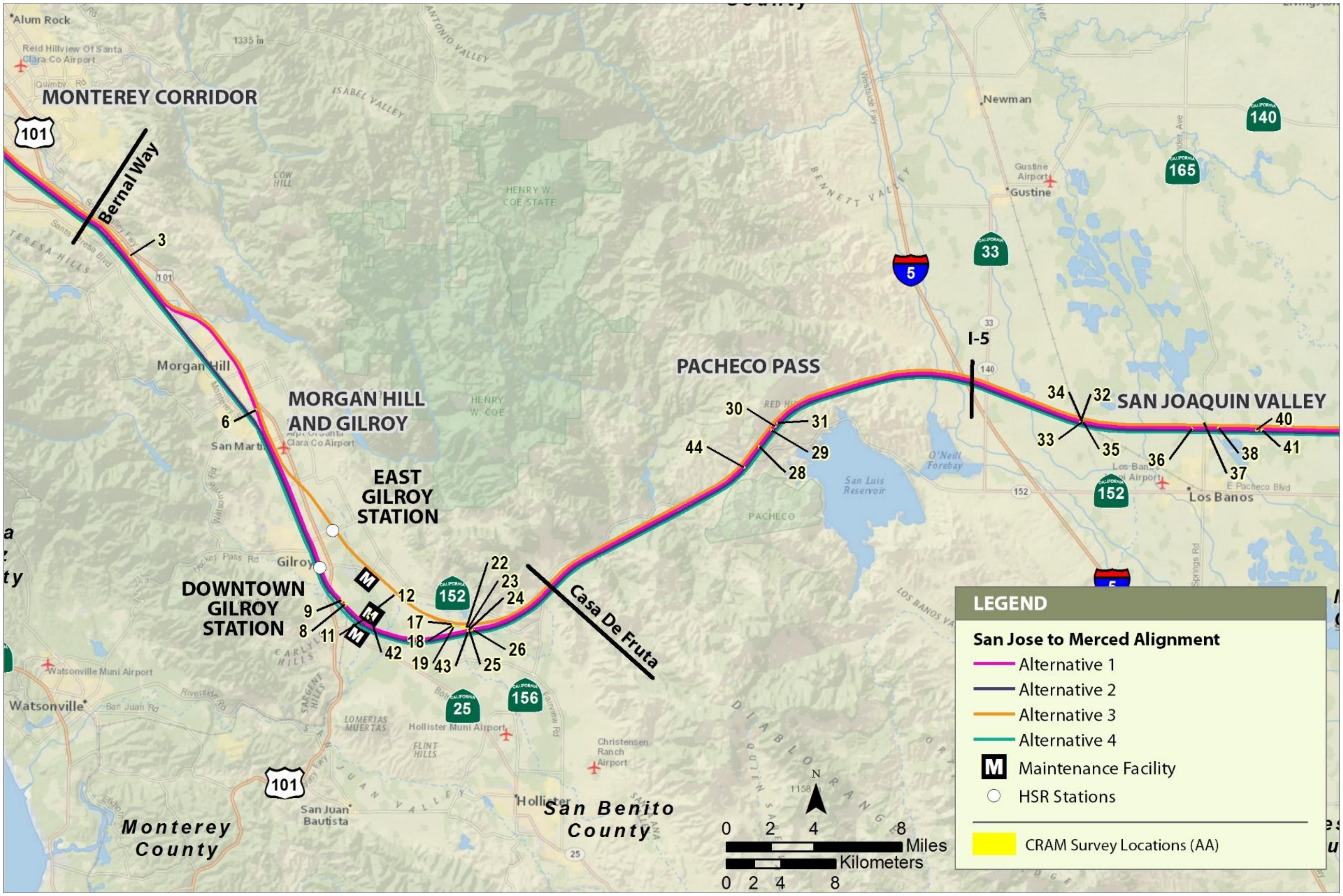

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Figure 5-1 CRAM Assessment Areas in the Study Area

5.6 Field Assessment

Field assessments were conducted April 22 through April 25, 2019, for the four project alternatives. This timing corresponds to the appropriate assessment window for riverine, depressional, and slope wetlands.

As required by CRAM, the field team modified AA boundaries during fieldwork to better capture the conditions present in the AAs at the time of the assessment. For example, AA08 was adjusted in the field not to exceed the maximum size for depressional wetlands (2 hectares [approximately 5 acres]). Additionally, some AAs were shifted during the field investigations to more appropriate locations that better represented the target wetlands. For example, AA31 was shifted to correctly align with the ephemeral drainage. The revisions to AA boundaries made in the field were used by the GIS analysts to update the CRAM maps. The results and maps provided in this report reflect the AAs and field conditions identified by the field team at the time that CRAM fieldwork was conducted.

The final CRAM score for each AA consists of four main attribute scores (buffer and landscape context, hydrology, physical structure, and biotic structure), which are based on the metric and submetric scores (i.e., measurable components of an attribute) (Table 5-2). CRAM practitioners assign a letter rating (A–D) for each metric/submetric based on a defined set of condition brackets ranging from an “A” as the theoretical best case achievable for the wetland class across California, to a “D” as the worst case achievable. Each metric/submetric condition level (A–D) has a fixed numerical value (A=12, B=9, C=6, D=3), which, when combined with the other metrics, results in a score for each attribute. That number is then converted to a percentage of the maximum score achievable for each attribute. That percentage represents the final attribute score, which ranges from 25 to 100 percent. The final overall CRAM score is the sum of the four final attribute scores, ranging from 25 to 100 percent.

Table 5-2 CRAM Attributes and Metrics

Attributes		Metrics and Submetrics
Buffer and Landscape Context		Aquatic Area Abundance
		Buffer:
		Percent of Assessment Area with Buffer
		Average Buffer Width
		Buffer Condition
Hydrology		Water Source
		Hydroperiod
		Hydrologic Connectivity
Structure	Physical	Structural Patch Richness
		Topographic Complexity
	Biotic	Plant Community Composition:
		Number of Plant Layers
		Number of Codominant Species
		Percent Invasion
		Horizontal Interspersion and Zonation
		Vertical Biotic Structure

In addition to calculating attribute and overall CRAM index scores, CRAM includes a stressor checklist. A *stressor* is defined in the CRAM User's Manual as "the consequence of anthropogenic events or actions that measurably affect conditions in the field" (CWMW 2013a). The stressor checklist can be used to explain low CRAM scores by identifying specific human-caused impacts on the landscape, hydrology, physical, or biotic structure of an AA. Some examples of stressors are point source discharge, flow diversitions or unnatural infolow, dikes/levees, grading/compaction, excessive runoff from watershed, trash or refuse, mowing/grazing, excessive human visitation, urban residential, intensive row-crop agriculture, and transportation corridor. In some cases, a single stressor may be the primary cause of low-scoring conditions, though conditions are usually caused by interactions among multiple stressors (CWMW 2013a)). The stressor checklist was completed for each AA assessed.

5.7 Field Conditions and Limitations

Forty-four AAs were selected based on previous permission to enter (PTE) approvals. However, nine PTEs had expired and had not been renewed; these AAs were dropped for lack of access. An additional four AAs were dropped in the field due to safety concerns associated with homeless encampments or fumigation warning signs in agricultural fields. The removal of 13 previously selected AAs left 31 AAs that were assessed in April 2019. Table 5-3 shows the number of AAs assessed in each wetland type.

Table 5-3 Number of AAs by Wetland Type

CRAM Type	Biological and Aquatic Resources Technical Report Type	Number of Assessment Areas
Depressional wetlands—constructed	Constructed basin	2
Depressional wetlands—natural	Alkali scrub wetland, freshwater pond, freshwater marsh	6
Riverine wetlands—constructed	Constructed watercourse, mixed riparian	9
Riverine wetland—natural	Natural watercourse, mixed riparian	7
Slope wetlands (subtype: nonchanneled wet meadow)	Freshwater marsh, season wetland, mixed riparian	4
Slope wetlands (subtype: nonchanneled forested slope)	Alkali marsh, palustrine forested wetland	3
Lacustrine wetlands (not surveyed)	Reservoir	0 (not affected)
Depressional wetlands (suptypes: individual vernal pools and vernal pool systems) (not surveyed)	Alkali vernal pool, alkali vernal pool complex, and vernal pool	0 (no access)
Total		**31**

5.8 Post-Field Data Evaluation

After completion of the fieldwork, the scores for each attribute were entered into an Excel spreadsheet by a CRAM team member and reviewed by the CRAM coordinator. The spreadsheet was compared with the field data forms for quality assurance purposes (for data entry and computational errors). The Excel spreadsheet provides the basis for this summary report. The spreadsheet and the original field data forms are provided as Appendices C and D, respectively. Additionally, AA boundary maps and site photographs are provided in Appendices B and E, respectively.

5.9 Extrapolation Methodology

Data from the 31 surveyed sites were used to extrapolate the evaluations of surveyed sites to all wetlands within the footprint (impact area) of the four project alternatives.

CRAM index scores for the wetland types assessed in study area were analyzed for obvious breaks in the data. CRAM scores for riverine features displayed a difference between natural and constructed features (as one might expect), with natural watercourses consistently scoring higher than constructed watercourses. Surprisingly, there was no similar difference among depressional features between natural and constructed features. A large difference was seen between depressional and slope wetlands and between the two slope wetland subtypes. Data were further reviewed within each wetland type to note any distinct breaks that would justify multiple condition classes (i.e., low, medium, and high). Mostly likely due to the small sample size, no distinct condition classes were identified. Therefore, the average CRAM scores were used for extrapolation as described further in the following paragraphs.

Because alkali marsh can be a depressional or a slope wetland, each nonsurveyed alkali marsh feature was viewed on aerial imagery to determine whether the average depressional wetland index score or the average slope wetland (wet meadow) index score should be assigned to each nonsurveyed feature. If the CRAM wetland type for alkali marsh could not be determined from the aerial imagery, the more conservative (higher) wet meadow slope average index score was assigned.The same procedure was used for alkali scrub wetland, which can also form as a depressional or slope wetland. If the CRAM wetland type for alkali scrub wetland could not be determined from the imagery, the more conservative (higher) wet meadow slope average index score was assigned.

Nonsurveyed constructed basin features were assigned the average index score for constructed basins. Nonsurveyed constructed watercourse features were assigned the average index score for riverine—constructed watercourse wetlands. Nonsurveyed freshwater marsh features were assigned the average index score for wet meadow slope wetlands. Nonsurveyed freshwater pond features were assigned the average index score for natural depression wetlands. Nonsurveyed natural watercourse features were assigned the average index score for riverine—natural watercourse wetlands.

Mixed riparian can occur along constructed watercourses and natural watercourses; it can also occur as forested slope wetland. Consequently, each nonsurveyed mixed riparian feature was viewed on aerial imagery to determine its correct CRAM wetland type. If a mixed riparian feature was found along a constructed watercourse, the average index score for riverine—constructed watercourses was assigned. If a mixed riparian feature was found along a natural watercourse, the average index score for riverine—natural watercourses was assigned. Finally, if a mixed riparian feature was not found along either a constructed or natural watercourse, it was assigned the average index score for forested slope wetlands.

Palustrine forested wetland also occurs along constructed watercourses and natural watercourses; like mixed riparian, it can also occur as forested slope wetland. Accordingly, the same procedure was used for palustrine forested wetland as for mixed riparian. If a palustrine forested wetland feature was found along a constructed watercourse, the average index score for riverine—constructed watercourses was assigned. If a palustrine forested wetland feature was found along a natural watercourse, the average index score for riverine—natural watercourse was assigned. If a palustrine forested wetland feature was not found along either a constructed or natural watercourse, it was assigned the average index score for forested slope wetlands.

Because of access limitations for vernal pools in the study area, the scores for 15 vernal pools, assessed in a previous CRAM assessment for the Merced to Fresno Project Section, were used to extrapolate to the vernal pool features in the current study area. Because the Merced to Fresno Project Section is geographically close to the vernal pool features in the study area, the vernal pools of the Merced to Fresno scores are expected to be representative of the vernal pools in the study area. Scores in the Merced to Fresno study area ranged from a low of 33 to a high of 72. In the *Revised Justification for Vernal Pool CRAM Scores and Documentation of CRAM Score*

Revisions—Merced to Fresno Section Permitting Phase 1 of the California High Speed Train Project (CH2M Hill 2013), a natural break could not be found in the distribution of the scores. However, a simple average was not recommended because of the broad range of scores, giving rise to concerns that the resources could be undervalued and consequently undermitigated. Through discussions with the USACE, two pools in the Merced to Fresno study area that were uncharacteristic were removed from consideration; the average of the remaining two highest scoring vernal pool AAs (65) was used as the score for vernal pool features in the Merced to Fresno study area (CH2M Hill 2013). Therefore, a CRAM score of 65 was used to extrapolate scores for the vernal pool features in the San Jose to Cental Valley Wye study area.Once an extrapolated score was assigned to each nonsurveyed feature, an average CRAM score was calculated for each alternative. All the CRAM scores for each feature in an alternative, either surveyed or extrapolated, were summed and divided by the number of features intersected by that alternative.

6 RESULTS OF WATERSHED EVALUATION AND CRAM ANALYSIS

6.1 Level 1 Watershed Profile

The project is associated with the following basin/subbasin units (with associated HUC-8 codes):

- Coyote watershed (18050003)
- Pajaro watershed (18060002)
- Middle San Joaquin–Lower Chowchilla watershed (18040001)

Figure 3-1 illustrates the project alternatives in the context of the three main watersheds and major hydrological features in the study area.

As Table 6-1 shows, more than half of the land within all three watersheds is natural land. The largest of the three watersheds, Middle San Joaquin–Lower Chowchilla watershed, has the largest percentage of agricultural land and the smallest percentage of developed land. In contrast, the smallest of the watersheds, Coyote watershed, has the largest percentage of developed land and smallest percentage of agricultural land. Pajaro watershed has the largest percentage of natural lands and minimal agricultural land.

Table 6-1 Land Use Intensity by Watershed

Land Use Intensity	Coyote Watershed		Pajaro Watershed		Middle San Joaquin–Lower Chowchilla Watershed	
	Area (acres)	Percent of Watershed	Area (acres)	Percent of Watershed	Area (acres)	Percent of Watershed
Developed	196,587.67	42.65	118,749.37	14.26	235,836.03	10.45
High/moderate intensity agriculture	1,189.46	0.26	30,985.42	3.72	720,517.66	31.94
Low intensity agriculture	416.04	0.09	14,804.87	1.78	119,968.41	5.32
Natural	262,778.06	57.00	667,978.43	80.24	1,179,779.90	52.29
Total	**460,971.23**		**832,518.09**		**2,256,102.00**	

Source: USGS and EPA 1999; LANDFIRE 2016

The tables in Appendix A detail aquatic features (stream type, waterbody type, and wetland type) by watershed, ecological subregion, and land use intensity. The miles of stream length in each watershed follows the size of the watershed. Coyote watershed is the smallest watershed with the least number of stream miles while Middle San Joaquin–Lower Chowchilla Watershed is the largest and has the greatest number of stream miles. The types of land use surrounding the streams follows the pattern of the overall watershed, with Middle San Joaquin–Lower Chowchilla having a greater percentage of streams of all types in high/moderate intensity agriculture, Pajaro having the highest percentage of streams of all types in natural land use, and Coyote having the greatest percentage of all stream types in developed land use. A great majority (71 to 85 percent) of both waterbodies and wetlands of all types are found in natural land use in all three watersheds. Individual stream and waterbodies by land use type are included in Appendix A.

6.1.1 Coyote Watershed

The Coyote watershed encompasses approximately 460,971 acres. As described above, this watershed has the largest percentage of developed land of the three watersheds. Similarly, Coyote watershed has a larger percentage of streams, waterbodies, and wetlands within developed land uses compared to the other watersheds.

The principal streams are Coyote Creek, the Guadalupe River, Los Gatos Creek, Saratoga Creek, and Stevens Creek. Major lakes and reservoirs are Anderson Lake, Coyote Lake, Calero

Reservoir, and Lexington Reservoir. Tables 1 and 4 in Appendix A show details of the linear features (rivers and streams) and waterbodies (lakes and ponds) in the Coyote watershed.

Using land use intensity as the main indicator, 65 to 83 percent of each type of aquatic resource in the Coyote watershed is in a relatively undisturbed (natural) condition (Table 6-2). Land use intensity also indicates that the main anthropogenic impact on aquatic resources in this watershed is development, with almost all of the remaining aquatic resources classified as developed (approximately 17 to 34 percent). Tables 1, 4, and 7 in Appendix A provide additional details on land use intensity by stream type, waterbody type, and wetland type, respectively.

Table 6-2 Percentage of Land Use Intensity in Coyote Watershed by Aquatic Resource Type

Land Use Intensity	Streams/Rivers	Waterbodies	Wetlands
Developed	34.37%	16.62%	29.28%
High/moderate intensity agriculture	0.16%	0.17%	0.33%
Low intensity agriculture	0.11%	0.07%	0.14%
Natural	65.36%	83.03%	70.25%

Sources: USGS and EPA 1999; USFWS 2011; LANDFIRE 2016

6.1.2 Pajaro Watershed

The Pajaro watershed encompasses approximately 832,518 acres. As previously described above, the Pajaro watershed is characterized by a large percentage of natural lands and minimal agricultural land.

The principal streams in the Pajaro watershed are the San Benito River, Pajaro River, Llagos Creek, and Tres Pinos Creek. Major reservoirs are Hernandez Reservoir, Chesbro Reservoir, and Uvas Resevoir. Appendix A, Tables 2 and 5 show details of the linear features (rivers and streams) and waterbodies (lakes and ponds) within the Pajaro watershed, respectively.

Using land use intensity as the main indicator, 62 to 82 percent of each type of aquatic resource in the Pajaro watershed is in a relatively undisturbed (natural) condition (Table 6-3). Land use intensity also indicates that the main anthropogenic impact on aquatic resources in this watershed is development, with approximately 14 to 20 percent of the aquatic resources classified as developed. High/moderate intensity represents approximately 2 and 5.5 percent of aquatic resources, with the remaining 1 to 2 percent classified as low intensity agriculture. Appendix A, Tables 2, 5, and 8 provide additional details on land use intensity by stream type, waterbody type, and wetland type, respectively.

Table 6-3 Percentage of Land Use Intensity in Pajaro Watershed by Aquatic Resource Type

Land Use Intensity	Streams/Rivers	Waterbodies	Wetlands
Developed	14.53%	19.67%	19.12%
High/moderate intensity agriculture	2.44%	5.55%	3.03%
Low intensity agriculture	1.07%	2.37%	1.18%
Natural	81.96%	72.41%	76.67%

Sources: LANDFIRE 2016; USGS and EPA 1999; USFWS 2011

6.1.3 Middle San Joaquin–Lower Chowchilla Watershed

The Middle San Joaquin–Lower Chowchilla watershed encompasses approximately 2,256,102 acres. As described above, Middle San Joaquin–Lower Chowchilla watershed has a large percentage of agricultural land use.

The principal linear features in the Middle San Joaquin–Lower Chowchilla watershed are Bear Creek, Delta-Mendota Canal, California Aqueduct, and San Joaquin River. Major lakes and reservoirs are H. V. Eastman Lake, Los Banos Lake, O'Neill Forebay, San Luis Reservoir, and Yosemite Lake. Tables A-14 and A-15 in Appendix A show details of the linear features (rivers and streams) and waterbodies (lakes and ponds) in the Middle San Joaquin–Lower Chowchilla watershed, respectively. Table 6-4 shows the acreage of vernal pool complexes in the Middle San Joaquin–Lower Chowchilla watershed by categories based on vernal pool cover, density, diversity, and number of large pools. This is the only watershed in the study area with vernal pool resources. It is important to note that the Holland vernal pool complex data shown in Table 6-4 include areas of high vernal pool density across the landscape and do not represent the acres of vernal pool wetland polygons. There are a variety of vernal pools in the Middle San Joaquin–Lower Chowchilla watershed, ranging from individual pools to complexes of varying densities and diversity, some with large pools.

Table 6-4 Vernal Pool Complexes Present in the Middle San Joaquin–Lower Chowchilla Watershed

Vernal Pool Percent Cover	Vernal Pool Density	Vernal Pool Diversity	Number of Large Pools	Area within Watershed (acres)
Individual Vernal Pool				
100% (ind pool/ stockpond)	–	–	–	73.02
Vernal Pool Matrix				
<2% cover vernal pools	Low	Low	>1 per 640 acres	654.60
			4+ per 640 acres	84.28
			None in polygon	89,209.12
		Med	None in polygon	847.89
	Med	Med	None in polygon	962.52
<2% cover vernal pools subtotal				*91,758.42*
>10% cover vernal pools	High	Low	>1 per 640 acres	11.52
			None in polygon	8.57
		Med	None in polygon	666.55
	Low	Low	>1 per 640 acres	95.67
	Med	High	1–3 per 640 acres	145.90
			4+ per 640 acres	2,803.49
		Low	None in polygon	8.55
>10% cover vernal pools Subtotal				*3,740.24*
2–5% cover vernal pools	Low	High	None in polygon	38.32
		Low	>1 per 640 acres	17,526.45
			1–3 per 640 acres	278.60

Vernal Pool Percent Cover	Vernal Pool Density	Vernal Pool Diversity	Number of Large Pools	Area within Watershed (acres)
			None in polygon	62,563.02
		Med	>1 per 640 acres	10,224.71
			1–3 per 640 acres	429.70
			None in polygon	16,667.65
	Med	High	>1 per 640 acres	1,501.19
			4+ per 640 acres	1,126.33
		Low	>1 per 640 acres	6,279.07
			1–3 per 640 acres	1,366.85
			None in polygon	3,387.58
		Med	>1 per 640 acres	2,506.46
			4+ per 640 acres	2,702.50
			None in polygon	8,197.48
2–5% cover vernal pools Subtotal				*134,795.89*
5–10% cover vernal pools	High	High	>1 per 640 acres	3,553.58
			1-3 per 640 acres	3,113.61
			None in polygon	480.35
		Low	None in polygon	16.39
		Med	>1 per 640 acres	2,214.78
			1–3 per 640 acres	440.97
			4+ per 640 acres	2,730.62
			None in polygon	7,422.67
	Low	High	None in polygon	116.56
		Low	None in polygon	4.52
		Med	None in polygon	86.51
	Med	High	4+ per 640 acres	921.76
		Low	4+ per 640 acres	753.42
			None in polygon	2,051.00
		Med	>1 per 640 acres	7,323.91
			1–3 per 640 acres	443.83
			4+ per 640 acres	4,967.70
			None in polygon	1,168.33
5–10% cover vernal pools Total				*37,810.53*
Grand Total				**268,178.09**

Source: Holland 2009

Using land use intensity as the main indicator, aquatic resources in the Middle San Joaquin–Lower Chowchilla watershed range from approximately 50 to 85 percent natural (Table 6-5). Land use intensity also indicates that the main anthropogenic impacts on aquatic resources in this watershed are high/moderate intensity agriculture and development, with approximately 7 to 25 percent of the aquatic resources classified as high/moderate intensity agriculture and 6 to 20 percent classified as developed. The remaining approximately 2 to 6 percent of aquatic resources in the watershed are classified as low intensity agriculture. Appendix A, Tables 3, 6, and 9 provide additional details on land use intensity by stream type, waterbody type, and wetland type, respectively.

Compared to the other two watersheds, the Middle San Joaquin–Lower Chowchilla watershed showed a larger range in land use intensity between aquatic resource types (in particular streams/rivers and waterbodies). One factor is that more than half the streams/rivers in the area are classified as artificial path or canal/ditch (Appendix A, Table 3). The second factor is that one waterbody (San Luis Reservoir) represents approximately one-third of the acreage and is classified as natural land use.

Table 6-5 Percentage of Land Use Intensity in Middle San Joaquin–Lower Chowchilla Watershed by Aquatic Resource Type

Land Use Intensity	Streams/Rivers	Waterbodies	Wetlands
Developed	19.50%	6.25%	16.97%
High/moderate intensity agriculture	25.23%	7.32%	11.39%
Low intensity agriculture	5.50%	1.62%	3.50%
Natural	49.76%	84.81%	68.15%

Sources: USGS and EPA 1999; USFWS 2011; LANDFIRE 2016

6.2 Level 2 CRAM Scores

6.2.1 Depressional Wetlands

Constructed basins, freshwater marsh, freshwater pond, and alkali scrub wetland were the wetland types that were assessed using the depressional wetland module. Two constructed basins and six natural depressions were evaluated. No considerable difference in scoring was observed between the constructed and the natural depressions (1 overall CRAM point difference between their average scores), with both types scoring in the Fair category (overall index score of 51–75). Figure 6-1 shows the average CRAM index scores and attribute scores for constructed basins and natural depressions evaluated using the depressional wetland module.

All depressional wetlands sampled were primarily surrounded by agricultural land, resulting in similarly low buffer and landscape context attribute scores for constructed basins and the three categories of natural depressional wetalnds. The largest difference between constructed and natural depressional wetlands was in the hydrology attribute because of the manipulated hydrologic regimes of constructed basins. However, the two constructed basins scored better in physical and biotic structure than the natural depressions.

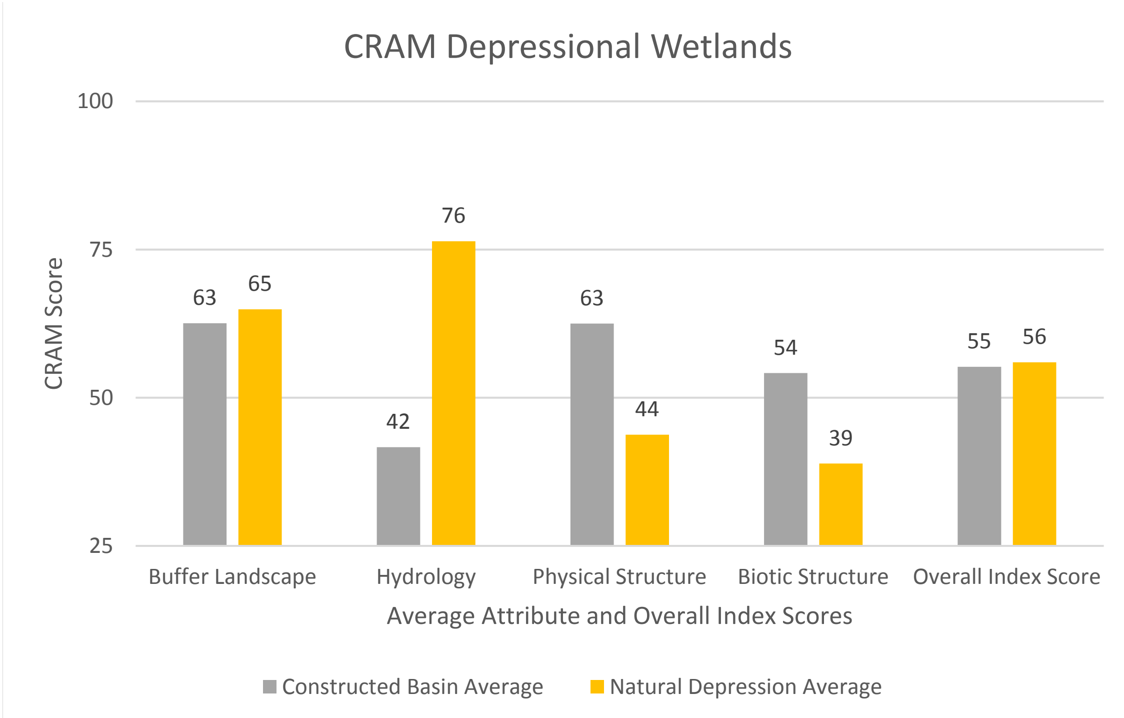

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Figure 6-1 Average Attribute and Overall Index Scores for Depressional Wetland AAs

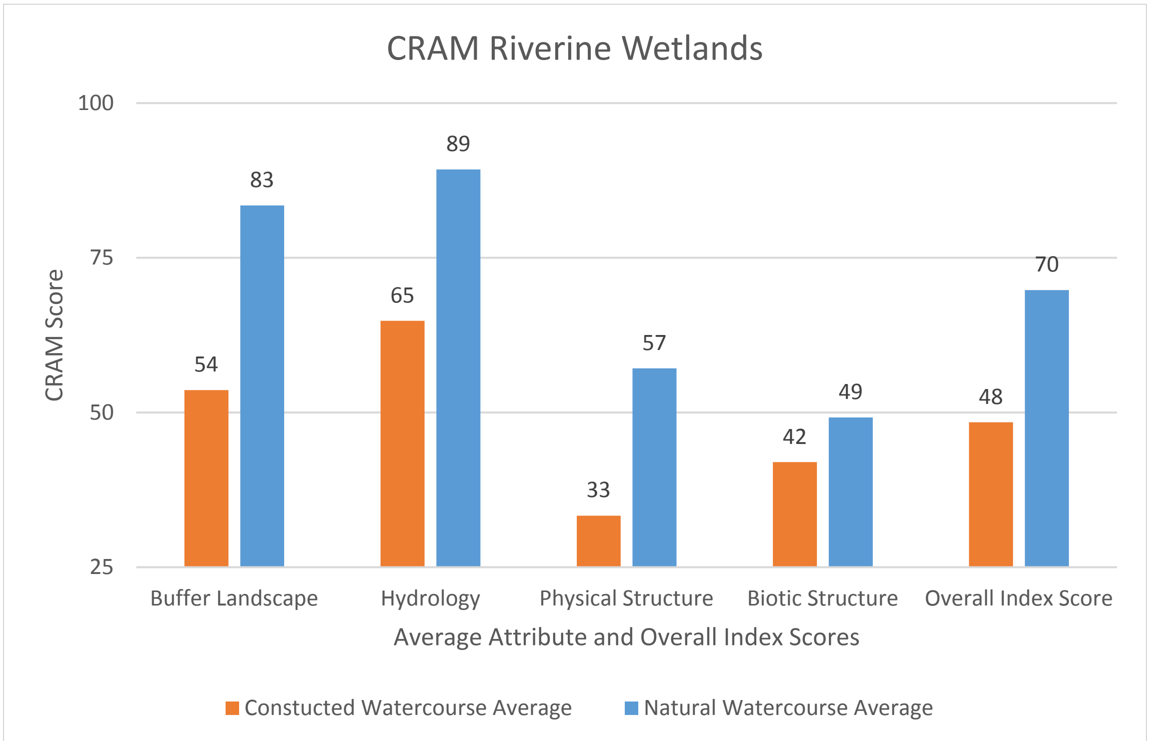
The constructed basins surveyed were treatment ponds at the South County Regional Wastewater Authority. The two basins had similar landscape positions leading to similar landscape and buffer scores, identical hydrology scores, and similar biotic structure scores. Physical structure varied the most as one AA had a single continuous bench, which increased its topographic complexity score.

The natural depressions surveyed were hydrologically closed off from a flow-through system. There may have been a distinct inlet and outlet but no obvious flow. They ranged in size from small shallow depressions with alkali vegetation to a very large (> 5 acres) freshwater marsh/pond. However, the natural depressions had little complexity either in macro or micro-topography and had few co-dominant species, resulting in low physical and biotic structure attribute scores.

6.2.2 Riverine Wetlands

The CRAM team evaluated 16 AAs using the riverine module for two wetland types: natural watercourses and constructed watercourses. Scores were based on the assessment of seven natural watercourses and nine constructed watercourses. The constructed watercourses scored lower than natural watercourses across all attributes and in their overall index score. Most of the constructed watercourses were adjacent to agriculture or development, lacked physical and biotic complexity, and had hydrologic regimes controlled by weirs, gates, and pumping systems. Although some of these features may historically have been natural features, most appear to be built for the purpose of water conveyance at a regional level or at a small scale within a property. Figure 6-2 illustrates the average attribute and overall index scores for constructed and natural watercourses evaluated using the riverine module.

Natural watercourses are natural riverine features that have not been channelized or have minimal disturbance to their hydrology. They were located farther from developed and agricultural land uses than constructed watercourses, with fewer culverts and breaks in riparian vegetation, giving these features high buffer and landscape scores. Because hydrology was minimally affected by human activity, these features scored high in hydrology. Physical structure averaged Fair scores (51–75) while biotic structure averaged Poor scores (25–50). However, these scores were still higher than the average of the constructed watercourse features.



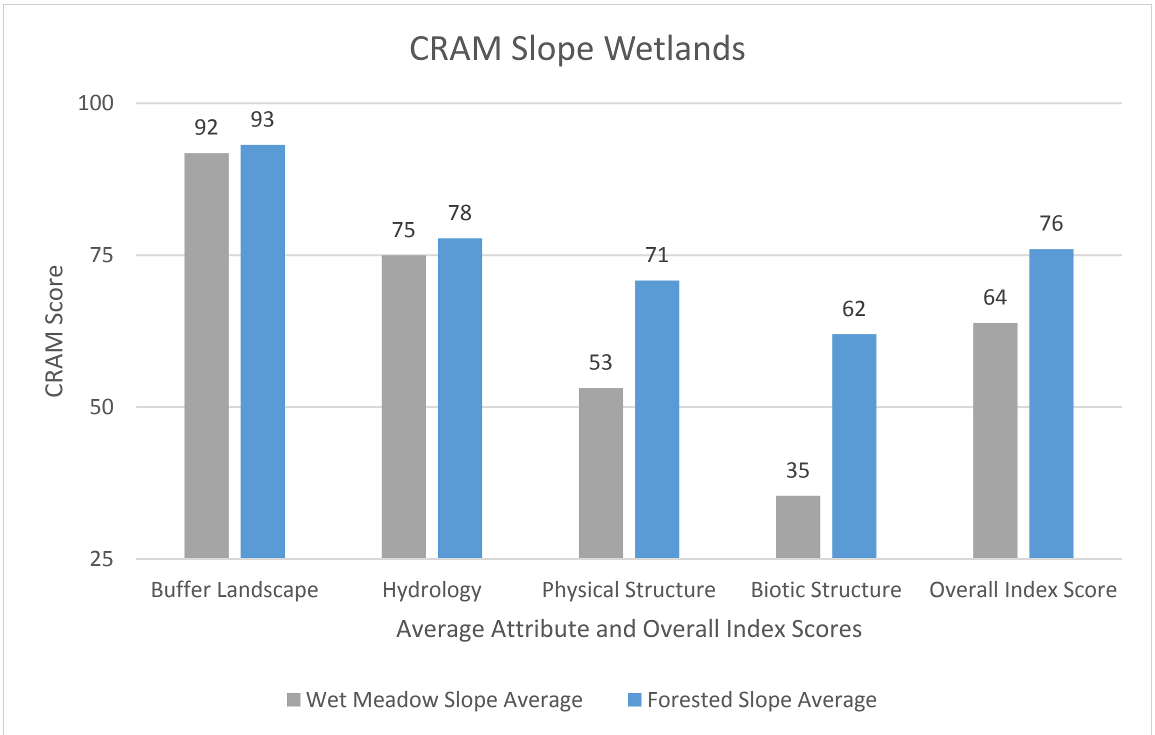
MAY 2019

Figure 6-2 Average CRAM Index and Attribute Scores for Riverine Wetland AAs

6.2.3 Slope Wetlands

The CRAM team evaluated seven AAs using the slope module for four weland types: freshwater marsh, seasonal wetland, palustrine forested wetland, and alkali marsh. These were further divided into two slope subtypes: nonchanneled wet meadow (four AAs, freshwater marsh and seasonal wetland) and nonchanneled forested slope (three AAs, palustrine forested wetland and alkali marsh). Slope wetlands are a broad category of groundwater-dominated wetlands in which groundwater may emerge into the root zone or across the ground surface seasonally or perennially, but they are mainly inundated by surface water and have unidirectional flow (CWMW 2017).

Slope wetlands can resemble despressional wetlands in aerial imagery, but no distinct topographic low is present. Nonchanneled wet meadows do not contain a stream or river channel, are dominated by groundwater throughflow or surface water sheet flow, and have less than 30 percent woody vegetation cover. Nonchanneled forested slope wetlands do not contain a stream or river channel, are dominated by groundwater throughflow or surface water sheet flow, and have have greater than 30 percent woody vegetation cover. The forested slope AAs averaged higher overall index scores than the wet meadow AAs because of their higher physical and biotic structure attribute scores. The wet meadows and forested slopes scored similarly in the buffer and landscape and hydrology attributes. Figure 6-3 illustrates the average attribute and overall index scores for wet meadow and forested slope wetlands evaluated using the slope module.



MAY 2019

Figure 6-3 Average CRAM Index and Attribute Scores for Slope Wetland AAs

6.2.4 Reservoir and Vernal Pools

The San Luis Reservoir was not assessed because none of the alternatives would affect it. Vernal pools would be affected by all four alternatives. However, access to the five potentially affected vernal pool features was not available. Accordingly, the data from the Merced to Fresno CRAM analysis were used to evaluate vernal pools in the study area.

6.2.5 Stressors

Constructed basin and constructed watercourse wetlands had the highest average number of stressors (14) of any of the wetland types (Table 6-6). However, natural depressions and wet meadow slope wetlands were not far behind, with roughly 13 stressors. The highest scoring wetland types—natural watercourses and forested slope wetlands—had the lowest average number of stressors. The most common type of stressors observed were buffer and landscape stressors such as row crops, urban/residential, and transportation corridor. Hydrologic and physical stressors such as nonpoint source discharge (farm runoff), ditches (agricultural drainage), grading/compaction, and plowing/discing were also common. The high occurrence of stressors was not unexpected given the developed (urban and intense agricultural land uses) in the study area, and the stressor evaluation further supports the observations of overall moderate to low scores for all wetland types.

Table 6-6 Average Number of Stressors by Attribute and Wetland Type

CRAM Wetland Type	Average Number of Stressors	Attribute Stressors			
		Buffer and Landscape Stressors	Hydrology Stressors	Physical Stressors	Biotic Stressors
Depressional—constructed basin	14	3	5	4	2
Depressional—natural	13	3	4	2.5	3.5
Riverine—constructed watercourse	14	3.38	3.13	4.75	2.75
Riverine—natural watercourse	8.25	2.38	1.63	1.75	2.5
Wet meadow slope	13.5	3.5	1.5	5	3.5
Forested slope	9	3	3	1.67	1.33

6.3 Sample Size

The sample size analysis was performed for each wetland type after surveying was complete in an attempt to confirm that the sample size was adequate to describe the aquatic resources. One AA was selected from each wetland type using a random number generator. The overall CRAM score of the selected AA was compared to the average overall score of the remaining AAs in that wetland type. The randomly chosen AA differed by less than 10 points from the average overall CRAM score for the remaining AAs for natural depressions, natural watercourses, and wet meadow slope wetlands. These results indicate that although sampling was limited by access, an adequate sampling was achieved to capture the variability in wetland condition in each of these wetland types.

Constructed watercourse wetlands and forested slope wetlands differed exactly by 10 points, indicating that more samples would be needed to ensure that the variability in wetland condition was captured with the current sample size for these wetland types. This type of analysis could not be performed for constructed basins or vernal pools, which had sample sizes fewer than 3 (2 and 0, respectively).

7 SUMMARY BY ALTERNATIVE

Tables 7-1 through 7-4 show the CRAM results for each of the four alternatives: wetland type, the number of times a wetland type is intersected by an alternative, the number of features that were directly surveyed (assessed with CRAM), the number of features that have been assigned extrapolated CRAM scores, and the average CRAM score for each wetland type, as well as totals in each category. The average overall CRAM score is the nearly the same for each alternative because of the large number of constructed watercourse and natural watercourse features that drive the average and the level of extrapolation that was necessary.

Because the overall CRAM score does not exhibit distinctions between alternatives, the number of intersections (i.e., impacts) of wetland features can be used for comparison. This method does not take into account acreage, but rather the frequency of interactions between a given alternative and the existing wetland features in the study area. Alternative 4 would result in the fewest intersections of the four alternatives. Alternative 4 would also result in the fewest interections with the higher-scoring natural wetland types (i.e., all types except constructed basin and constructed watercourse). Alternative 2 would result in the most intersections of the four alternatives as well as the most intersections with the higher-scoring natural wetland types. Alternatives 1 and 3 would fall between Alternatives 2 and 4 in the total number of intersections and number of intersections with natural wetland types.

Table 7-1 Summary of CRAM Results for Alternative 1

Wetland Type	Intersected Features			Average CRAM Score
	Surveyed	Extrapolated	Total	
Alkali Marsh	2	43	45	64
Alkali Scrub Wetland	3	26	29	59
Alkali Vernal Pool/California Annual Grassland Complex	0	3	3	65
California Sycamore Woodland	0	12	12	70
Constructed Basin	2	91	93	55
Constructed Watercourse	7	822	829	48
Freshwater Marsh	1	6	7	65
Freshwater Pond	0	18	18	56
Mixed Riparian	2	265	267	68
Natural Watercourse	7	427	434	70
Palustrine Forested Wetland	1	98	99	69
Seasonal Wetland	2	52	54	62
Vernal Pools	0	5	5	65
TOTAL	**27**	**1841**	**1868**	**59**

Table 7-2 Summary of CRAM Results for Alternative 2

Wetland Type	Intersected Features			Average CRAM Score
	Surveyed	Extrapolated	Total	
Alkali Marsh	2	41	43	64
Alkali Scrub Wetland	3	23	26	59
Alkali Vernal Pool/California Annual Grassland Complex	0	3	3	65
California Sycamore Woodland	0	12	12	70
Constructed Basin	2	99	101	55
Constructed Watercourse	6	895	901	48
Freshwater Marsh	1	7	8	65
Freshwater Pond	0	18	18	56
Mixed Riparian	3	285	288	68
Natural Watercourse	7	436	443	70
Palustrine Forested Wetland	1	88	89	69
Seasonal Wetland	2	60	62	63
Vernal Pools	0	5	5	65
TOTAL	**27**	**1972**	**1999**	**58**

Table 7-3 Summary of CRAM Results for Alternative 3

Wetland Type	Intersected Features			Average CRAM Score
	Surveyed Features	Extrapolated Features	Total	
Alkali Marsh	2	41	43	64
Alkali Scrub Wetland	3	23	26	59
Alkali Vernal Pool/California Annual Grassland Complex	0	3	3	65
California Sycamore Woodland	0	12	12	70
Constructed Basin	0	62	62	55
Constructed Watercourse	5	755	760	48
Freshwater Marsh	3	17	20	65
Freshwater Pond	2	18	20	55
Mixed Riparian	0	265	265	68
Natural Watercourse	6	380	386	70
Palustrine Forested Wetland	0	58	58	68
Seasonal Wetland	1	48	49	63
Vernal Pools	0	5	5	65
TOTAL	**22**	**1687**	**1709**	**59**

Table 7-4 Summary of CRAM Results for Alternative 4

Wetland Type	Intersected Features			Average CRAM Score
	Surveyed	Extrapolated	Total	
Alkali Marsh	2	41	43	64
Alkali Scrub Wetland	3	23	26	59
Alkali Vernal Pool/California Annual Grassland Complex	0	3	3	65
California Sycamore Woodland	0	12	12	70
Constructed Basin	0	13	13	55
Constructed Watercourse	4	790	794	48
Freshwater Marsh	1	6	7	65
Freshwater Pond	0	18	18	56
Mixed Riparian	1	186	187	68
Natural Watercourse	6	394	400	70
Palustrine Forested Wetland	1	77	78	70
Seasonal Wetland	2	46	48	62
Vernal Pools	0	5	5	65
TOTAL	**20**	**1614**	**1634**	**58**

8 NET WATERSHED CONDITION

This section discusses the waters present in each watershed and how the CRAM analysis and stressors characterize aquatic resources across the watersheds. The CRAM scores reported in Chapter 7 provide a “snapshot” of watershed conditions in the study area. The waters present in each watershed and land use intensity are discussed in Section 6.1.

8.1 Coyote Watershed

Waters in the Coyote watershed are within land uses mapped as approximately 57 percent natural, 43 percent developed, and 0.35 percent agricultural (0.26 percent high intensity and 0.09 percent low intensity).

As Table 8-1 shows, predominant streams in the Coyote watershed are ephemeral streams within natural land uses, predominant waterbodies are perennial lakes and ponds within natural land uses, and predominant wetlands are lakes within natural land uses.

Table 8-1 Summary of Waters and Land Uses in the Coyote Watershed

Wetland/Water Category	Wetland/Water Type	Land Use				Total
		Developed	High/Moderate Intensity Agriculture	Low Intensity Agriculture	Natural	
Streams (miles)	Artificial path	26.54	0.09	0.11	40.61	67.35
	Canal ditch	55.03	1.01	1.26	13.32	70.61
	Connector	10.56	0.07	--	1.34	11.97
	Ephemeral stream	89.53	0.40	0.05	506.03	596.01
	Intermittent stream	178.15	--	--	121.52	299.68
	Perennial stream	70.73	0.57	0.06	183.17	254.52
	Streams total	*430.54*	*2.14*	*1.48*	*865.99*	*1,300.14*
Waterbodies (acres)	Intermittent lake/pond	53.14	--	--	66.80	119.94
	Perennial lake/pond[1]	469.63	3.16	2.29	2,988.50	3,463.58
	Reservoir	13.51	--	--	0.38	13.89
	Nonearthen reservoir[2]	28.29	--	--	0.45	28.74
	Evaporator reservoir	6.73	--	--	1.84	8.57
	Treatment reservoir	35.86	3.19	0.45	14.06	53.57
	Swamp/marsh	13.00	--	--	7.53	20.53
	Waterbodies total	*620.16*	*6.35*	*2.74*	*3,079.56*	*3,708.82*
Wetland (acres)	Estuarine and marine deepwater	5.38	--	--	0.76	6.14
	Estuarine and marine wetland	95.57	--	0.17	16.27	112.01
	Freshwater emergent wetland	263.06	5.88	0.29	364.59	633.82
	Freshwater forested/shrub wetland	651.12	1.52	0.10	642.66	1,295.40

Wetland/Water Category	Wetland/Water Type	Land Use				Total
		Developed	High/Moderate Intensity Agriculture	Low Intensity Agriculture	Natural	
	Freshwater pond	411.21	16.32	7.64	477.69	912.86
	Lake	251.98	2.31	1.50	2,785.12	3,040.91
	Other	33.27	--	--	25.57	58.84
	Riverine	826.13	2.55	2.53	1,774.99	2,606.21
	Wetlands total	*2537.72*	*28.58*	*12.23*	*6,087.65*	*8,666.19*

Source: USGS and USEPA 1999; USFWS 2011
[1]Includes perennial lake/pond with stage = to date of photography and stage = spillway elevation
[2]Includes reservoir type = water storage

Within the Coyote watershed, CRAM was conducted on one AA in Coyote Creek. This natural waterway scored 75, which is considered good. Because it was a single AA, the results cannot be extrapolated further. While 57 percent of the waters within the watershed have a natural land use intensity, the project footprint is focused in more developed portions of the watershed.

Due to the number of stressors likely to be present, wetlands/waters within these developed areas would be expected to have a poor CRAM score. Wetlands/waters within natural land uses would be expected to score within the fair to good range. Because most of the watershed is natural, most of the waters within the watershed would likely be characterized as fair to good.

8.2 Pajaro Watershed

Waters in the Pajaro watershed are within land uses mapped as approximately 80 percent natural, 14 percent developed, and 6 percent agricultural (4 percent high intensity and 2 percent low intensity).

As Table 8-2 shows, predominant streams in the Pajaro watershed are intermittent streams within natural land uses, predominant waterbodies are perennial lakes and ponds within natural land uses, and predominant wetlands are riverine within natural land uses.

Table 8-2 Summary of Waters and Land Uses in the Pajaro Watershed

Wetland/Water Category	Wetland/Water Type	Land Use				Total
		Developed	High/Moderate Intensity Agriculture	Low Intensity Agriculture	Natural	
Streams (miles)	Artificial path	29.91	3.42	1.73	70.28	105.34
	Canal ditch	39.51	15.99	7.25	14.02	76.76
	Connector	4.22	0.68	0.33	8.49	13.72
	Intermittent stream	264.46	44.43	19.16	1,968.61	2,296.65
	Perennial stream	54.72	1.33	0.40	154.91	211.35
	Streams total	*392.98*	*65.85*	*28.87*	*2,216.30*	*2,703.99*

Wetland/Water Category	Wetland/Water Type	Land Use				Total
		Developed	High/Moderate Intensity Agriculture	Low Intensity Agriculture	Natural	
Waterbodies (acres)	Intermittent lake/pond	144.38	11.30	6.00	457.82	619.50
	Perennial lake/pond[1]	301.33	115.76	23.80	2,134.69	2,575.57
	Nonearthen reservoir[2]	72.81	2.42	1.54	68.05	144.83
	Sewage treatment reservoir	219.79	82.29	58.99	11.39	372.47
	Swamp/marsh	11.79	–	–	89.97	101.76
	Waterbodies total	*750.10*	*211.78*	*90.33*	*2,761.92*	*3,814.13*
Wetland (acres)	Estuarine and marine deepwater	1.42	–	–	16.21	17.64
	Estuarine and marine wetland	0.54	–	–	10.11	10.65
	Freshwater emergent wetland	598.54	133.77	61.33	1,256.65	2,050.28
	Freshwater forested/shrub wetland	707.83	58.27	17.59	2,291.79	3,075.48
	Freshwater pond	473.10	55.96	22.75	834.51	1,386.32
	Lake	271.18	120.81	41.22	1,836.94	2,270.14
	Other	9.84	–	0.22	11.43	21.49
	Riverine	1,039.28	123.33	47.68	6,181.08	7,391.36
	Wetlands total	3,101.74	*492.13*	*190.79*	*12,438.71*	*16,223.37*

Source: USGS and USEPA 1999; USFWS 2011
[1]Includes perennial lake/pond with stage = to date of photography and stage = spillway elevation
[2]Includes reservoir type = water storage

Within the Pajaro watershed, CRAM was conducted at 16 AAs. The average score for each wetland/water type is shown in Table 8-3.

Table 8-3 Average CRAM Scores in Pajaro Watershed

Waterbody Type	Number of Features Assessed	Average AA CRAM Score
Constructed basin	2	56
Constructed watercourse	6	53
Forested slope	1	69
Natural depression	3	57
Wet meadow—slope	4	64

While most of the watershed is natural, the project would traverse portions of the watershed with existing development (Figure 4-1). Wetlands and nonwetland waters outside the project footprint would be expected to score higher than was observed within the project footprint. The CRAM scores from the AAs affected by the project in this watershed characterize the features as fair. Constructed watercourses within agricultural areas and developed areas would be expected to be scored poor to fair. The features within the natural portions of the watershed would be expected to range between fair and good.

8.3 Middle San Joaquin–Lower Chowchilla Watershed

Waters in the Middle San Joaquin–Lower Chowchilla watershed are within land uses mapped as approximately 52 percent natural, 10 percent developed, and 37 percent agricultural (32 percent high intensity and 5 percent low intensity).

As Table 8-4 shows, predominant streams in the Middle San Joaquin–Lower Chowchilla watershed are intermittent streams within natural land uses, predominant waterbodies are perennial lakes and ponds within natural land uses, and predominant wetlands are freshwater emergent wetlands within natural land uses.

Table 8-4 Summary of Waters and Land Uses in the Middle San Joaquin–Lower Chowchilla Watershed

Wetland/Water Category	Wetland/Water Type	Land Use				Total
		Developed	High/Moderate Intensity Agriculture	Low Intensity Agriculture	Natural	
Streams (miles)	Artificial path	241.84	98.35	25.87	656.57	1,022.62
	Canal ditch	1,385.82	2,075.99	446.62	359.83	4,268.27
	Connector	1.71	0.86	0.16	6.77	9.51
	Ephemeral stream	2.98			272.37	275.35
	Intermittent stream	323.05	377.67	87.59	3,647.69	4,436.00
	Perennial stream	51.72	43.39	6.65	193.88	295.64
	Streams total	*2,007.12*	*2,596.26*	*566.90*	*5,137.11*	*10,307.38*
Waterbodies (acres)	Intermittent lake/pond[1]	746.84	464.90	148.27	7,356.37	8,716.38
	Perennial lake/pond[2]	573.63	466.10	191.57	18,825.25	20,056.56
	Aquaculture reservoir	0.36	0.31	0.16	2.89	3.71
	Water storage nonearthen reservoir	97.88	221.43	7.14	2,574.43	2,900.88
	Treatment reservoir	67.51	5.76	1.56	95.36	170.18
	Swamp/marsh	888.21	1,626.24	268.30	3388.11	6,170.86
	Waterbodies total	*2,374.43*	*2,784.74*	*617.00*	*32,242.41*	*38,018.57*

Wetland/Water Category	Wetland/Water Type	Land Use				Total
		Developed	High/Moderate Intensity Agriculture	Low Intensity Agriculture	Natural	
Wetland (acres)	Freshwater emergent wetland	17,200.89	8,015.89	2,194.89	60,738.71	88,150.38
	Freshwater forested/shrub wetland	2,537.40	3,133.28	1,743.93	3,848.79	11,263.39
	Freshwater pond	884.08	678.78	144.09	5,322.51	7,029.46
	Lake	330.36	340.11	61.96	20,338.33	21,070.76
	Riverine	4853.65	5,155.56	1,178.35	13,408.85	24,596.41
	Wetlands total	25,806.38	*17,323.61*	*5,323.21*	*103,657.19*	*152,110.40*

Source: USGS and USEPA 1999; USFWS 2011
[1]Includes perennial lake/pond with stage = to date of photography and stage = spillway elevation
[2]Includes reservoir type = water storage

In the Middle San Joaquin–Lower Chowchilla watershed, CRAM was conducted at 14 AAs. The average score for each wetland/water type is shown in Table 8-5.

Table 8-5 Average CRAM Scores in Middle San Joaquin–Lower Chowchilla Watershed

Waterbody Type	Number of Features Assessed	Average AA CRAM Score
Constructed watercourse	3	41
Forested slope	2	79
Natural depression	3	55
Natural watercourse	6	69

Land uses across the watershed are consistent with those within the project footprint. Constructed watercourses (artificial path or canal/ditch) in this watershed are predominantly within agricultural areas; consequently, the average CRAM scores of the AAs affected by the project in this watershed indicate a poor wetland condition. Forested wetland AAswithin natural land uses affected by the project received a CRAM score of 79, which indicates a good rating. Natural depression and natural watercourse AAs affected by the project are within the fair range. Accordingly, it is anticipated that the majority of the waterbodies in the natural portions of the watershed would be characterized as fair to good.

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